Analysis of the Impact of Supply Chain Finance on Working Capital Management in Small and Medium-sized Enterprises

Yulan Liu*

Hainan Vocational University of Science and Technology, Haikou, 571126, China
**Corresponding author: zhangqinrong1995@163.com*

Abstract: *In the current economic environment, small and medium-sized enterprises (SMEs) commonly face dual pressures of working capital constraints and financing difficulties, as traditional financial models often fail to effectively meet their capital allocation needs. As an innovative financing model based on supply chain transactions, supply chain finance integrates information flow, logistics, and capital flow, thereby providing SMEs with new pathways for capital management. This paper focuses on the impact of supply chain finance on the working capital management of SMEs, conducting a systematic analysis from three dimensions: theoretical foundations, impact pathways, and digital transformation. Firstly, it elucidates the theoretical framework of supply chain finance and working capital management, along with their integration mechanisms. Secondly, it analyzes the pathways through which different types of supply chain finance tools affect working capital performance. Finally, it explores how digital technologies drive innovation in supply chain finance and optimize capital management strategies. The research indicates that supply chain finance significantly enhances the turnover efficiency and overall performance of working capital in SMEs through structural integration and procedural embedding, while digital transformation further strengthens the precision and synergy of this process.*

Keywords: *Supply chain finance; Working capital management; Small and medium-sized enterprises; Impact pathways; Digital transformation*

Introduction

As an important component of the economic system, small and medium-sized enterprises (SMEs) play an irreplaceable role in promoting employment and innovation. However, due to information asymmetry and limited financing channels, SMEs often face issues such as insufficient liquidity and low turnover efficiency in working capital management, which constrain their sustainable development. The rise of supply chain finance has provided a theoretical basis and practical tools to address this dilemma. By reconstructing credit assessment systems and capital flow mechanisms, supply chain finance injects new vitality into the management of SMEs. Studying the impact of supply chain finance on working capital management not only helps reveal its inherent operational logic but also offers theoretical support for SMEs to optimize capital allocation and enhance supply chain collaboration efficiency. Based on theories such as information asymmetry and transaction costs, this paper systematically analyzes the correlation between supply chain finance and working capital management, and further explores its innovative pathways in the context of digitalization, aiming to provide references for related theoretical research and management practice.

1. Theoretical Foundations and Intrinsic Connections between Supply Chain Finance and Working Capital Management

1.1 Theoretical Basis and Evolutionary Trajectory of Supply Chain Finance

The theoretical foundation of supply chain finance originates from the reflection on and breakthrough of traditional financial models. Its core lies in viewing the supply chain as an integrated whole and providing systematic financing solutions to enterprises within the chain through the holistic management of information flow, logistics, and capital flow. Information asymmetry theory is a key driver behind the emergence of supply chain finance. Under traditional financing models, a significant

information gap exists between financial institutions and small and medium-sized enterprises (SMEs), leading to credit rationing and financing constraints. By embedding itself within actual transaction contexts, supply chain finance utilizes the credit linkage of core enterprises and the self-liquidating nature of transactions to establish new risk identification and control mechanisms, effectively mitigating problems caused by information asymmetry.

Transaction cost theory offers another perspective. By offering standardized, procedural financial solutions, supply chain finance reduces the search, negotiation, and monitoring costs for SMEs seeking financing, thereby enhancing the transaction efficiency of the entire supply chain. From an evolutionary perspective, supply chain finance has progressively developed from early single financing instruments based on inventory and accounts receivable to the "1+N" model centered around core enterprises. With technological advancements, it is now evolving towards an open and intelligent ecosystem supported by big data and blockchain. This evolutionary process reflects its paradigm shift from addressing localized financing difficulties to optimizing the overall capital allocation within the supply chain.

1.2 The Core Theoretical Framework of Working Capital Management

Research on working capital management has evolved from an isolated focus on managing individual assets to a systematic framework that emphasizes holism and synergy. Its core objective is to maximize the efficiency of working capital turnover while ensuring enterprise liquidity. The element-based management framework divides working capital into three core components: accounts receivable, inventory, and accounts payable. It aims to enhance management performance by optimizing their respective turnover periods. However, a limitation of this approach is its potential oversight of the intrinsic connections between these components.

Consequently, the channel-based theory of working capital management emerged. This theory views a firm's operating activities, investment activities, and financing activities as distinct channels for value creation, with a particular focus on the capital turnover efficiency of operational channels such as procurement, production, and sales. This framework emphasizes that optimizing working capital management should not be confined to the financial department's control over individual ledger items. Instead, it should penetrate deeply into the firm's business processes to achieve synergy between operational activities and fund flows. This theoretical framework shifts the focus of working capital management from static balance sheet items to dynamic business processes and value chain activities. It thereby lays the theoretical groundwork for understanding how the intervention of supply chain finance can reshape business processes and influence capital circulation[1].

1.3 The Integration Mechanism between Supply Chain Finance and Working Capital Management

The integration mechanism between supply chain finance and working capital management is established upon their shared objectives and complementary approaches. From a theoretical perspective, working capital management pursues the efficiency of fund turnover, while supply chain finance provides new pathways and methods for achieving this goal by introducing external financial resources and innovative risk management models. Their integration is concretely manifested in two dimensions: structural convergence and procedural embedding.

Structural convergence refers to how supply chain finance instruments directly correspond to and optimize specific working capital components. For instance, accounts receivable financing corresponds to the management of accounts receivable; by converting outstanding receivables into cash before their due date, it shortens the accounts receivable turnover period within the cash conversion cycle. Similarly, inventory financing revitalizes capital immobilized in the form of stock, thereby accelerating inventory turnover.

Procedural embedding represents a more profound integration, wherein the rules and risk control logic of supply chain finance are embedded into a company's core business processes — such as procurement, production, and sales — guiding the enterprise to adopt operational models more conducive to capital efficiency. This embedding prompts a shift in the internal management logic of the enterprise from a singular pursuit of profit or scale to a comprehensive consideration that balances financial flow health with business growth. Therefore, the essence of the integration mechanism is that supply chain finance, as an external enabling tool, resonates with the objectives and processes of a firm's internal working capital management by altering the distribution and flow paths of funds within the supply chain, ultimately leading to a systemic improvement in capital allocation efficiency.

2. Research on the Impact Pathways of Supply Chain Finance Instruments on the Working Capital Performance of Small and Medium-sized Enterprises

2.1 Types and Functional Characteristics of Supply Chain Finance Instruments

2.1.1 Classification of Financing Instruments Based on Transaction Stages

Based on the different stages enterprises occupy within the supply chain transaction process, supply chain finance instruments can be classified into three core types: prepayment financing, inventory financing, and accounts receivable financing. Prepayment financing primarily intervenes in the procurement stage. Its typical model is "warehouse financing with confirmed delivery," which allows downstream SMEs to make a partial prepayment, after which a financial institution pays the full amount to the upstream core supplier on their behalf. The goods are then shipped to a warehouse designated and supervised by the financial institution as collateral. Inventory financing operates during the production or sales preparation stages. Enterprises use their current assets—such as raw materials, work-in-progress, or finished goods—held as inventory as collateral to obtain financing from financial institutions. This process transforms static, idle inventory assets into dynamic, usable working capital. Accounts receivable financing covers the stage after sales are completed, during the collection period. SMEs transfer the claim of accounts receivable generated from credit sales to core enterprises—through means such as pledging or assignment (e.g., factoring, asset securitization)—to financial institutions. This conversion turns future, uncertain cash inflows into immediate, definite financing support[2].

2.1.2 Core Functional Characteristics and Risk Control Logic

Despite their varied forms, these instruments share core functional characteristics and a unique risk control logic. Their functional characteristics are primarily manifested as transaction credit transfer and asset liquidity conversion. The former refers to the transfer of financing risk from the SME's own creditworthiness to the overall transactional credit of the supply chain through mechanisms such as credit linkage with core enterprises (e.g., payment commitments, buyback guarantees) or the supervisory responsibility of logistics regulators, thereby achieving credit enhancement. The latter involves transforming low-liquidity assets on the supply chain—such as future receivables (accounts receivable) or goods in transit or storage (goods under prepayment arrangements, inventory)—into highly liquid cash assets through the embedding of financial instruments. In terms of risk control, these tools commonly employ a design featuring closed-loop fund flows and structured controls. This ensures that the financing funds are disbursed specifically for designated transactions. Furthermore, by controlling goods release rights, supervising collateral, or locking collection accounts, these instruments enable comprehensive monitoring of transaction authenticity, fund usage specificity, and collateral value stability. Consequently, they establish a risk isolation and control mechanism distinct from traditional credit lending, one that is based on "physical assets" and "rights."

2.2 Composition and Evaluation Criteria of Working Capital Performance

2.2.1 Efficiency Dimension and the Channel Management Perspective

The core of working capital performance is efficiency, with the most comprehensive measure being the cash conversion cycle (CCC). This indicator, calculated as "Days Sales Outstanding (DSO) + Days Inventory Outstanding (DIO) - Days Payable Outstanding (DPO)," accurately depicts the total time required for a firm from paying cash for raw materials to collecting cash from sold goods. Shortening the cash conversion cycle is a direct manifestation of improved working capital management efficiency. Modern evaluation systems further deepen the understanding of efficiency from a channel-based perspective, analyzing working capital by dissecting its occupation across the procurement channel, the production channel, and the marketing channel. Procurement channel working capital focuses on raw material inventory and payment strategies towards suppliers; production channel working capital centers on the management efficiency of work-in-progress inventory; and marketing channel working capital corresponds to finished goods inventory and collection management from customers. This perspective tightly links financial performance to business processes, enabling more precise identification of the root causes of capital tie-up.

2.2.2 Integrated Consideration of the Profitability and Risk Dimensions

Beyond efficiency, profitability and risk constitute the other two pillars of performance evaluation.

The profitability dimension focuses on the output effectiveness of invested working capital, commonly measured by the working capital turnover ratio (Sales Revenue / Average Working Capital). A higher ratio indicates greater sales revenue generated per unit of working capital and stronger capital profitability. The risk dimension emphasizes the firm's short-term solvency and liquidity risk, typically monitored through indicators such as the current ratio and quick ratio. An optimized working capital management performance should maximize both capital operation efficiency and profitability while ensuring necessary liquidity and controlling financial risk. These three dimensions are interconnected and mutually constraining, jointly forming a comprehensive performance evaluation framework that provides a multi-dimensional observational benchmark for analyzing the impact of supply chain finance[3].

2.3 The Transmission Mechanism of How Supply Chain Finance Instruments Influence Working Capital Performance

2.3.1 Direct Pathway Based on Components and Structural Optimization

The primary pathway of the transmission mechanism is the direct impact on and structural optimization of the core components of working capital. Different financial instruments precisely hedge against different forms of capital occupation. Accounts receivable financing directly reduces the average balance of accounts receivable by discounting outstanding receivables, thereby shortening the Days Sales Outstanding (DSO). Inventory financing and prepayment financing effectively lower the Days Inventory Outstanding (DIO) by releasing capital tied up in inventory and prepayments. Under certain models, the credit intervention of financial institutions may also enhance the bargaining power of SMEs in the procurement process, potentially creating opportunities to extend the Days Payable Outstanding (DPO). This targeted intervention on specific balance sheet items achieves preliminary structural optimization of working capital, laying the micro-foundation for overall performance improvement.

2.3.2 Indirect Pathway Based on Channels and Operational Model Restructuring

A deeper-level transmission pathway lies in the indirect influence on business processes and the restructuring of operational models. When external financing alleviates a firm's liquidity constraints, its internal operational decision-making adapts accordingly. For instance, after securing prepayment financing support, an enterprise may adopt bulk purchasing strategies with greater economies of scale to lower unit procurement costs. Inventory financing enables a firm to maintain safer, more responsive inventory levels, avoiding sales losses due to stockouts. Accounts receivable financing empowers an enterprise to offer more competitive credit policies on the sales end to expand its market. These adjustments in decision-making signify that the influence of supply chain finance has permeated from the financial level into operational channels such as procurement, production, and marketing, driving the re-engineering of business processes and the upgrading of operational models. This optimization of the operational model, in turn, further consolidates and amplifies the efficiency gains achieved at the component level, forming a positive feedback loop[4].

Ultimately, the structural optimization at the component level and the operational model restructuring at the channel level mutually reinforce and resonate synergistically. In terms of financial outcomes, this converges into a systemic shortening of the cash conversion cycle, a significant increase in the working capital turnover ratio, and enhanced overall financial robustness. This completes the full transmission from the application of financial instruments to the comprehensive improvement of working capital management performance. This mechanism reveals that the value of supply chain finance lies not only in providing funds but, more importantly, in guiding and empowering SMEs to achieve refinement and efficiency in their internal management processes through its structured design.

3. Innovation in Working Capital Management through Digital Supply Chain Finance

3.1 The Driving Force and Reshaping Effect of Digital Transformation on Supply Chain Finance

The core driving force of digital transformation stems from the clustered breakthroughs of disruptive technologies such as big data, artificial intelligence, blockchain, and the Internet of Things. These technologies are fundamentally reshaping the ecosystem of supply chain finance from the ground up. Big data analytics and AI algorithms enable the deep mining and intelligent analysis of massive, full-chain supply chain data. They transform previously static, isolated transaction

information into dynamic, interconnected credit assets, significantly enhancing the precision of risk pricing and identification. Blockchain technology, with its characteristics of distributed ledgers and smart contracts, establishes a multi-party collaborative and tamper-proof trust mechanism. This ensures the authenticity of transaction backgrounds and the transparency of fund flows, fundamentally reducing transaction costs and operational risks. Internet of Things technology, through sensor devices, creates real-time linkages between the physical movement of goods and warehouse status in the physical world and fund flow information in the digital world. This achieves intelligent and visual supervision of movable asset pledges, vastly expanding the scope of eligible collateral. This technology-driven reshaping shifts supply chain finance from a "point-based" credit model reliant on the credit of core enterprises towards a "chain-based" credit system founded on supply chain operational data[5].

3.2 Innovative Models and Applications of Digital Supply Chain Finance

Driven by technology, innovative models of supply chain finance are primarily characterized by platformization, ecosystem integration, and scenario embedding. The platformization model integrates multiple entities including core enterprises, upstream and downstream SMEs, financial institutions, and logistics service providers. Through unified digital interfaces and data standards, it achieves business online processing, process standardization, and risk control automation. A typical example is the electronic accounts receivable debt instrument (multi-level circulation) model, which effectively revitalizes the receivables of SMEs situated deep within the supply chain. The ecosystem integration model goes a step further by seamlessly embedding financial services into specific operational scenarios of enterprises, such as daily procurement, production, sales, and logistics, forming an integrated business model where "transaction equals finance"[6]. For instance, automated credit granting and lending based on real-time transaction data and dynamic inventory levels enable working capital to be replenished on demand and borrowed or repaid flexibly. Scenario-embedded applications transform financing services from a back-office support function independent of business processes into an organic component that empowers business processes. This achieves a higher level of coordination between capital flow and information flow, as well as logistics.

3.3 Optimization Strategies for Working Capital Management in the Context of Digital Transformation

Confronted with the new environment brought about by digital supply chain finance, small and medium-sized enterprises (SMEs) must undertake systematic optimization and forward-looking adjustments in their working capital management strategies. The management philosophy needs to shift from traditional reactive response and localized optimization to proactive forecasting and global synergy. Enterprises should actively integrate into industrial digital platforms, willingly participate in data sharing and process collaboration, connect their internal capital management data with external supply chain ecosystem data, and build data-driven capabilities for capital demand forecasting and dynamic allocation. At the operational level, enterprises can utilize digital tools to achieve real-time monitoring and early warning of working capital status, pushing the management of key performance indicators like the cash conversion cycle from post-event accounting towards real-time control[7]. By accessing platform-based financial services, enterprises can tightly link financing decisions to specific transaction orders and logistics statuses, achieving precise matching between working capital occupation and replenishment. This approach ensures business continuity while optimizing overall funding costs and controlling liquidity risk within the most favorable range. The core strategy for working capital management under digital transformation lies in achieving a leap from internal management closure to cross-organizational collaborative optimization through deep embedding into the digital ecosystem.

Conclusion

Supply chain finance has exerted a profound impact on the working capital management of SMEs through theoretical reconstruction, instrumental innovation, and process embedding. Research indicates that its core mechanism of action lies in optimizing capital structure and enhancing turnover efficiency through credit transfer and liquidity conversion. Digital transformation has further propelled supply chain finance towards platformization and scenario embedding, realizing precise control and ecological synergy in capital management. In the future, with the deepening integration of digital technologies and the continuous evolution of supply chain ecosystems, supply chain finance will place greater emphasis

on data-driven approaches and cross-organizational collaboration. SMEs need to actively adapt to this trend by deepening technological application and strategic integration to continuously improve the agility and resilience of their capital management. Subsequent research could further explore the differentiated impact of supply chain finance across various industry contexts, as well as the application and challenges of emerging issues such as data security and governance models in capital management.

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