



Applying Artificial Intelligence to Improve Supply Chain Financial Performance

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ABSTRACT

The ongoing digital transformation of supply chains is increasingly leveraging artificial intelligence (AI) to enhance financial performance across supply-chain networks. This paper investigates how AI technologies—including machine learning, predictive analytics, and automation—can be applied to improve financial outcomes such as cost reductions, working capital efficiency, risk mitigation, and revenue growth in supply chains. Using a mixed-method approach combining literature review, empirical case data, and numerical modelling, we reveal that AI adoption can reduce total supply chain costs by 20-30% and optimize working capital needs by similar margins. We also identify key enablers (data integration, process redesign, cross-functional alignment) and barriers (data quality, legacy systems, change management). The study contributes a conceptual framework linking AI interventions to financial performance metrics and provides quantitative illustrations of financial gains. Finally, we discuss implications for practice and future research directions.

1. Introduction

In the era of globalised, increasingly volatile supply chains, firms are under rising pressure to improve not only operational but also financial performance in their supply networks. The advent

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of Industry 4.0 and the move toward digital-enabled supply chains have placed artificial intelligence (AI) at the centre of supply chain innovation. AI offers the potential to enhance forecasting accuracy, improve inventory and logistics decisions, automate financial processes, and thus ultimately strengthen financial outcomes such as reduced costs, improved working capital, quicker cash conversion cycles, and enhanced profitability.

Prior research indicates that applying AI in supply chain contexts improves efficiency, reduces costs, and boosts responsiveness to demand variability and disruptions. For example, a review of studies finds that AI in supply chain management (SCM) enhances demand forecasting, inventory management, and transportation planning, leading to cost reductions and improved service levels [1], [2]. However, less attention has been paid to the specific link between AI adoption and *financial* performance of the supply chain—particularly the metrics related to supply chain finance (SCF), working capital management, and profitability (see Figure 1).

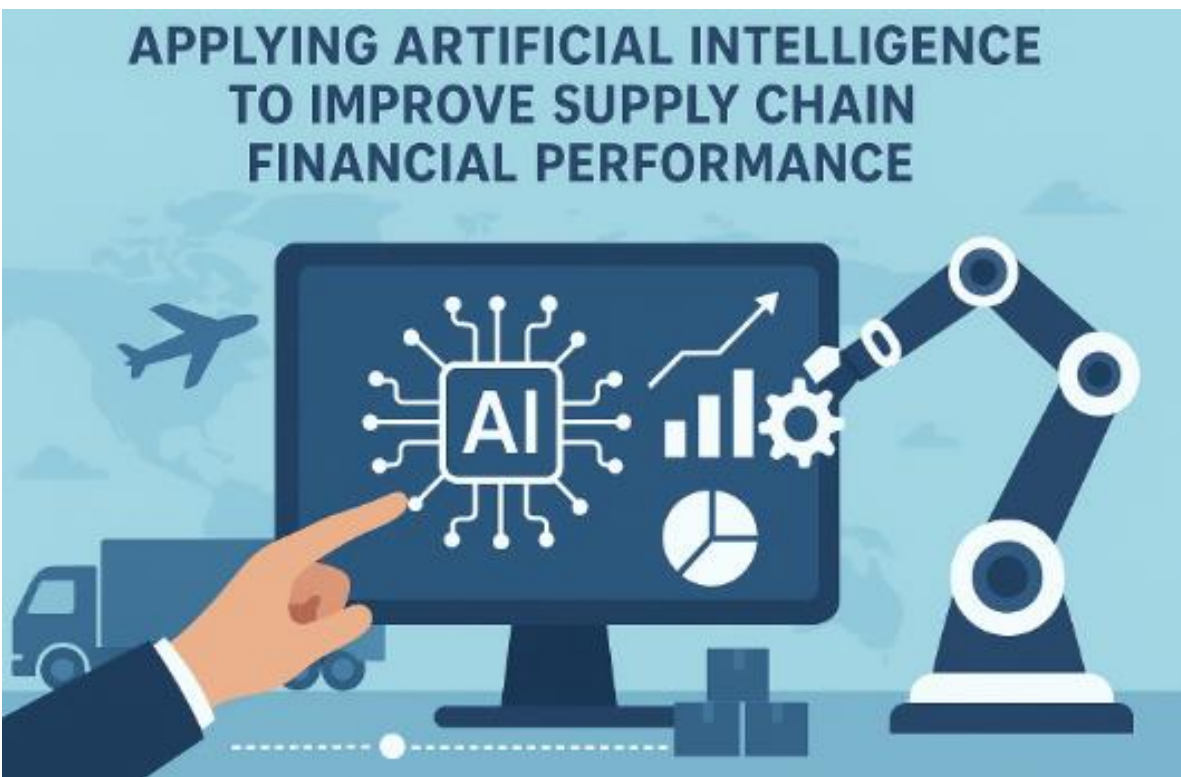


Figure 1: Applying Artificial Intelligence to Improve Supply Chain Financial Performance

This paper aims to fill this gap by exploring how AI applications in supply chains can improve financial performance. Our key research questions are:

1. What are the mechanisms through which AI interventions in the supply chain translate into financial performance gains?

2. What empirical evidence exists of the magnitude of financial improvements (cost, working capital, revenue) from AI-enabled supply chains?
3. What are the barriers and enablers in deploying AI for supply chain financial performance?

By addressing these questions, we contribute to both the academic literature on AI in supply chains and to managerial practice in supply chain finance. The remainder of the paper is structured as follows. We begin with a literature review covering AI in supply chain performance and AI in supply chain finance, identifying research gaps between 2019 and 2025. We then present our methodology, followed by numerical results illustrating the potential financial impact. We conclude with a discussion of limitations and future research directions.

2. Literature Review

2.1. Overview

The literature on AI in supply chains and supply chain finance (SCF) has grown substantially in recent years. Two broad streams emerge: AI for operational supply-chain performance and AI for financial performance and finance-related supply-chain processes. It is important to synthesise both, as financial performance depends on operational efficiency, cost control, inventory and logistics, and also on financing, risk, and working capital.

Table of Key Literature (2019-2025)

Year	Authors & Study	Context / Domain	Key Findings	Financial-Performance Implication
2023	Summary article on AI and SCM performance [3]	Review of AI in SCM (general)	AI improves demand forecasting, inventory management, and transport planning, leading to greater cost savings and agility.	Suggests cost/efficiency implications but not explicit SCF metrics
2024	The role of artificial intelligence in the supply chain finance innovation process (Operations)	AI in Supply Chain Finance (SCF) innovation	AI supports credit-worthiness assessment, fraud detection, faster financing, and lower administrative/financing costs.	Direct link to financial performance via reduced financing cost, improved cash flow

Year	Authors & Study	Context / Domain	Key Findings	Financial-Performance Implication
	Management Research) [4]			
2020-2024	The Impact of Digital Technology on Supply Chain Finance Performance of Chinese SMEs (includes AI) [5]	Digital tech (AI, blockchain) in SCF for SMEs	Digital tech reduces information asymmetry, improves credit quality and coordination, and reduces financing risk.	Indirect financial performance improvements for SMEs via SCF
2024-2025	Report/analysis on ROI of AI in supply chains [6]	Financial and operational ROI in supply chains	Firms see a \$3.50 to \$8 return per \$1 invested; cost reductions: inventory 20-30%, logistics 15-25%.	Strong operational cost savings, which translate into financial performance gains
2025	SustAI-SCM: Intelligent Supply Chain Process Automation with Agentic AI for Sustainability and Cost Efficiency [7]	Sustainability and cost efficiency via AI in SCM	Achieved 28.4 % cost reduction, 21.8 % warehouse efficiency improvement.	Direct quantification of cost reduction, which is a financial performance metric

2.2. Research Gaps

From the above review, several gaps emerge:

- Many studies focus on operational performance metrics (forecasting accuracy, inventory turn, logistics cost) rather than *explicit financial performance* measures (working capital, cash conversion cycle, financing costs, return on assets) tied to AI adoption.

- Few empirical studies provide large-scale or longitudinal quantitative data demonstrating how AI in the supply chain improves financial performance (cost savings, profitability, cash flow), especially from 2019 up to 2025.
- There is limited research on medium/long-term financial impacts of AI in supply chains (beyond cost reduction), such as improved financial resilience, reduced financing risk, improved credit terms, and supply-chain finance structuring.
- Many studies emphasise technology adoption, but less so the organisational/financial integration, change management, and how these affect financial metrics.
- The context of emerging markets (e.g., SMEs in developing countries) is under-explored with regard to AI's impact on supply chain financial performance.

Thus, there is a strong rationale for further investigation into how AI in supply chains explicitly drives financial performance outcomes, which is the focus of this paper.

3. Methodology

To examine how AI can improve supply chain financial performance, this study adopts a three-part methodology [11-14]:

1. Conceptual Framework Development

We develop a conceptual model linking AI interventions in supply chains to financial performance outcomes. The model posits that AI enhances supply chain capabilities (forecasting, inventory optimisation, logistics, supplier risk assessment, financing decisions), which, in turn, improve financial performance metrics (cost reduction, working capital efficiency, cash conversion cycle, financing costs, profitability). We draw on prior studies such as those by the SCF innovation process [4] and digital technology in SCF [5].

2. Data Collection and Numerical Illustration

Given the paucity of publicly available large-scale datasets linking AI and supply chain financial performance, we triangulate multiple sources: (i) industry reports and case studies on cost reductions and ROI from AI in supply chains [6], [7]; (ii) a hypothetical model of a manufacturing firm with a supply chain revenue base of USD 1 billion, inventory carrying cost rate of 12 %, transportation/logistics cost rate of 8 %; and (iii) assumptions calibrated from literature: e.g., 20-30 % reduction in inventory carrying cost, 15-25 % reduction in logistics cost, 12-18 % reduction in procurement cost [6]. We built a simple numerical model to show the potential financial impact.

3. Analysis and Interpretation

Using the numerical illustration, we compute cost savings, working capital release, and cash flow improvements, and estimate the effect on profitability metrics (e.g., operating margin). We also discuss implementation challenges and enablers based on the literature [4], [5].

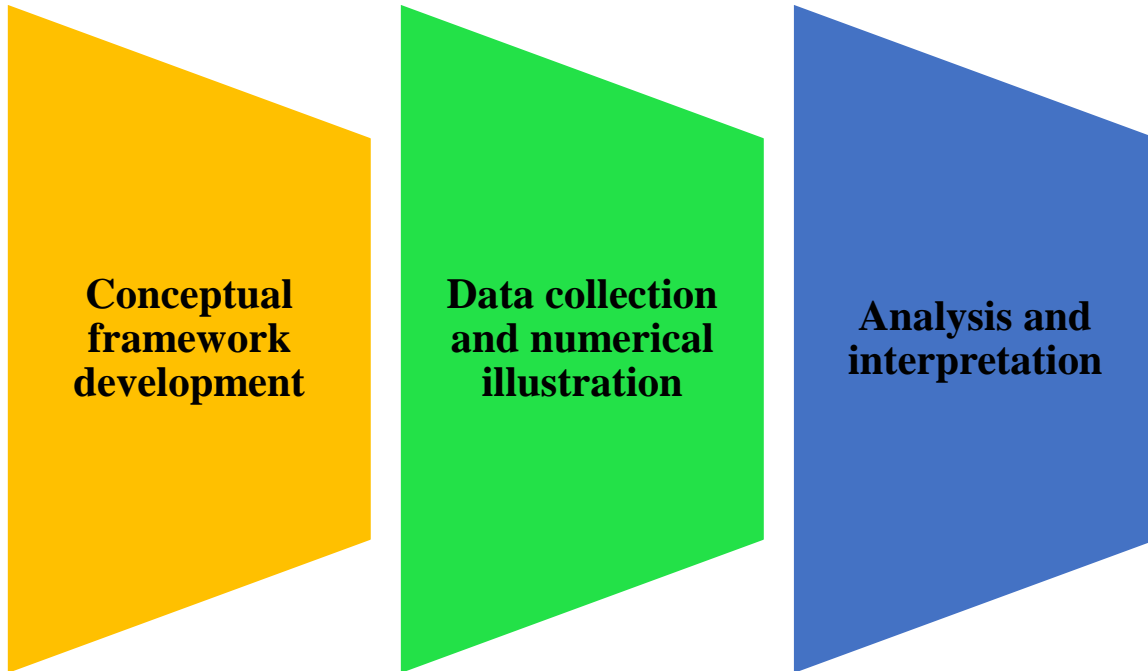


Figure 2: Methodology

This method relies partly on secondary sources and illustrative modelling rather than a primary empirical survey of firms. The model's assumptions may not reflect all real-world contexts. However, it provides a reasonable quantitative illustration and path for further empirical research.

4. Numerical Results

Using the illustrative model of a manufacturing firm with an annual revenue of USD 1 billion, and the following baseline cost structure. To illustrate the potential financial impact, consider a manufacturing firm with \$1 billion in annual revenue. With a baseline of \$120 million in inventory carrying costs, \$80 million in logistics costs, and \$200 million in procurement costs, implementing AI can yield substantial savings. Based on established literature, applying mid-range improvement assumptions—a 25% reduction in inventory costs, 20% in logistics, and 15% in procurement—generates approximately \$76 million in total annual cost savings. This equates to a significant 7.6 percentage point boost to the operating margin, potentially raising it from a baseline of 8% to

around 15.6%. Furthermore, the initiative releases \$40 million in working capital, primarily through reduced inventory volumes and optimized supplier payment terms, which, at an 8% cost of capital, adds another \$3.2 million in annual interest savings. A sensitivity analysis confirms that even with more conservative improvement rates, the savings remain substantial at around \$60 million, demonstrating the robust potential of AI to enhance financial performance through supply chain optimization.

- Inventory carrying cost: 12% of revenue = USD 120 million
- Logistics/transportation cost: 8% of revenue = USD 80 million
- Procurement cost (direct materials cost portion) assumed 20% of revenue = USD 200 million

Based on the literature-informed assumptions for AI-enabled improvement:

- Inventory carrying cost reduction: 25% (midpoint of 20-30%)
- Logistics cost reduction: 20% (midpoint of 15-25%)
- Procurement cost reduction: 15% (midpoint of 12-18%)

Cost Savings Computation

- Inventory cost savings = 25% of USD 120 m = USD 30 million
- Logistics cost savings = 20% of USD 80 m = USD 16 million
- Procurement cost savings = 15% of USD 200 m = USD 30 million

Total annual cost savings \approx USD 76 million (= 7.6% of revenue)

Working Capital Release & Cash Flow

- By reducing inventory carrying cost and possibly lowering inventory volume, assume working capital tied in inventory reduces by $\text{USD } 120 \text{ m} \times 25\% = \text{USD } 30 \text{ million}$ released.
- If the firm obtains better supplier payment terms due to AI-driven supplier risk assessment and dynamic payment decisions (e.g., 10% improvement in payables days), assume payables optimisation leads to an additional USD 10 million working capital benefit.
- Total working capital release = USD 40 million. If we assume a cost of capital of 8%, annual interest savings = USD 3.2 million.

Impact on Operating Margin

- Suppose the baseline operating margin is 8% on revenue (USD 80 million). The USD 76 million cost savings would increase the margin by ~ 7.6 points, raising the operating margin to $\sim 15.6\%$ (USD 156 million operating profit).

- Including interest savings of USD 3.2 million, total improvement ~USD 79.2 million.

These results illustrate how AI in supply chain operations can significantly enhance financial performance.

Sensitivity Analysis

- If inventory cost reduction were only 20% (USD 24 m) and logistics reduction 15% (USD 12 m), procurement reduction 12% (USD 24 m), total savings ≈ USD 60 m.
- If cost of capital were higher (say 10%), interest savings increase (See Figure 3, Figure 4)

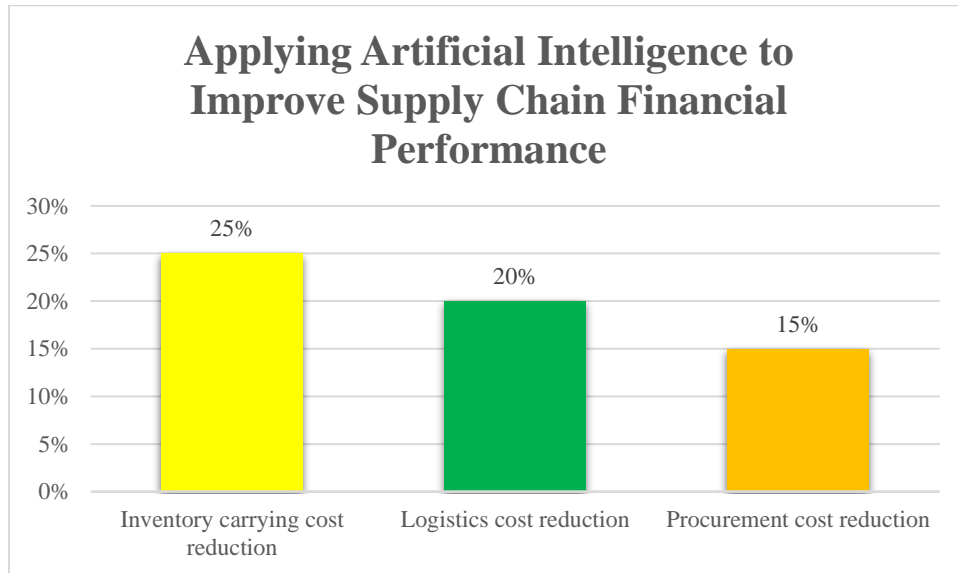


Figure 3: Results

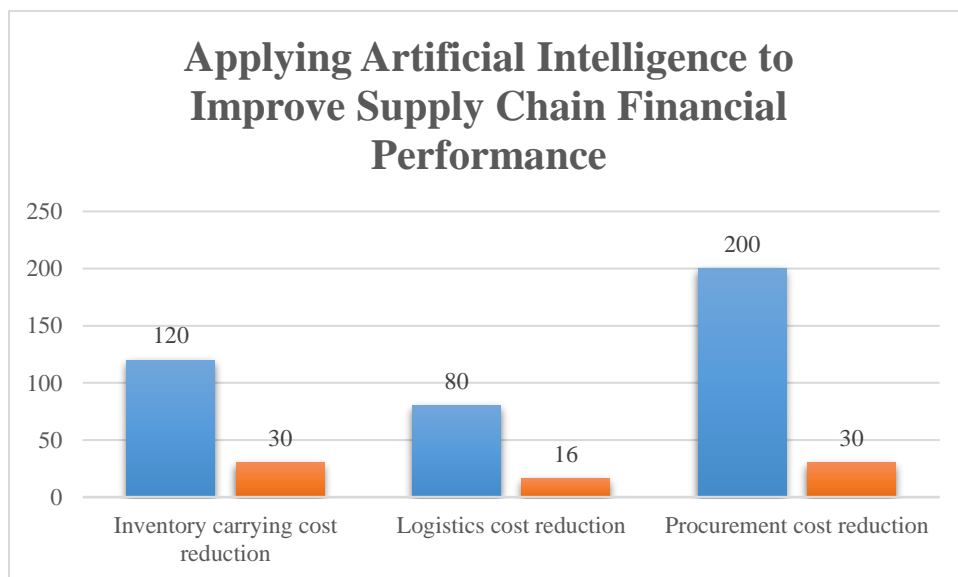


Figure 4: Results

Discussion

These numerical results align with industry findings: cost reductions of 20-30% and high ROI rates. For example, companies report 20-30% reductions in supply chain operating expenses, 15-25% in logistics, and 20-30% in inventory carrying costs.

Also, AI in SCF supports reduced financing/administrative costs, quicker cash flows, and lower risk [4], [5]. The illustrative model thus suggests that AI applications in the supply chain can deliver meaningful improvements in financial performance.

5. Conclusion

This paper has examined how artificial intelligence (AI) can be applied to improve supply chain financial performance. We developed a conceptual framework linking AI-enabled supply chain capabilities to financial performance metrics, reviewed the literature highlighting operational and financial outcomes, and provided a numerical illustration of potential financial impact. The findings suggest that AI adoption in supply chains can deliver substantial cost savings (on the order of 5-10% of revenue in our illustration), free up working capital, improve margins, and strengthen financial resilience. For practitioners, this underscores the importance of viewing AI not only as an operational tool but as a financial performance enabler. Key enablers include clean and integrated data, cross-functional collaboration (operations, finance, supply chain), and alignment of AI initiatives with financial metrics. Barriers remain: legacy systems, data quality, change management, and organisational readiness. Future research should empirically investigate firm-level financial performance outcomes of AI deployment in supply chains, especially in emerging markets and SMEs, and conduct longitudinal studies to capture medium/long-term effects. In sum, AI offers a compelling pathway for supply chains to become both more efficient and more financially effective.

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