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Challenges and Optimization Pathways of Moutai's Digital Supply Chain Finance Model

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Abstract: In the era of the digital economy, traditional supply chain finance models face challenges such as information fragmentation, inefficient processes, and insufficient credit transmission, necessitating digital transformation. This study focuses on Kweichow Moutai Group, systematically analyzing its innovative practices in supply chain finance and examining the mechanisms through which digital technologies enhance core enterprise credit empowerment, improve supply chain collaboration efficiency, and optimize risk management. The research reveals that Moutai Group has transformed supply chain finance from unilateral credit granting to ecosystem-based credit sharing by establishing an IoT-enabled asset verification platform, developing smart contract-driven bill financing systems, and building a blockchain-based multi-party credit alliance. This model significantly lowers financing barriers for small and medium-sized suppliers while creating new value chain growth points through data assetization strategies. Finally, the study proposes further improvements from the perspectives of technical standardization and adaptive regulatory frameworks.

Keywords: Digital technology integration; Liquor industry chain; Credit penetration; Intelligent risk control; Ecosystem-based financing

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1. Introduction

In the rapidly evolving digital economy, traditional supply chain finance (SCF) models face significant challenges, including information asymmetry, inefficient credit transmission, and high risk management costs, necessitating a digital transformation to enhance financial efficiency across industrial chains. As a leading enterprise in China's liquor industry, Kweichow Moutai Group operates a complex supply chain spanning raw material cultivation, brewing, warehousing, logistics, and distributor networks, characterized by substantial capital requirements and long cycles [1]. Conventional credit models struggle to meet the financing needs of small and medium-sized enterprises (SMEs) in its upstream and downstream ecosystem.

In recent years, Moutai Group has leveraged digital technologies—such as the Internet of Things (IoT),

blockchain, and big data—to construct a novel SCF ecosystem anchored in core enterprise credit and supported by data assetization [2]. This innovation has transformed the traditional unilateral credit model into a multi-party credit-sharing paradigm. The new approach not only significantly reduces financing costs for SMEs but also uncovers new value chain growth points through data monetization strategies, offering a pioneering case for digital financial innovation in asset-heavy industries.

2. The drivers behind Moutai's digital transformation of supply chain finance

The digital transformation of Moutai Group's supply chain finance (SCF) stems primarily from the inherent limitations of traditional financial models in addressing the complexities of its extensive industrial chain. As a leading player in China's liquor industry, Moutai's supply chain encompasses long-cycle processes ranging from sorghum cultivation and base liquor production to warehousing, logistics, and distributor networks [3]. Small and medium-sized enterprises (SMEs) operating upstream and downstream frequently struggle with financing accessibility and affordability. Traditional bank credit models, which rely heavily on collateral and financial statements, fail to transmit the core enterprise's creditworthiness effectively to peripheral suppliers. Consequently, businesses at the supply chain's tail end—lacking qualifying collateral—often face liquidity crunches [4]. Compounding this issue is the prevalence of data silos, where fragmented information across different stages prevents financial institutions from verifying trade authenticity in real time, exacerbating adverse selection and moral hazard risks. Since 2018, intensifying industry competition and rising ESG demands have pressured Moutai to adopt digital solutions that enhance capital allocation efficiency across its supply chain, thereby stabilizing and future-proofing its ecosystem.

A more profound catalyst lies in the transformative potential of digital technologies in industrial finance. Moutai's supply chain presents numerous asset scenarios ripe for digitization: soil moisture data from sorghum farms, IoT-monitored fermentation pits, blockchain-based liquor traceability, and more [5]. These real-time datasets offer dynamic risk-assessment dimensions beyond traditional credit metrics. By converting physical assets into verifiable digital assets, Moutai replaces "collateral-based credit" with "data-driven credit," enabling previously intangible factors—such as the value of brewing techniques or inventory liquidity—to serve as financing foundations. Furthermore, Guizhou Province's "Big Data Strategy" and Moutai's own "Smart Moutai" initiative synergistically promote the market-oriented deployment of data. For instance, the 2021 launch of the "SCF Cloud Platform" (a collaboration with Industrial Bank) integrated order, logistics, and capital flow data to automate accounts receivable verification and enable credit splitting, boosting credit transmission efficiency by over 40%.

External shifts further accelerated this transformation. The COVID-19 pandemic exposed the fragility of offline financial services amid supply chain disruptions, while Moutai's digital platform ensured financing continuity via remote asset validation and smart contract settlements [6]. Concurrently, regulatory support—exemplified by the China Banking and Insurance Regulatory Commission's (CBIRC) 2022 Guidelines on Promoting SCF to Serve the Real Economy—legitimized innovations like blockchain-based bill discounting and digital warehouse receipt pledging. Crucially, digitization transcends risk mitigation to unlock new value streams. By analyzing distributor sales histories and consumer behavior, Moutai dynamically adjusts prepayment financing limits and designs tailored financial products for premium clients, transitioning from "financing services" to "data-driven value-added services." These practices underscore that Moutai's SCF digital evolution is fundamentally propelled by a triad of forces: technological advancement, industrial pain points, and policy tailwinds.

3. The architecture of Moutai's digital supply chain finance model

Moutai's digital supply chain finance (DSCF) model is built upon its closed-loop, full-industry-chain ecosystem, reconstructing the traditional financial value chain through three core principles: data transparency, credit sharing, and intelligent collaboration. At the foundational technological level, Moutai has established a hybrid infrastructure combining blockchain and IoT. Blockchain nodes connect core enterprises, tier-one suppliers, financial institutions, and regulators to ensure the immutability of trade authenticity, while IoT devices are embedded in critical stages such as raw material cultivation, base liquor production, and logistics, collecting real-time data on temperature, humidity, and transport routes to create a digital twin of the physical supply chain. This "on-chain/off-chain" dual verification mechanism effectively mitigates traditional SCF pain points like invoice fraud and duplicate financing [7]. For example, in Moutai's 2022 "digital warehouse receipt pledge" collaboration with ICBC, IoT sensors dynamically monitored stored liquor conditions while hashed data was recorded on-chain, granting movable asset financing a risk-control credibility comparable to real estate collateral.

At the business middle layer, Moutai developed an intelligent analytics platform integrating "four flows" (order, logistics, capital, and invoice), powered by AI-driven dynamic credit assessment models. Unlike traditional financing, which relies on static financial statements, this platform evaluates suppliers based on behavioral data and distributor performance metrics to generate customized credit scores [8]. For upstream sorghum farmers, the platform incorporates satellite weather and soil moisture data, automatically adjusting prepayment financing limits when droughts threaten yields. For downstream distributors, point-of-sale (POS) system integration enables automated sales-revenue deductions and profit releases, optimizing cash flow. This data-centric approach reduced non-performing loans by 63% and cut approval times from 7 days to 2 hours.

The application ecosystem layer features a modular network connecting financial institutions and third-party service providers via open APIs. Moutai digitizes its core enterprise credit into transferable electronic claims, enabling multi-tier supplier receivable financing. It also embeds scenario-specific financial products, such as the "Fermentation Capacity Loan" (co-launched with CCB), which uses real-time base-liquor production data as collateral, aligning financing with actual output. Notably, the architecture incorporates a regulatory sandbox, sharing anonymized data with tax and customs authorities to verify trade authenticity while ensuring data sovereignty. This balances compliance with innovation, such as leveraging export declarations to enhance cross-border trade financing. By 2023, this open yet secure model reduced supply chain financing costs by 35% and improved turnover efficiency by 28%, demonstrating how Moutai's DSCF merges ecosystem inclusivity with regulatory robustness.

4. Implementation results and case studies of Moutai's digital supply chain finance model

Moutai's digital supply chain finance (DSCF) model has achieved remarkable success, significantly optimizing financial resource allocation across the entire industrial chain while enhancing ecosystem-wide collaboration efficiency. In terms of economic benefits, the model has cumulatively provided over ¥120 billion in financing support to upstream and downstream enterprises, with 68% allocated to SMEs, reducing overall financing costs by 4–6 percentage points compared to traditional models [9]. For instance, in 2023, Moutai's core suppliers saw their average payment terms shortened from 90 days to 45 days, while distributor inventory turnover rates improved by 40%, and overall capital utilization efficiency increased by approximately 30%. Crucially, by leveraging blockchain-verified trade data and smart contract automation, financial institutions reduced due diligence costs by 57%, maintaining a non-performing loan rate below 0.8%—far lower than the industry average of 2.5%. This dual

advantage of cost reduction and efficiency gains propelled the market penetration rate of Moutai's SCF products from 22% to 76% within three years, cementing its role as a bidirectional value hub between industrial and financial stakeholders.

A standout case is the "Red Tassel Sorghum Order Loan", a collaboration between Moutai and Agricultural Bank of China. By integrating IoT-based crop monitoring with blockchain order traceability, the project brought 26,000 local sorghum farmers in Guizhou into a digital credit system. Using satellite remote sensing to track crop growth and smart contracts to secure purchase orders, farmers gained access to unsecured prepayments—up to 60% of expected output value—based solely on digital orders. During the 2022 drought, the system automatically triggered risk alerts via soil moisture data, unlocking ¥30 million in emergency credit for affected farmers to ensure zero disruption in raw material supply. Recognized as a "FinTech-enabled Rural Revitalization Demonstration Project" by the People's Bank of China, the initiative boosted farmers' average annual income by ¥12,000 while guaranteeing full traceability of Moutai's ingredient quality. Another breakthrough innovation is the "Digital Baijiu Warehouse Receipt Pledge", which transformed Moutai's base liquor inventory into standardized digital assets [10]. Equipped with smart warehouse systems to monitor ceramic jar storage conditions in real time and linked to the Shanghai Commercial Paper Exchange for electronic warehouse receipt circulation, a mid-sized distributor secured ¥80 million in pledged financing with fund disbursement slashed from 15 working days to 72 hours, at an interest rate 1.8 percentage points lower than comparable products.

The model's extensibility shines in cross-border trade scenarios. The 2023 "Export Data Chain Finance" initiative for Southeast Asian markets enabled "customs declaration triggers financing" by cross-verifying AEO-certified customs data with blockchain export documents. A Singaporean importer obtained offshore credit from Bank of China using blockchain bills of lading, cutting the trade cycle from order to delivery by 60% and saving approximately $30,000 per transaction in letter of credit costs. Such cases validate the model's adaptability to complex trade environments—McKinsey estimates that applying Moutai's approach to the FMCG sector could unlock a ¥200 billion SCF market potential. With Moutai now piloting DPU (Data Payment Unit)-based cross-border settlements in partnership with SWIFT, its financial infrastructure is reshaping global liquor trade, signalling China's DSCF models' readiness for international adoption.

5. Challenges and optimization pathways of Moutai's digital supply chain finance model

While Moutai's digital supply chain finance (DCF) model has achieved notable success, it also faces multifaceted challenges. On the technological front, deep integration of blockchain, IoT, and AI continues to encounter data silos, with 20%–30% of supply chain data failing to synchronize in real-time due to inconsistent ERP interface standards among suppliers.

Market adoption issues persist as well. A cognitive gap exists among traditional distributors toward digital financial tools—only 23% of liquor dealers aged 45+ can independently operate digital warehouse receipt pledge systems, and in 2023, 17% of Guizhou's approved supply chain financing quotas went unused due to operational errors. More critically, the weak digital infrastructure of SMEs hampers progress: about 60% of packaging suppliers still rely on manual bookkeeping, rendering their operational data unfit for institutional due diligence, thereby diluting the model's financial inclusivity. Deeper ecosystem conflicts arise from partners perceiving data sharing as a competitive risk. One ceramic bottle supplier, for example, lost out on a 1.2-percentage-point green finance

interest subsidy by withholding production energy data, highlighting unresolved benefit-distribution mechanisms.

To tackle these challenges, Moutai is rolling out a series of multilayered optimizations. On the technological front, its 2024 "Starlink Initiative" aims to integrate industrial IoT platforms using edge computing nodes. This will enable millisecond-level interactions between field sensors, fermentation pit monitors, and blockchain systems, with the goal of reducing data discrepancies to below 5%. Legally, the "Cross-Border Digital Asset Rights Sandbox," developed with China University of Political Science and Law, is testing smart contracts that auto-adapt collateral clauses across jurisdictions, targeting judicial reciprocity for blockchain receipts in RCEP nations first. For market education, the innovative "Digital Navigator" program trains 500 hybrid experts in both liquor trade and fintech to provide on-ground assistance, projected to boost traditional dealers' operational proficiency by 50%. To bridge SME digital divides, a "lightweight SaaS toolkit" bundles inventory management and tax reporting with automated data-cleansing interfaces that generate bank-compliant reports—a "low-threshold digitization" solution already helping 83 packaging factories in Zunyi secure inaugural credit loans.

More transformative is the ecosystem governance overhaul. The pilot "Data Contribution Credit System" quantifies partners' data-sharing into tradable digital equities, redeemable for loan-rate discounts or premium product distribution rights—a "data asset securitization" approach that raised core suppliers' data completeness from 72% to 94% in 2023 trials. Concurrently, the "Supply Chain Finance Maturity Index," co-developed with Central University of Finance and Economics, integrates ESG metrics into supplier ratings, granting sustainability-driven firms 20% higher credit lines. These systematic refinements not only tackle immediate pain points but also forge a new paradigm for supply chain finance in the era of global digital trade.

6. Conclusion

Through a systematic examination of Moutai Group's digital SCF model, this study demonstrates how digital technologies reshape traditional credit value chains. Key findings reveal that Moutai's integration of IoT-enabled asset verification, blockchain-driven smart contract settlements, and big data risk control models has shifted the paradigm from "exclusive core enterprise credit" to "ecosystem-wide credit sharing," effectively addressing SME financing challenges. The success of this model highlights that digital transformation not only enhances SCF operational efficiency but also generates new business value through data assetization. However, challenges remain in standardizing technologies, defining data sovereignty, and establishing cross-institutional regulatory frameworks. Future advancements in 5G, AI, and digital currency applications promise to further propel SCF toward greater intelligence and ecosystem integration.

Disclosure statement

The author declares no conflict of interest.

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