



# Generative Artificial Intelligence and Supply Chain Performance: The Mediating Roles of Innovation Ambidexterity and Absorptive Capacity from a Dynamic Capabilities and Information Processing Perspective

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## Abstract

The rapid diffusion of Generative Artificial Intelligence (GenAI) is changing supply chain management, yet many organizations continue to face the AI Productivity Paradox, in which cutting-edge investments fail to yield the expected performance gains. Existing research often examines GenAI adoption and supply chain outcomes independently, overlooking the mechanisms that link technological capability to performance. This study carries out a systematic literature review to examine the roles of Innovation Ambidexterity (IA) and Absorptive Capacity (ACAP) in translating GenAI capabilities into supply chain performance. Drawing on the Dynamic Capabilities View and Organizational Information Processing Theory, the study puts forward a dual-mediation conceptual framework. The data show that GenAI serves as a technological enabler rather than a direct performance driver. IA facilitates a balance between exploration and utilization, while ACAP enables the effective use of AI-generated knowledge. Together, these capabilities improve supply chain efficiency, agility, and resilience.

**Keywords:** Generative Artificial Intelligence, Innovation Ambidexterity, Absorptive Capacity, Supply Chain Performance, Dynamic Capabilities

## Introduction

In today's digital economy, global supply chains operate in increasingly complex and volatile environments, where frequent disruptions and uncertainty compel organizations to adopt advanced technologies to enhance resilience and performance (Belhadi et al., 2024). Among these technologies, Generative Artificial Intelligence (GenAI) has emerged as a transformative force in supply chain management and logistics (Fosso Wamba et al., 2024; Dubey et al., 2021; Helo & Hao, 2022). Unlike traditional AI, which focuses on prediction and classification, GenAI processes unstructured data to generate new insights and simulate decision scenarios, enabling faster and more strategic responses.



Despite these capabilities, many organizations experience the “AI Productivity Paradox,” where investments in AI fail to deliver expected performance gains (Queiroz et al., 2021). This occurs because AI is often treated as a plug-and-play solution rather than being integrated into organizational routines and decision-making processes. From the perspective of the Dynamic Capabilities View, technological resources alone cannot create sustained competitive advantage without complementary organizational mechanisms (Teece, 2007). Innovation Ambidexterity (IA), defined as the ability to balance exploration and exploitation (March, 1991), is therefore critical for aligning GenAI with both efficiency and adaptability (Al-khatib et al., 2024).

Similarly, Organizational Information Processing Theory emphasizes the importance of Absorptive Capacity (ACAP) in managing complex information. Although GenAI expands data-processing capabilities, its value depends on the organization’s ability to acquire, assimilate, and apply AI-generated knowledge effectively.

However, prior studies fail to provide a clear multilevel explanation of how Generative Artificial Intelligence (GenAI) translates into supply chain performance outcomes. Existing research does not sufficiently distinguish between strategic- and operational-level mechanisms, thereby limiting understanding of how technological capabilities translate into organizational performance. This limitation reflects the absence of an integrated perspective that simultaneously considers Innovation Ambidexterity (as a strategic capability) and Absorptive Capacity (as an operational capability). Therefore, a more comprehensive framework is needed to explain how these complementary mechanisms jointly mediate the relationship between GenAI and performance.

RQ: Accordingly, this study seeks to address the following research question: how does Generative Artificial Intelligence (GenAI) influence supply chain performance through the dual mediating roles of Innovation Ambidexterity and Absorptive Capacity?

## Objectives

1. To systematically review the literature on Generative Artificial Intelligence and supply chain performance.
2. To synthesize existing research to identify the roles of Innovation Ambidexterity and Absorptive Capacity in translating GenAI capability into performance outcomes.
3. To propose an integrated conceptual framework based on DC and OIPT for future empirical research.



## Concept Theory Framework

To address the research question of how Generative Artificial Intelligence (GenAI) shapes supply chain performance through the dual mediating roles of Innovation Ambidexterity (IA) and Absorptive Capacity (ACAP), this study develops an integrated conceptual framework grounded in the Dynamic Capabilities View (DCV) and Organizational Information Processing Theory (OIPT). The framework addresses fragmented prior research that has often examined technological capabilities and organizational mechanisms in isolation, thereby limiting understanding of how AI-enabled resources generate performance outcomes. Existing studies have not sufficiently clarified the mediating processes through which GenAI enhances supply chain performance, despite growing recognition of the AI Productivity Paradox.

The framework conceptualizes GenAI as a capability-enabling resource whose performance effects are indirect and depend on complementary organizational mechanisms. Innovation Ambidexterity operates at a strategic level by enabling firms to balance exploration and exploitation, while Absorptive Capacity operates at the operational level by facilitating the acquisition, assimilation, transformation, and application of AI-generated knowledge. By integrating these two capabilities into a dual-mediation structure, the framework addresses the lack of multilevel explanation in prior research and explains how organizations translate GenAI capabilities into supply chain efficiency, agility, and resilience.

From the DCV perspective, GenAI supports exploratory and exploitative innovation through simulation, decision-making, automation, and predictive analytics (Bilgram & Laarmann, 2023; Al-khatib et al., 2024; Khan et al., 2024). However, organizations often prioritize operational efficiency while neglecting balanced innovation. IA, defined as the capability to manage exploration and exploitation (March, 1991), enables firms to align GenAI initiatives with both adaptability and efficiency, thereby strengthening supply chain agility and resilience (Li et al., 2024; Sharma et al., 2024).

From the OIPT perspective, organizational performance under uncertainty depends on the effective processing and utilization of information (Tushman & Nadler, 1978; Srinivasan & Swink, 2018). Although GenAI expands data-processing capabilities, its value depends on how well organizations interpret and implement AI-generated insights. ACAP is therefore crucial for converting complex AI outputs into actionable supply chain decisions (Cohen & Levinthal, 1990; Zahra & George, 2002; Fosso Wamba et al., 2024; Martinez-Sanchez & Lahoz-Leo, 2018).

The synthesized literature indicates that GenAI positively influences both IA and ACAP, which jointly mediate the relationship between GenAI and supply chain performance (Benzidia et al., 2021; Baah et al., 2022). Together, these capabilities explain



how GenAI contributes to improved efficiency, agility, and resilience in complex supply chain environments.

## Materials and Methods

This study employs a Systematic Literature Review (SLR) to synthesize prior research on Generative Artificial Intelligence (GenAI), Innovation Ambidexterity (IA), Absorptive Capacity (ACAP), and Supply Chain Performance. Rather than aggregating empirical findings, the objective is to construct a theoretically grounded conceptual framework that explains how GenAI influences performance outcomes through organizational capabilities. The review follows established principles of systematic inquiry to ensure transparency, replicability, and methodological rigor (Snyder, 2019).

A structured search strategy was designed using keywords including “Generative AI,” “Large Language Models,” “Supply Chain,” “Innovation Ambidexterity,” “Absorptive Capacity,” and “Performance,” combined with Boolean operators. Search was conducted in Scopus, Web of Science Core Collection, ScienceDirect, and IEEE Xplore, focusing on titles, abstracts, and keywords to ensure conceptual relevance and alignment with the research objectives.

Given the rapid advancement of GenAI technologies, the review was limited to peer-reviewed English-language journal articles and major conference proceedings published since 2020. Explicit inclusion and exclusion criteria were applied. The study selection process followed the PRISMA 2020 guidelines to ensure transparency, rigor, and replicability in the identification, screening, eligibility assessment, and inclusion of studies (Page et al., 2021). Studies were included if they examined GenAI or related AI technologies within organizational or supply chain contexts and demonstrated methodological clarity. Non-peer-reviewed publications, purely technical studies lacking managerial implications, and inaccessible full-text articles were excluded (Page et al., 2021).

The selection procedure involved duplicate removal, title and abstract screening, and full-text assessment. Methodological quality was critically evaluated to minimize bias and strengthen the credibility of the synthesis. Data extraction captured authorship, publication year, theoretical foundations (e.g., DCV and OIPT), research design, and key findings related to GenAI, IA, ACAP, and performance. A mixed deductive–inductive thematic synthesis approach was adopted to identify recurring relational patterns across studies (Fereday & Muir-Cochrane, 2006).

The synthesis yields three structural insights. First, GenAI operates primarily as a capability-enabling resource rather than a direct performance determinant. Second, Innovation Ambidexterity and Absorptive Capacity consistently mediate the relationship



between AI adoption and operational and strategic outcomes. Third, supply chain performance improvements depend on the firm's ability to reconfigure resources and integrate AI-generated knowledge effectively. These insights underpin the proposed Concept Theory Framework and clarify the mechanisms through which GenAI mitigates the AI Productivity Paradox (Sodhi et al., 2022).

## Results

The systematic search across Scopus, Web of Science Core Collection, ScienceDirect, and IEEE Xplore identified 412 records. After removing 36 duplicates, 376 articles were screened based on titles and abstracts. A total of 281 studies were excluded due to contextual misalignment, technical emphasis without managerial implications, or the absence of supply chain performance dimensions. Ninety-five full-text articles were assessed for eligibility, of which 53 were excluded according to predefined criteria. Ultimately, 42 peer-reviewed articles were retained for qualitative synthesis, forming the analytical foundation of this review.

The methodological profile demonstrates a clear predominance of quantitative, model-driven research. Approximately 78% of the selected studies employed Structural Equation Modeling (SEM), with Partial Least Squares-SEM as the most frequently used analytical technique. Around 14% relied on regression or panel-data methods, while 8% adopted qualitative or mixed-methods approaches. This distribution indicates increasing methodological maturity in AI-performance research and reflects a strong emphasis on testing structural relationships.

Geographically, more than 65% of empirical investigations were conducted in emerging economies, particularly in Asia and the Middle East. China, India, Thailand, and Saudi Arabia appear frequently, suggesting that AI-enabled supply chain transformation is especially prominent in rapidly developing markets. Studies from Europe and North America more commonly focus on strategic renewal, digital transformation, and resilience-building.

Publication trends reveal accelerating scholarly attention. Of the 42 retained studies, 13 (31%) were published between 2020 and 2021, while 29 (69%) appeared between 2022 and 2025. This upward trajectory reflects growing academic engagement with Generative AI and advanced AI applications in supply chain and organizational contexts.

The thematic synthesis identifies four structural patterns. Generative Artificial Intelligence (GenAI) is positioned as a technological enabler rather than a direct performance driver, with its influence on forecasting, decision support, and planning largely indirect. Innovation Ambidexterity (IA) acts as a strategic transformation



mechanism, allowing firms to balance exploratory initiatives with exploitative efficiency, thereby strengthening performance outcomes. Absorptive Capacity (ACAP) serves as a knowledge-integration mechanism, as AI-generated insights must be assimilated into organizational routines to produce tangible supply chain improvements. Finally, Supply Chain Performance (SCP) is conceptualized multidimensionally, emphasizing efficiency, agility, and resilience over purely financial measures. Information concerning the four patterns are manifested in Table 1.

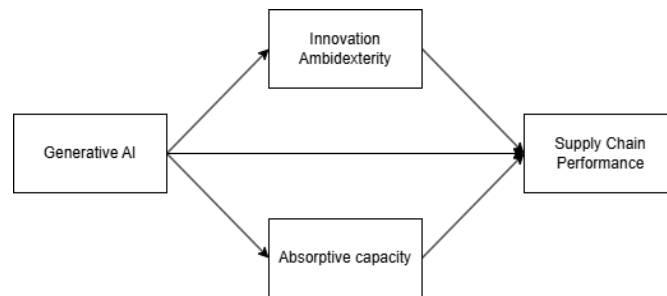
**Table 1:** Synthesized Constructs, Definitions, and Structural Relationships Identified in the Systematic Review

Constructs	Synthesized Definitions	Role in the Model	Key References
Generative Artificial Intelligence (GenAI)	AI technology that generates new outputs and supports strategic and operational supply chain decisions.	Independent Variable	Fosso Wamba et al. (2024); Dwivedi et al. (2023); Jackson et al. (2024); Al-khatib et al. (2024)
Innovation Ambidexterity (IA)	Capability to balance exploration and exploitation in innovation.	Strategic Mediator	March (1991); Al-khatib et al. (2024); Khan et al. (2024)
Absorptive Capacity (ACAP)	Capability to acquire and apply external knowledge, including AI-generated insights.	Operational Mediator	Cohen & Levinthal (1990); Zahra & George (2002); Martinez-Sanchez & Lahoz-Leo (2018); Abou-Foul et al. (2023)
Supply Chain Performance (SCP)	Outcomes reflected in efficiency, agility, and resilience.	Dependent Variable	Belhadi et al. (2024); Li et al. (2024)

In Table 1, based on the synthesized relational patterns, a dual-mediation conceptual structure emerged. The synthesis supports three integrated propositions: Generative Artificial Intelligence (GenAI) positively influences Innovation Ambidexterity (IA); GenAI positively influences Absorptive Capacity (ACAP); and both IA and ACAP positively influence Supply Chain Performance (SCP). Furthermore, IA and ACAP jointly



mediate the relationship between GenAI and SCP. The proposed conceptual structure, derived from the systematic synthesis of prior literature, is illustrated in Figure 1.



**Figure 1:** The proposed framework

This pattern suggests that the dominance of emerging economies reflects the rapid pace of digital transformation and the relatively higher marginal benefits of AI adoption in these contexts. Firms in emerging markets often operate with greater structural inefficiencies and resource constraints, making AI-enabled capabilities such as GenAI particularly valuable for improving decision-making, coordination, and operational performance. In contrast, organizations in developed economies tend to focus more on strategic renewal and incremental innovation, which may explain the relatively lower concentration of empirical studies in these regions.

## Conclusions and Discussion

This study set out to answer the research question of how Generative Artificial Intelligence (GenAI) influences supply chain performance through the dual mediating roles of Innovation Ambidexterity (IA) and Absorptive Capacity (ACAP). The findings indicate that GenAI does not directly drive performance outcomes; rather, its impact is realized through a dual-mediation mechanism in which IA and ACAP jointly translate technological capability into operational and strategic performance improvements. Innovation Ambidexterity enables organizations to align GenAI with both exploratory innovation and exploitative efficiency, while Absorptive Capacity ensures that AI-generated insights are effectively absorbed and transformed into actionable decisions. Together, these capabilities explain how firms overcome the AI Productivity Paradox and achieve improvements in supply chain efficiency, agility, and resilience.

Innovation Ambidexterity emerges as a strategic transformation mechanism. Organizations that balance exploration and exploitation (March, 1991; Ojha et al., 2018; Sahi et al., 2021) are better positioned to embed GenAI within coherent innovation strategies, enabling stronger supply chain performance. The synthesis consistently



supports the mediating role of IA in the relationship between GenAI adoption and performance outcomes. Complementing this strategic perspective, Organizational Information Processing Theory emphasizes the importance of Absorptive Capacity in managing uncertainty and data complexity (Srinivasan & Swink, 2018). While GenAI expands information-processing capability, value realization depends on the firm's ability to interpret and operationalize AI-generated insights (Abou-Foul et al., 2023).

Absorptive Capacity, defined as the ability to acquire, assimilate, transform, and exploit knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002), operates as a knowledge-integration mechanism that converts AI outputs into actionable supply chain decisions. The synthesized evidence supports a dual-mediation structure in which IA functions at the strategic level and ACAP at the knowledge-integration level. Supply chain performance, conceptualized through efficiency, agility, and resilience, improves when these capabilities operate synergistically. Theoretically, integrating DCV and OIPT clarifies that the AI Productivity Paradox reflects capability misalignment rather than technological limitation. Managerially, organizations must move beyond a plug-and-play orientation and invest in balanced innovation governance and organizational learning to realize sustainable competitive advantage.

### Limitations and Future Research

Despite its theoretical contributions, this study has several limitations that should be acknowledged. First, this research adopts a systematic literature review approach, which is inherently conceptual and relies on the interpretation and synthesis of existing studies rather than primary empirical data. As a result, the proposed dual-mediation framework has not been empirically tested, and its causal relationships remain theoretically inferred. Second, the review is limited to peer-reviewed English-language publications indexed in major academic databases and published after 2020. While this decision ensures relevance to the rapid evolution of Generative Artificial Intelligence (GenAI), it may exclude earlier foundational studies and emerging evidence published in other languages or non-indexed sources. Third, although the study identifies Innovation Ambidexterity (IA) and Absorptive Capacity (ACAP) as key mediating mechanisms, it does not account for potential moderating variables such as environmental uncertainty, digital maturity, organizational culture, or leadership support, which may influence the strength and direction of these relationships. Finally, the synthesis primarily reflects evidence from emerging economies, which may limit the generalizability of the findings to developed market contexts.



Future research should extend this work by empirically validating the proposed conceptual framework using quantitative methods such as Structural Equation Modeling (SEM) or longitudinal designs to capture dynamic capability development over time. In addition, further studies could examine the role of contextual moderators, including technological readiness, industry characteristics, and institutional environments, to provide a more nuanced understanding of how GenAI capabilities translate into supply chain performance. Comparative cross-country or cross-industry analyses would also help assess the resilience and generalizability of the dual-mediation mechanism. Moreover, future research may explore additional organizational capabilities, such as digital transformation capability or knowledge governance mechanisms, to refine and extend the theoretical model. By addressing these directions, subsequent studies can deepen the understanding of AI-enabled supply chain transformation and further clarify how organizations can overcome the AI Productivity Paradox. These findings directly address the previously identified research gap by providing a multilevel explanation of how GenAI translates into supply chain performance through complementary organizational capabilities.

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