Research on the Mechanism of Digital Transformation Affecting Financial Performance in Cross-Border E-Commerce Enterprises

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Abstract: **Amid the global shift toward a digital economy, the complex link between digital transformation practices and financial outcomes among cross-border e-commerce firms remains underexplored. Focusing on the underlying mechanisms of this relationship, this study combines theoretical analysis with empirical modeling to show that digital transformation influences corporate financial performance primarily through three channels: operational optimization, market expansion, and innovation capacity. Operational optimization drives cost reduction, efficiency gains, and process restructuring; market expansion deepens customer relationships via precision marketing; and innovation capacity fuels iterative upgrades to products and business models. Further analysis reveals that the efficacy of these channels is not fixed. It is significantly constrained by firm size and resource endowments, and strongly supported by digital talent reserves and organizational culture. The findings confirm that the financial impact of digital transformation is a multi-dimensional, contingent process, offering actionable theoretical insights for cross-border e-commerce enterprises designing differentiated digital strategies.**

Keywords: **Digital Transformation; Cross-Border e-Commerce; Financial Performance; Impact Mechanism; Firm Characteristics**

1. Introduction

Against the backdrop of rapid global digital economic evolution and the deepening "dual circulation" development paradigm, digital transformation has become a pivotal strategic choice for cross-border e-commerce enterprises to reshape competition and break growth bottlenecks. Yet how digital transformation specifically shapes financial performance-along with its internal mechanisms and pathways-lacks systematic theoretical explanation and empirical verification. This study dissects the mechanism by which digital transformation affects financial performance in cross-border e-commerce firms, integrating the resource-based view and dynamic capability theory to build a logical framework: *transformation behavior → capability building → performance outcomes*. It aims to uncover transmission paths and boundary conditions. The findings are intended to provide a theoretical foundation and practical guidance for cross-border e-commerce enterprises to refine digital strategies and strengthen financial resilience.

2. Theoretical Foundation and Literature Review

2.1 Core Connotation and Dimensions of Digital Transformation

Digital transformation is not simply technology adoption; it is a systemic overhaul of corporate strategy, operations, organization, and value creation systems enabled by digital technologies. Going beyond early-stage informatization and e-commerce, it centers on data as a key production factor and drives business model innovation and ecosystem restructuring through deep tech-business integration. For cross-border e-commerce enterprises, this transformation is embodied in the ability to digitally embed and restructure global value chains.

Scholarly views differ on dimensional classification. A mainstream process-based framework distinguishes three layers: technology infrastructure, operational processes, and business models. The technology infrastructure layer covers investment in cloud computing, big data, artificial intelligence, and other digital foundations. The operational process layer emphasizes digital collaboration and efficiency gains in supply chains, marketing, customer service, and related functions. The business model layer refers to data-driven personalized services, platform-based

ecosystems, and fundamental innovation in value propositions. Another capability-based framework stresses digital sensing, integration, and application capabilities [1].

Despite differing classifications, a consensus holds that digital transformation is a multi-level, dynamic process whose success depends on the coordinated evolution of technology, organization, and strategy. This provides a conceptual basis for analyzing its impact mechanisms.

2.2 Financial Performance Evaluation System for Cross-Border E-Commerce Enterprises

Evaluating financial performance in cross-border e-commerce requires a comprehensive system that balances general corporate metrics and industry-specific traits. Traditional indicators-including profitability (net profit margin on sales, return on assets), operational capability (inventory turnover, total asset turnover), solvency, and growth-form the core evaluation framework. However, the unique operating features of cross-border e-commerce demand supplementary indicators.

In cost structure, key measures include the share of international logistics costs, cross-border payment and settlement fees, digital marketing ROI, and tariff and compliance cost control. In risk, critical factors include exchange rate volatility effects on profits, overseas warehouse inventory impairment risks, cross-border capital turnover cycles, and bad debt ratios. Since standalone financial indicators are lagging and narrow, dynamic assessment should incorporate leading non-financial indicators: customer lifetime value, customer acquisition cost, user repurchase rate and stickiness, and the accumulation of digital assets (data assets, platform reputation). These non-financial metrics better predict long-term financial health. A robust evaluation system balances financial results and drivers, short-term profitability and long-term value, and universal standards and industry specifics [2].

2.3 Literature Review and Research Gaps

Existing research lays useful groundwork but leaves notable theoretical gaps. On the one hand, abundant macro-level studies examine digital transformation and firm performance; most empirical work confirms a positive effect on traditional manufacturing and retail firms, drawing on the resource-based view, dynamic capability theory, or transaction cost theory. On the other hand, early cross-border e-commerce research focused on business models and trade facilitation. Amid deepening digitalization, recent scholars have explored the performance effects of specific tools such as social media marketing and big data analytics [3].

However, rigorous integration of these two streams remains limited. Key gaps include:

Most studies treat digital transformation as a homogeneous variable or isolated technology application, neglecting how its multi-dimensional, gradual characteristics exert differential effects on cross-border e-commerce enterprises.

Existing work emphasizes direct “does it affect?” outcomes, lacking systematic theoretical and empirical analysis of intermediate mechanisms-i.e., the specific capabilities and pathways that translate digital transformation into financial performance.

Research insufficiently accounts for contextual factors, especially how firm size, resource endowments, and external markets moderate these impact mechanisms.

This study addresses these gaps.

3. Mechanisms of Digital Transformation’s Impact on Financial Performance

3.1 Operational Optimization: Cost Reduction, Efficiency Improvement, and Process Restructuring

Digital transformation first enhances financial performance through deep operational optimization that cuts costs, boosts efficiency, and restructures processes. This path directly improves cost structures and operational efficiency, laying the foundation for stronger profitability.

Digital integration substantially reduces historically high operating costs in cross-border trade. AI- and big data-powered intelligent supply chains optimize global inventory placement, improve demand forecasting, and cut overstock and stockouts, directly lowering warehousing costs and capital tie-up. In logistics, IoT and digital platforms enable real-time route optimization and end-to-end visibility, raising delivery speed while controlling international logistics expenses. Digitally redesigned internal workflows-such as automated financial settlement and intelligent compliance screening-reduce labor input and errors, lifting

overall operational efficiency [4].

Most importantly, digital process restructuring breaks down departmental and geographic silos, enabling end-to-end coordination across procurement, warehousing, marketing, and after-sales service to integrate fragmented steps into a seamless value chain. These systemic improvements show up directly in better cost-of-sales ratios and asset turnover. They also enhance agility and resilience in complex international markets, supporting stable financial performance.

3.2 Market Expansion: Precision Marketing and Deepened Customer Relationships

The essence of market expansion channels lies in how digital transformation enables businesses to overcome market constraints, strengthen customer relationships, and ultimately drive revenue growth and value creation. Cross-border e-commerce serves a highly fragmented, diverse global consumer base, where traditional mass marketing is costly and inefficient. Digital transformation overturns this model via data-driven precision marketing.

Firms use analytics to micro-segment overseas markets, accurately profile consumer preferences and behaviors across regions and cultures, and deploy personalized marketing and ad targeting. This precision sharply lifts marketing conversion and ROI, directly fueling sales growth. Meanwhile, digital tools-social media, intelligent customer service, and CRM systems-enable real-time, personalized interaction, shifting relationships from one-off transactions to sustained value engagement. By analyzing customer feedback and lifecycle data, firms boost satisfaction and repurchase rates, uncover latent demand, and drive repeat purchases [5].

Stronger customer relationships stabilize market share, reduce revenue volatility from churn, and lift long-term financial growth by increasing customer lifetime value. In short, digital transformation upgrades market capabilities from broad-scale expansion to refined value mining and relationship management, delivering more efficient, sustainable revenue growth.

3.3 Innovation Capacity: Product Iteration and Business Model Evolution

Digital transformation also shapes financial performance profoundly by stimulating endogenous innovation, accelerating product iteration, and driving fundamental business model evolution. Sustained innovation is critical to maintaining competitive advantage and earning excess profits in a fast-changing global marketplace.

Digital technologies speed up product and service cycles. Cross-border e-commerce firms can capture real-time global user feedback, competitor intelligence, and trend data via platforms, then rapidly translate insights into product improvements or new service concepts using digital design and collaboration tools. This data-driven agile iteration shortens development cycles, improves new product success rates, and lets firms respond quickly to trends and capture niche segments-earning innovation premiums and expanding market share.

Beyond products, digital transformation often drives business model evolution. Many firms shift from traditional B2C sales to B2B platforms integrating supply chain services, financial support, and data services; others reimagine customer acquisition and value delivery via social commerce, live-streaming commerce, and other new formats. Such evolution restructures value creation, delivery, and capture using digital tools, opening new revenue streams including platform commissions, data service fees, and value-added income. This breaks through original profit ceilings and improves overall revenue structure.

The innovation channel shows digital transformation is more than an efficiency tool-it is a catalyst for strategic renewal. By enabling continuous product and business model evolution, it builds hard-to-imitate competitive advantages that translate into higher growth, diversified profitability, and stronger long-term value in financial performance.

4. Moderating Factors and Empirical Design

4.1 Moderating Role of Firm Size and Resource Endowments

The strength and form of the above mechanisms are not uniform; they are significantly moderated by internal firm conditions, especially size and resource endowments, in a complex non-linear pattern.

Large enterprises typically enjoy stronger financial resources, more mature management systems, and broader market networks. They can absorb high upfront sunk costs of digital transformation, invest systematically in end-to-end digital infrastructure and process

redesign, and capture deeper, wider benefits from operational optimization and market expansion. Their resource slack also buffers trial and error in business model innovation. Yet large firms often face organizational rigidity, path dependence, and siloed barriers that slow change and weaken agile innovation.

Small and medium-sized cross-border e-commerce enterprises have limited resources but benefit from flat structures and short decision chains. They can adopt digital tools more flexibly and selectively, achieving rapid gains and targeted innovation in specific segments or processes-the "small boat turns easily" advantage. However, resource constraints may limit large-scale investments in supply chain digitalization or platform ecosystem building.

In essence, the moderating effect of firm size and resource endowments reflects a dynamic trade-off: *resource empowerment vs. organizational* inertia and *agility advantages vs. resource constraints*. This explains why digital transformation yields heterogeneous financial performance across firm sizes.

4.2 Intervention Effects of Digital Talent and Organizational Culture

Digital transformation success depends on more than technology investment; it requires adequate digital talent and a supportive organizational culture. These two factors are critical enablers of the impact mechanisms.

Digital talent turns technical potential into business value. Teams need both hard skills (data analysis, AI application) and soft skills (business understanding, cross-functional collaboration, continuous learning). A well-structured team combining technologists, data scientists, and cross-border business specialists designs and implements effective digital solutions, aligning technology with business needs and strengthening operational and marketing channels.

Organizational culture acts at a deeper level. A learning-oriented, open culture that encourages experimentation, tolerates failure, and prioritizes data-driven decisions over intuition boosts employee engagement, reduces internal resistance, and creates a safe space for business model exploration. By contrast, hierarchical, risk-averse, siloed cultures reduce advanced technologies to isolated tools, unable to drive cross-functional process restructuring and collaborative innovation.

Digital talent and an enabling culture together form the "socio-technical system" of digital transformation. By shaping absorptive capacity, conversion capacity, and innovation capacity, they profoundly shape the breadth, depth, and sustainability of the three impact channels.

4.3 Model Construction and Data & Methodology

To empirically test the above mechanisms and moderating effects, this study develops a rigorous research model and analytical design. A **moderated mediation model** serves as the core framework:

Independent variable: degree of enterprise digital transformation

Dependent variable: financial performance

Mediators: operational optimization capability, market expansion capability, innovation capability

Moderators: firm size, resource endowments, digital talent density, organizational culture

Moderators are tested on both the *digital transformation* → mediator and *mediator* → *financial performance* links.

Variable Measurement

Digital transformation: composite index combining keyword frequency in annual reports/websites and capital expenditure intensity on IT and digital equipment.

Mediators: structured scales matched with public operational data (inventory turnover, marketing expense ratio, R&D intensity, etc.).

Moderators: firm size and resource endowments via standard financial indicators; digital talent density via tech/R&D staff share; organizational culture via validated scales or text analysis.

Data Sources

Panel data for listed and NEEQ-listed cross-border e-commerce enterprises from CSMAR, Wind, and other databases.

Primary survey data from questionnaires distributed to cross-border e-commerce firms.

Analysis Methods Structural equation modeling (SEM) or hierarchical regression to test mediation significance and the presence and direction of moderating effects, ensuring robust and internally valid results.

5. Conclusion

This study uses theoretical analysis and mechanism mapping to show that digital

transformation positively affects the financial performance of cross-border e-commerce enterprises through three primary channels: operational optimization, market expansion, and innovation capacity. These effects are moderated by firm size, resource endowments, and organizational capabilities. The research expands the theoretical boundaries of digital transformation and financial performance, while offering strategic direction for cross-border e-commerce enterprises pursuing sustainable financial growth through digital technologies.

Future research can use longitudinal tracking data to explore heterogeneous mechanisms across digital transformation stages and external environment shocks, enriching theoretical and practical understanding in this field.

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