Интеграция целей ESG с финансовыми инновациями в китайских МСП

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На фоне цифровой трансформации и требований устойчивого развития китайские малые и средние предприятия (МСП) сталкиваются с растущим давлением, требующим повышения финансовой прозрачности, операционной эффективности и долгосрочной устойчивости. В данном исследовании рассматриваются механизмы, с помощью которых инновации в области финансового мониторинга способствуют устойчивому развитию китайских МСП. На основе теорий ресурсоориентированного подхода (RBV) и устойчивой бизнес-модели (SBM) анализируются траектории развития инновационных инструментов и подтверждает их роль в оптимизации распределения ресурсов, повышении операционной эффективности и интеграции целей ESG с учетом конкретных ситуаций. Полученные результаты свидетельствуют о том, что передовые инструменты финансового мониторинга не только укрепляют внутренние системы управления, но и способствуют достижению более широких целей, включая экологическую ответственность и финансовую устойчивость.

Ключевые слова: *малые и средние предприятия, инновации в области финансового мониторинга, оптимизация ресурсов и интеграция ESG, устойчивое развитие.*

JEL: *O31, Q56, G32.*

Integrating ESG Goals with Financial Innovation in Chinese SMEs

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Against the backdrop of digital transformation and sustainability imperatives, Chinese small and medium-sized enterprises (SMEs) face escalating pressure to enhance financial transparency, operational efficiency, and long-term resilience. This research explores the mechanisms through which financial monitoring innovations facilitate sustainable development for Chinese SMEs. Grounded in the Resource-Based View (RBV) and Sustainable Business Model (SBM) theories, it analyzes the developmental trajectories of innovative tools and validates their roles in optimizing resource allocation, boosting operational efficiency, and integrating ESG objectives through case-based analysis. The findings indicate that advanced financial monitoring tools not only strengthen internal management systems but also drive the realization of broader objectives, including environmental responsibility and financial resilience.

Key words: *small and medium-sized enterprises, financial monitoring innovation, resource optimization and ESG Integration, sustainable development.*

Introduction

The sustainable development of small and medium-sized enterprises is a key pillar of high-quality economic growth in China.As of June 2024, the number of small, medium and micro enterprises in China has exceeded 53 million, contributing more than 60% of tax revenue and GDP, more than 70% of technological innovation, more than 80% of urban employment, and more than 90% of the total number of enterprises [9]. It has become the core engine for promoting high-quality economic development and supporting Chinese-style modernization, playing an indispensable role in stabilizing employment, stimulating market vitality, and deepening the industrial division of labor.

Currently, small and medium-sized enterprises (SMEs) face tripartite challenges: global supply chain realignment constrains market demand, limited financing channels heighten capital pressures, and delayed digital transformation undermines managerial efficiency — collectively impeding sustainable development. Amid tightening ESG disclosure requirements and accelerated digitalization, demand has intensified for intelligent financial monitoring tools integrating ESG metrics.

New financial monitoring tools based on big data, artificial intelligence and blockchain provide a breakthrough path for this purpose. Such tools help companies build sustainable development systems and achieve ESG goals through real-time financial analysis, innovative financial services, and optimized resource allocation.

Materials and Methods Research

The primary objective of this study is to examine how financial monitoring innovations, such as cloud-based ERP systems, ESG data tools, and AI-driven risk controls, enhance the sustainable development of Chinese SMEs. Specifically, the research investigates how these tools facilitate resource optimization and ESG integration under the frameworks of the Resource-Based View (RBV) and Sustainable Business Model (SBM) theories.

The research employs a mixed-methods approach, utilizing both qualitative and quantitative data. The qualitative component includes case studies of two

representative Chinese SMEs: Ningbo Xusheng Automotive Technology Co., Ltd. (manufacturing sector) and MINISO Group (retail sector). Financial reports, ESG disclosures, and corporate announcements from 2020 to 2023 were used as primary data sources. Secondary data were obtained from official databases such as the China National Bureau of Statistics, Industrial Bank Green Finance Portal, and ESG reports published by Miniso Group and Mercury Home Textiles.

The methodological framework combines theoretical analysis with comparative case study methodology. The research applies RBV to evaluate how digital tools enhance unique, inimitable resources, and applies SBM to assess how financial innovations support ESG integration. Two case studies are conducted, comparing firms from different sectors to assess financial efficiency and ESG performance before and after tool implementation.

Key performance indicators (KPIs) such as operating cost ratios, inventory turnover rates, net cash flows, ESG reporting accuracy, and energy savings are measured and compared. Supplementary analysis of national and regional policies (e.g., green loans and smart factory subsidies) is conducted to evaluate the interaction between institutional incentives and technological adoption.

This research examines how financial monitoring innovations (e.g., cloud-based ERP systems, ESG data tools, AI-driven risk controls) enhance sustainable development in Chinese SMEs through the theoretical lenses of Resource-Based View and Sustainable Business Model theories. It employs a mixed-methods approach combining comparative case studies of manufacturing and retail firms with quantitative KPI analysis and policy evaluation to investigate resource optimization and ESG integration mechanisms.

The Development and Breakthroughs of Innovative Financial Monitoring Tools

This research critically examines the constraints inherent in traditional financial instruments while exploring transformative breakthroughs within innovative monitoring frameworks (fig.1). Conventional financial monitoring systems face significant impediments stemming from their reliance on singular data dimensions,

static risk assessment structures, and substantial accessibility barriers. These limitations diminish their functional efficacy within complex and dynamically evolving regulatory landscapes.

In contrast, innovative tools demonstrate substantive advancements through three core capabilities: integrated multisource data synthesis enabling comprehensive analysis, continuous risk surveillance through real-time tracking mechanisms, and intelligent modeling incorporating scenario-specific analytical granularity. Collectively, these developments markedly enhance operational adaptability and strategic relevance for small and medium-sized enterprises while advancing financial supervision toward more intelligent, precise, and inclusive operational paradigms.

The core types and functions of innovative financial monitoring tools are reshaping the accuracy and timeliness of enterprise risk management through the integration of intelligent algorithms and multi-source data. Its core architecture mainly includes:

1. Supply Chain Finance Platforms: Hubs for Resource Collaboration.

Supply chain finance platforms use blockchain technology to achieve transparency and solve financing difficulties caused by information asymmetry in traditional supply chains.For example, Ant Chain's green finance platform uploads the transaction data of upstream and downstream enterprises to the blockchain, generating non - tamperable electronic vouchers that help SMEs quickly obtain accounts receivable financing. From the perspective of the RBV, such platforms transform dispersed supply chain resources into "irreplaceable competitive advantages" through data sharing, such as reducing financing costs, shortening the account period, and enhancing supply chain resilience [4].

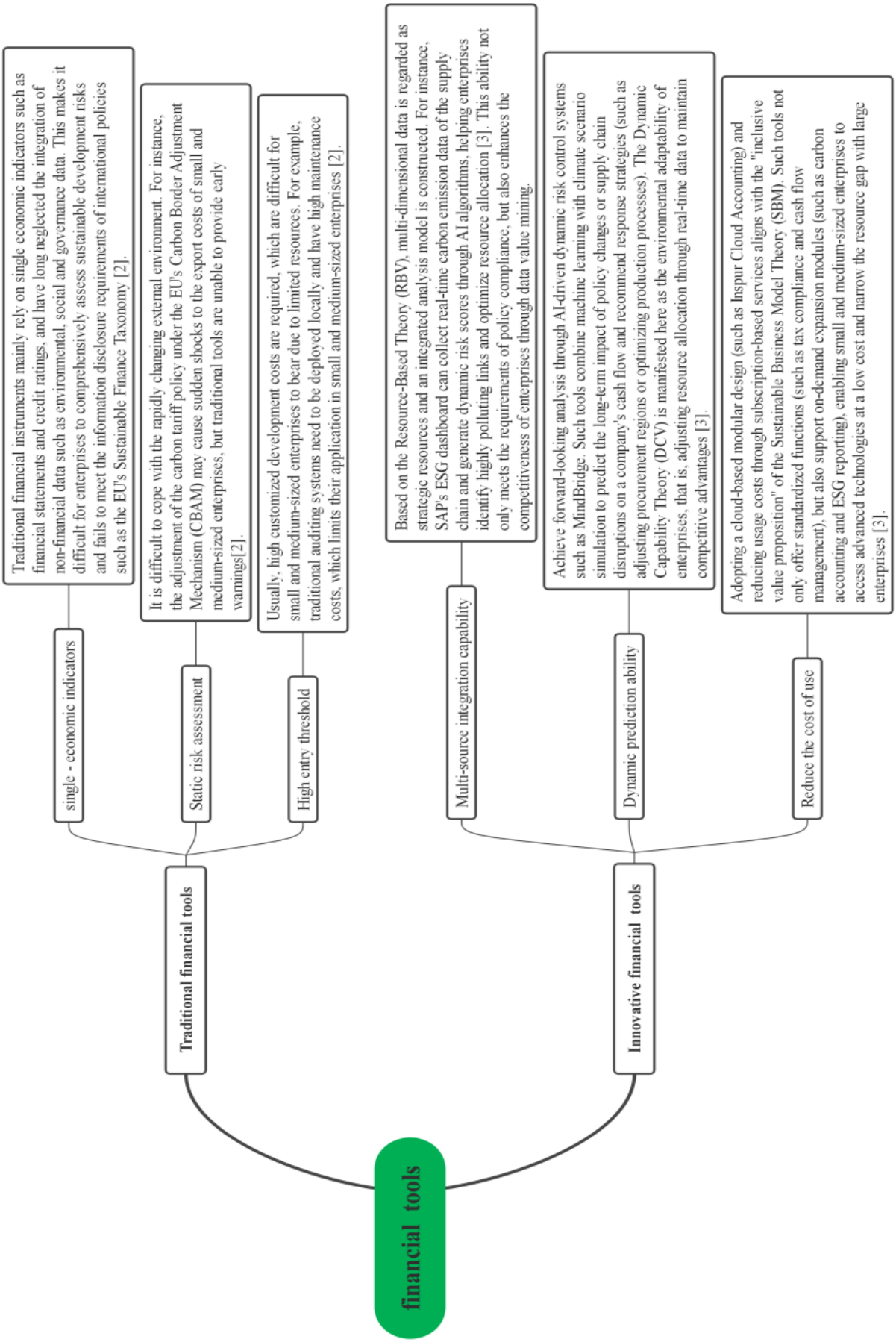

Fig. 1. classification of financial tools.
Source: comparison chart by the authors.

2. ESG Data Integration Tools: Bridges for Compliance and Financing.

ESG data tools (such as Aisino 365's tax risk control system) can automatically collect data on carbon emissions, energy consumption, etc., and generate ESG reports that meet international standards, helping enterprises connect with green financing channels. Based on the SBM theory, on the one hand, standardized reports reduce compliance costs; on the other hand, high ESG ratings can attract green investors (such as green bonds or impact funds), expanding financing channels. The case of ABN AMRO shows that SMEs using ESG tools have an average 3 - 5 percentage point reduction in financing costs and a 20% increase in ratings [3].

3. AI - Driven Dynamic Risk Control Systems: Interpreters of Long - Term Risks.

AI - based risk control systems (such as SAP's supply chain compliance module) analyze multi - dimensional data (such as policy texts, market trends, and supply chain logs) through machine learning to predict the long – term impact of carbon tariff adjustments or climate policies on enterprise finances and generate response suggestions. For example, a manufacturing enterprise used an AI tool to identify high - energy - consuming links and achieved a 12% annual reduction in energy – saving costs through technological transformation while avoiding future carbon tax risks. The dynamic capabilities of such tools are reflected in their real-time response to external environmental shifts, transforming risk warnings into strategic opportunities [3].

The Positive Impact of Financial Monitoring Innovation on the Sustainable Development of Small and Medium-sized Enterprises in China: An Empirical Analysis Based on RBV and SBM

This article selects Ningbo Xusheng Automotive Technology Co., LTD. (manufacturing industry) and MINISO Group (retail industry) for comparative analysis. Xusheng Co., Ltd. holds a leading position in the field of automotive lightweight components. In 2021, it introduced a cloud-based ERP system, integrating financial and supply chain management modules. As a global fast fashion retail brand, MINISO launched an automated supply chain finance platform in 2022 to optimize the

cash flow management of its global stores.

Resource Optimization (RBV) Significantly Enhances Operational Efficiency

According to the Resource-Based View (RBV), a firm's core competitiveness stems from unique and non-replicable resources and capabilities. Digital resources, such as cloud-based financial systems and automated tools, have notably reduced management costs and enhanced operational efficiency for SMEs.

For Ningbo Xusheng Auto Technology Co., Ltd., the proportion of administrative expenses to operating revenue decreased from 4.30% in 2020 to 2.73% in 2023 [11], representing a 36.51% reduction(tab.1). This decrease in operating costs was attributed to automated expense reimbursement and budget control mechanisms. Through the implementation of lean production and intelligent transformation, industry enterprises have significantly reduced production working hours, significantly improved production efficiency, and injected strong impetus into the development of enterprises [1]. The inventory turnover rate increased from 4.2 times per year in 2020 to 5.1 times per year in 2023, a 21.4% increase, demonstrating the effectiveness of the system in real-time inventory monitoring. The AI-driven cost prediction module reduced the procurement error rate by 28% [11], becoming a key factor in long-term partnerships with clients like Tesla. This exemplifies the pivotal role of dynamic capabilities in responding to market fluctuations and aligns with the RBV's hypothesis of "resource inimitability".

The net cash flow from operating activities of MINISO increased from 1.23 billion yuan in 2021 to 1.85 billion yuan in 2023 [7], representing a growth of 50.4%, thanks to the real-time account reconciliation on the platform. The operating cost of a single store was reduced by 8.7% [7], which was attributed to the labor-saving process of automated expense approval. Digitalization has also helped the internal management of retail brands to improve efficiency. Even under the influence of the epidemic, the effectiveness of shopping guides for Chinese chain retail brands in 2021 has increased by 5.4% compared to 2019 [13]. Automation tools enhance enterprise resilience by strengthening organizational capabilities (data-driven culture) and ensuring resource

scarcity (cash flow stability).

Table 1

Efficiency Improvement from the RBV Perspective

Indicators	Ningbo Xusheng Auto Technology Co., Ltd. (Manufacturing Industry)	Miniso Group (Retail Industry)	Theoretical Verification
Operating Cost Reduction	The proportion of administrative expenses ↓ 36.51%	Single - store operating cost ↓ 8.7%	Resource Value
Enhancement of Dynamic Capabilities	Inventory turnover rate ↑ 21.4%	Net cash flow from operating activities ↑ 50.4%	Dynamic Capabilities
Formation of Technological Barriers	Procurement error rate ↓ 28%	Payment cycle shortened by 33%	Inimitability

Source: compiled by the authors based on data analysis [7; 11].

ESG Integration and Value Creation within the Framework of the Sustainable Business Model (SBM)

The SBM emphasizes the synergy between economic goals and ESG responsibilities, and financial monitoring tools assist small and medium - sized enterprises in achieving this synergy.

After the energy-saving transformation, the Xusheng Green Project is expected to save 4.78 million yuan in electricity bills per year, and the energy consumption per unit output value will be lower than the average of the same industry in Ningbo City by about 30%, and the carbon emissions will be lower than that of the same industry by about 10% [12]. By virtue of its carbon footprint report, it obtained a green loan of 150 million yuan from Industrial Bank, with an interest rate 0.8 percentage points lower than the market rate (tab.2) [11]. The digital learning platform has increased the training completion rate of retail companies by an average of 40%, of which ESG courses account for more than 30%. Within 6 months, the participation rate of employee compliance training increased from 52% to 89% (an increase of 37%) [6]. Digital tools have re - engineered the value proposition (low - carbon production) and

the stakeholder network (banks, suppliers), achieving a win - win situation for the economy and the environment.

Miniso Group identified high - pollution packaging suppliers through its data platform. After replacement in 2023, it reduced plastic usage by 120 tons [7]. The integration of digital energy monitoring tools (e.g., IoT-based sensors and cloud analytics platforms) reduced the payback period of retrofits by 28.7% on average, as real-time data enabled proactive maintenance and adaptive control strategies [4]. The preparation cycle of the ESG report was shortened from 6 months to 3 months, and automated data collection reduced the error rate by 40% [7]. Supply chain finance tools, through transparent governance (data traceability) and stakeholder collaboration (consumer participation), have strengthened social responsibility practices.

Table 2

ESG Integration under the SBM Framework

Indicators	**Ningbo Xusheng Auto Technology Co., Ltd. (Manufacturing Industry)**	**Miniso Group (Retail Industry)**	**Theoretical Verification**
Environmental Value	Energy consumption per unit ↓ 15%	Plastic usage ↓ 120 tons	Environmental cost tracking (SBM)
Economic - Social Synergy	Green loan interest rate preferential by 0.8%	Consumer carbon credit participation rate ↑ 50%	Stakeholder collaboration (SBM)
Governance Optimization	ESG report cycle shortened by 50%	Supply chain transparency score ↑ 30%	Value proposition reconstruction (SBM)

Source: compiled by the authors based on data analysis [7; 11].

The Synergistic Effect of RBV and SBM: The Symbiosis of Efficiency and Responsibility

Financial monitoring innovation, driven by the synergy between resource optimization (Resource-Based View, RBV) and the integration of sustainable business models (SBM), is a pivotal force enabling SMEs to enhance efficiency and achieve their Environmental, Social, and Governance (ESG) objectives.

Analysis of the Synergy Mechanism. The mechanism of this synergy is primarily manifested through two key dimensions: data-driven value creation and policy linkage.

Firstly, data-driven initiatives create dual value. A salient example is Ningbo Xusheng Auto Technology Co., Ltd., whose cloud-based ERP system, at the RBV level, reduced its financial cycle by 30% and yielded over 20 million yuan in annual management cost savings [11]. Concurrently, at the SBM level, as of the end of June 2021, the balance of Industrial Bank's green Loans (People's Bank of China caliber) reached 412.736 billion yuan. According to the proportion of loan-supported funds, it is estimated that 948,200 tons of standard coal can be saved every year and 1.7342 million tons of carbon dioxide can be reduced annually [5]. This case demonstrates how digitalization can simultaneously enhance operational efficiency and generate direct economic benefits from sustainability initiatives.

Secondly, policy linkages amplify the synergistic effect. For instance, the People's Government of Zhejiang Province will grant subsidies to future factories and smart factories (digital workshops) recognized at the provincial level at a rate of not more than 20% of the actual investment, up to 3 million yuan [10]. This policy design directly links financial incentives with sustainability performance, compelling enterprises to integrate resource optimization with social responsibility and thereby magnifying the policy's synergistic impact.

Quantitative Evidence. The efficacy of this synergy is substantiated by robust quantitative evidence. National data from 2023 indicates that SMEs adopting digital tools achieve an average 2.5-percentage-point increase in Return on Equity (ROE) and an 18% improvement in their ESG rating compliance rate [8]. Moreover, industry-specific data reveals that manufacturing enterprises undergoing digital transformation reduce their unit energy consumption by 12% to 15% (tab.3), while automation systems in the retail sector cut labor costs by 10% to 15% [13]. These statistics clearly illustrate the significant economic and environmental benefits of digital innovation.

Table 3

Synergistic Effect of RBV and SBM

Synergy Dimension	Ningbo Xusheng Auto Technology Co., Ltd. (Manufacturing Industry)	Miniso Group (Retail Industry)	Policy Linkage
Data - Driven Dual Value	Annual cost savings of 20 million yuan (RBV) + Interest savings of 5 million yuan (SBM)	Cash flow improvement (RBV) + Plastic reduction (SBM)	Zhejiang Intelligent Manufacturing Subsidy of 3 million yuan
Cross - Industry Quantitative Evidence	Energy consumption in manufacturing ↓ 12% - 15%	Labor costs in retail ↓ 10% - 15%	National ESG compliance rate ↑ 18%
Policy Incentive Effect	Green loans incorporated into local ratings	Supply chain transparency incorporated into supplier contracts	Yangtze River Delta "Intelligent Manufacturing + Green" Pilot

Source: compiled by the authors based on data analysis [7; 11].

Insights and Policy Implications. In promoting technological inclusivity, there is a pressing need to extend smart manufacturing subsidies to micro-enterprises, taking inspiration from Jiangsu Province's specialized fund model for "Intelligent Transformation and Digital Upgrading". This approach would help level the playing field for smaller enterprises, enabling them to access the financial resources necessary to adopt advanced manufacturing technologies and digital solutions. Such measures are critical for narrowing the technological gap between micro-enterprises and their larger counterparts, fostering more equitable industrial development.

In the domain of ESG financial incentive design, several successful models beyond Zhejiang's "Green Loan Connect" serve as exemplars of effective market-driven mechanisms. For instance, the Shanghai Pudong Development Bank has pioneered "ESG-linked loans" that adjust interest rates based on annual improvements in clients' carbon emission reduction targets and social responsibility metrics. Similarly, the Guangdong-Hong Kong-Macao Greater Bay Area has launched a "Green and Low-Carbon Enterprise Certification Scheme," where certified firms gain preferential access to green bonds with interest rates 1-2 percentage points lower than conventional financing. These initiatives mirror the Zhejiang platform's approach by

embedding ESG criteria into financial instruments, thereby creating tangible incentives for corporate sustainability.

Complementing such financial innovations, cultivating regional collaborative innovation requires strategic pilot projects in key economic zones. The Beijing-Tianjin-Hebei region, for example, has established a "Digital-Green Integration Pilot Zone" that aggregates successful practices like Ningbo Xusheng's AI-driven energy optimization systems and MINISO's blockchain-based sustainable supply chain. This zone facilitates cross-sector knowledge transfer through industry alliances, where manufacturers, fintech firms, and research institutions co-develop solutions such as smart energy management platforms and ESG data aggregation tools. In the Guangdong-Hong Kong-Macao Greater Bay Area, a similar initiative—"Sustainable Industry 4.0 Clusters"—connects digital transformation service providers with green technology enterprises, enabling SMEs to adopt integrated solutions like cloud-based carbon accounting systems and IoT-powered resource monitoring.

By fostering these synergistic ecosystems, policymakers enable a virtuous cycle: digital tools enhance ESG data transparency, which in turn strengthens access to preferential financing; meanwhile, ESG-focused incentives drive demand for innovative digital solutions. This integration not only accelerates industrial upgrading but also positions China's economic zones as global benchmarks for sustainable development, where financial incentives and technological innovation converge to address both operational efficiency and environmental stewardship.

Conclusion

This article analyzes the contribution of financial monitoring innovations to the sustainable development of SMEs in China. By relying on national statistical data and firm-level case evidence, the research confirms that cloud-based accounting systems, automated reporting tools, and ESG-related tools significantly enhance cost control, reporting accuracy, and the readiness for sustainability.

The performance improvements observed, such as shorter financial cycles, reduced error rates, and increased visibility in ESG aspects, demonstrate that digital monitoring systems bring both operational and strategic advantages to SMEs.

To accelerate the sustainable transformation of SMEs, it is recommended to promote the deep integration of resource optimization and green practices through technological subsidies (such as the "Intelligent Manufacturing Loan" in Zhejiang Province), ESG financial incentives (linking interest rates with ratings), and the construction of cross-industry data platforms. Future research should be extended to multiple industries, including agriculture and the service industry, and explore the transformative potential of emerging technologies such as blockchain in enhancing supply chain transparency. The government should improve the mandatory ESG disclosure mechanism and the carbon trading mechanism. Enterprises should avoid "digitization for the sake of digitization", and financial institutions can develop sustainability-linked loans to jointly build a green innovation ecosystem.

In conclusion, financial monitoring innovation acts as a fundamental enabler for the sustainability of SMEs, aligning daily operations with long-term development goals and promoting responsible economic growth.

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