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Research on the Impact of Digital Transformation on Enterprise Cost Stickiness from the Perspective of New Quality Productivity

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Abstract

Against the backdrop of accelerated global digital transformation and the booming development of new quality productivity, the paradigm of enterprise cost management is undergoing profound changes. Based on the core characteristics of new quality productivity such as technology-driven, data-enabled, and efficiency leap, this article systematically explores the impact mechanism and typical patterns of digital transformation on enterprise cost stickiness. The study found that new quality productivity has significantly changed the asymmetry of cost fluctuations with income by reshaping cost structure, optimizing resource allocation, and improving decision-making efficiency. On the one hand, digital investment has enhanced the "rigidity" characteristics of fixed costs. On the other hand, the application of data elements and intelligent tools has weakened the intrinsic motivation of cost stickiness by reducing adjustment costs and alleviating agency problems. Through case analysis, four typical paths are summarized: intelligent manufacturing model, platform collaboration model, data decision-making model and cloud sharing model, and suggestions are put forward from three levels: policy support, enterprise practice and ecological construction, to provide theoretical reference and practical guidance for enterprises to optimize cost management and enhance financial resilience in the era of new quality productivity. The research expands the application of cost stickiness theory in digital contexts and provides a new perspective for understanding the interactive relationship between technological progress and corporate micro-behavior.

Keywords

New Quality Productivity; Digital Transformation; Enterprise Cost Stickiness.

1. Introduction

1.1. Research Background and Practical Needs

At present, the global economy is shifting from factor-driven to innovation-driven. New quality productivity with digitalization, intelligence and greening as its core features has become a key force in reshaping the industrial competition landscape. The report of the 20th National Congress of the Communist Party of China clearly proposed to "promote the high-end, intelligent and green development of the manufacturing industry" and regarded new quality productivity as an important engine for high-quality development. In this context, the digital transformation of enterprises is no longer limited to the application of technical tools, but through the integration of data elements, reconstruction of production paradigms, and upgrading of organizational capabilities, a systematic change from efficiency improvement to competitiveness reshaping is achieved.

Cost stickiness, as a core feature of enterprise cost management, reflects the asymmetry of cost changes with revenue, that is, costs rise rapidly when revenue increases, and costs fall slowly when revenue decreases (Anderson et al., 2003). Traditional research believes that adjustment

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costs, manager expectations, agency problems and contract rigidity are the main drivers of cost stickiness (Weiss, 2010). However, in the context of new quality productivity, digital transformation is profoundly affecting the generation logic of cost stickiness by changing the way resources are allocated, reconstructing cost components, and optimizing decision-making mechanisms. For example, Haier Group has achieved full-chain digitalization of orders, production, and logistics through the COSMO Plat industrial Internet platform, which has increased the adjustment speed of production costs when revenue fluctuates by 30% and significantly reduced cost stickiness; however, some traditional manufacturing companies, due to excessive reliance on manual labor and offline processes, still bear high fixed costs when revenue plummeted during the epidemic, exposing the rigid defects of their cost structure.

1.2. Research Significance and Theoretical Value

From a practical perspective, Chinese companies are facing the triple pressure of demand contraction, supply shocks, and weakening expectations. Excessive cost stickiness will lead to tight cash flow and reduced risk resistance. According to the "White Paper on Cost Management of Chinese Enterprises in 2024", companies with high digital transformation maturity have a cost stickiness coefficient 25% lower than traditional companies, and their profit margin stability during economic downturns has increased by 18%. Revealing the impact mechanism of digital transformation on cost stickiness will help companies build a more flexible cost management system and enhance their sustainable development capabilities supported by new quality productivity.

From a theoretical perspective, existing literature focuses on the impact of digitalization on cost efficiency and cost structure (e.g. Xie Jiaping, 2021), but lacks research from the perspective of dynamic asymmetry of cost stickiness, and even less systematic analysis combining the core elements of new productivity (technological innovation, data elements, green transformation, etc.). This paper combines the "new momentum, new paradigm, and new ecology" characteristics of new productivity with the cost stickiness theory, expands the technical and economic dimensions of micro-enterprise behavior research, and provides a new framework for understanding the interactive relationship between technological progress and organizational change .

2. The Internal Logic of How New Quality Productivity Affects Enterprise Cost Stickiness

New-quality productivity takes "technology-data-organization" collaborative innovation as its core. By reconstructing cost drivers, optimizing resource allocation mechanisms, and changing managers' decision-making patterns, it has a systematic impact on the four major drivers of cost stickiness (adjustment costs, expectation management, agency problems, and contract rigidity).

2.1. Technological Reconstruction: Cost Structure Transformation from "Physical Assets" to "Digital Assets"

Traditional enterprise costs are mainly physical assets such as factories, equipment, and labor, which are characterized by high sunk costs and low adjustment elasticity, resulting in strong cost stickiness. New-quality productivity drives enterprises to transform toward a dual-wheel drive of "digital assets + smart devices": on the one hand, the investment in digital assets such as cloud computing, big data platforms, and AI algorithms forms a new type of fixed cost, whose marginal usage cost approaches zero, but the initial investment is high and the specialization is strong, which may strengthen the "rigidity" of fixed costs (such as Salesforce's deployment of a CRM system requires continuous investment in R&D and maintenance costs); on the other hand, automated equipment such as industrial robots and smart warehousing replace manual labor,

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converting variable costs (such as piece-rate wages) into fixed costs (equipment depreciation), but at the same time reducing the adjustment costs of product switching through flexible production technologies (such as 3D printing and modular production). For example, after Midea's Foshan factory introduced 500 robots, the proportion of labor costs dropped from 20% to 8%, and the production line switching time was shortened from 4 hours to 30 minutes, significantly improving the flexibility of cost adjustment.

Impact on cost stickiness: Technological investment may increase the proportion of fixed costs, but intelligent tools reduce short-term adjustment costs, making it easier to reduce costs when revenue decreases, thereby weakening stickiness.

2.2. Data Empowerment: Upgrading Expected Management from "Experience-based Decision-making" to "Data-driven"

Managers' persistent judgment of revenue fluctuations is an important inducement of cost stickiness (Noreen & Soderstrom, 1997). Traditional decision-making relies on historical experience and market research, and there are information lags and cognitive biases, which lead managers to tend to retain redundant costs to cope with "potential recovery". Under the new quality productivity, real-time data analysis (such as ERP systems, business intelligence BI tools) enables managers to accurately identify the structural factors of revenue changes: predict demand trends through user behavior data (such as Amazon's dynamic pricing algorithm), use supply chain data to monitor cost transmission paths, and even simulate cost adjustment plans under different revenue scenarios through machine learning. For example, Tsingtao Beer integrates sales terminals, inventory, and logistics data through the data middle platform, predicts the risk of sales decline in advance during the peak season of 2023, and actively reduces advertising and promotion costs, reducing the sales expense stickiness coefficient from 1.2 to 0.8.

Impact on cost stickiness: Improved data transparency reduces expectation bias, making it easier for managers to distinguish short-term disturbances from long-term trends in revenue fluctuations, avoiding "over-retention" of costs, and thus reducing stickiness.

2.3. Organizational Change: From "Bureaucracy" to "Platformization" to Alleviate Agency Problems

Agency theory believes that differences in goals between management and shareholders may lead to "excessive stickiness" of costs (such as management refusing to cut redundant costs in order to maintain scale). New quality productivity promotes the transformation of organizational forms to flat and networked: on the one hand, digital tools (such as OA systems and project management platforms) improve information symmetry, and shareholders and boards of directors can monitor cost changes through real-time financial data (such as Alibaba's "DingTalk + Financial Middle Platform" to achieve transparency in the entire process of expense reimbursement); on the other hand, platform organizations give front-line employees more decision-making power and realize automated cost control through "data sharing + rule presets" (such as Haier's "people-oriented" model allows each business unit to independently optimize the cost structure). Research shows that companies with a high degree of digitalization have management cost stickiness that is 15%-20% lower than traditional companies, mainly due to the reduction in agency costs (Chen Shaohui, 2024).

Impact on cost stickiness: Organizational agility and decentralized decision-making reduce agency friction, making cost adjustments more in line with the overall interests of the enterprise, thereby suppressing stickiness.

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2.4. Ecological Synergy: Transaction Cost Optimization from "Unilateral Contract" to "Network Collaboration"

In the traditional supply chain, the contractual relationship between enterprises and suppliers and customers is rigid, which makes it difficult to adjust procurement costs and logistics costs in a timely manner when revenue decreases. New quality productivity relies on the industrial Internet platform to build a collaborative ecosystem and achieve real-time matching of supply and demand through data sharing: for example, JD Logistics' "Qinglong System" connects hundreds of thousands of suppliers, dynamically adjusts storage resources and transportation routes according to order volume, and increases the response speed of logistics costs by 40% when revenue fluctuates; Pinduoduo's "Nongdi Yunpin" platform uses big data on the supply and demand of agricultural products to help farmers adjust their planting scale in real time and reduce the stickiness of inventory costs caused by unsalable products. This network collaboration model breaks the rigidity of unilateral contracts and reduces the adjustment resistance of transaction costs through flexible pricing and dynamic capacity allocation.

Impact on cost stickiness: Ecological synergy weakens the rigidity of external contracts, making it possible to adjust upstream and downstream costs in a coordinated manner, thereby reducing overall cost stickiness.

3. Typical Patterns of How Digital Transformation Affects Enterprise Cost Stickiness

3.1. Smart Manufacturing Model: Technology-driven Production Cost Elasticity

Core features: Based on the industrial Internet, Internet of Things (IoT), and automated equipment, we build a production system of "intelligent hardware + flexible processes" to reduce the resistance to adjusting production costs.

Mechanism of action:

① Automation substitution reduces the stickiness of labor costs: industrial robots and intelligent quality inspection equipment are used to replace repetitive labor, converting variable labor costs into fixed equipment investment, while improving the flexibility of capacity adjustment (for example, after Foxconn Zhengzhou factory introduced the AI quality inspection system, the number of quality inspectors was reduced by 60%, and the response speed of quality inspection costs to production fluctuations increased by 40%).

② Digital twin and dynamic production scheduling to optimize fixed cost allocation: Use digital twin technology to simulate capacity allocation, combine with MES system to monitor equipment utilization in real time, automatically adjust production line load when revenue fluctuates, and avoid ineffective precipitation of fixed costs such as equipment depreciation (for example, Sany Heavy Industry Beijing Pile Driver Factory reduced equipment idle rate from 18% to 8% and production cost stickiness coefficient by 27% through 5G+Industrial Internet);

③ Modular production reduces product switching costs: Through 3D printing and flexible production lines, small-batch production of multiple varieties can be achieved, reducing the switching costs between different products (for example, the modular production line of Qingdao Haier Jiaozhou Factory can complete product model switching within 30 minutes, and the production adjustment cost is reduced by 50% compared with traditional production lines).

Typical case: Through the "Lighthouse Factory" transformation, Sany Heavy Industry's production costs only fell by 10% when the industry's revenue declined by 15% in 2022, and the cost stickiness coefficient dropped from 1.5 to 1.1, which was significantly better than the industry average.

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3.2. Platform Collaboration Model: Flexibility of Transaction Costs in Ecological Networks

Core features: Relying on the industrial Internet platform to integrate upstream and downstream resources, and optimizing the adjustment flexibility of the supply chain and external transaction costs through data sharing and collaboration mechanisms.

Mechanism of action:

① Real-time matching of supply and demand reduces the stickiness of procurement costs: Platform data discloses market demand in real time (e.g. JD Logistics' "Qinglong System" connects 300,000 suppliers and dynamically allocates storage resources on demand), promoting suppliers and enterprises to adjust production capacity synchronously and avoid rigid lock-in of procurement orders (e.g. Suning.com negotiates a "tiered procurement contract" with suppliers, floating procurement volume based on quarterly sales forecasts, reducing the stickiness of raw material costs by 22%).

② Network collaboration weakens contract rigidity: Establish flexible transaction rules through the platform credit system (such as the "dynamic commission model" between Meituan and merchants that automatically adjusts the rate according to the order volume), replace the rigid constraints of traditional fixed contracts, and improve the flexibility of cost adjustment;

③ The sharing economy model shares fixed costs: Enterprises rent idle production capacity through sharing platforms (such as Alibaba Cloud's "Cloud Factory" shared manufacturing equipment), converting part of the fixed costs into variable expenses (for example, small and medium-sized manufacturing companies use shared injection molding machines, which reduces equipment depreciation costs by 30% and increases flexibility with production fluctuations by 60%).

Typical case: Pinduoduo's "Farmland Cloud Shopping" platform connects 8 million farmers with tens of millions of consumers . It adjusts the planting scale in real time through big data on supply and demand of agricultural products, reducing the inventory cost stickiness caused by unsalable products by 40% compared with traditional agricultural enterprises.

3.3. Data Decision-making Model: Information Transparency and Precise Expected Management

Core features: With the help of big data analysis, machine learning and other technologies, a real-time and accurate cost forecasting and decision-making system is built to reduce cost stickiness caused by managers' expectation deviations.

Mechanism of action:

① Multi- dimensional data integration improves the ability to identify revenue fluctuations: Integrate internal and external data (such as ERP system sales data and third-party market research data), and use machine learning to distinguish short-term disturbances and long-term trends in revenue fluctuations (such as Huawei's GTS system analyzes market order data from various countries, accurately identifies short-term fluctuations and long-term recessions in overseas markets in 2020, and adjusts service costs in a targeted manner);

② Scenario simulation and stress testing to optimize cost adjustment strategies: Establish a cost-revenue elasticity model to simulate the optimal cost adjustment path under different revenue reductions (e.g. Tencent Financial Middle Platform's "Stress Testing Module" can generate 20 cost optimization solutions for management to make dynamic decisions);

③ Real-time monitoring and automated early warning reduce decision-making lags: set cost stickiness early warning indicators (such as automatically freezing non-essential expenses when revenue drops by more than 5% for two consecutive months), and use digital tools to achieve real-time response to cost adjustments (such as Tsingtao Beer's data center predicted

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a decline in sales in advance and proactively reduced promotional expenses by 15%, reducing the sales expense stickiness coefficient from 1.2 to 0.8).

Typical case: Amazon uses user behavior data and dynamic pricing algorithms to accurately predict quarterly revenue fluctuations, and quickly adjusts advertising and warehousing costs after promotional events such as Prime Day, so that the sales expense stickiness is always maintained below 0.9.

3.4. Cloud Sharing Model: Lightweight Cost Structure with Modularized Resources

Core features: Use cloud computing and SaaS services to achieve resource sharing and cost modularization, and transform traditional fixed costs into "pay-as-you-go" flexible expenditures.

Mechanism of action:

① Lightweight IT infrastructure: Use public clouds (such as Alibaba Cloud and Huawei Cloud) to replace self-built servers, and convert fixed costs such as IT hardware depreciation and maintenance into variable costs that are paid based on usage (for example, small and medium-sized enterprises using Kingdee Cloud Starry Sky can reduce IT cost investment by 60% and increase adjustment flexibility by 80%).

② Modular outsourcing of business processes: With the help of shared service platforms (such as financial shared centers and human resources outsourcing platforms), flexible configuration of non-core businesses can be achieved (for example, Didi temporarily increases customer service seats through the cloud platform during peak order periods and automatically reduces them during low-peak periods, reducing customer service cost stickiness by 35% compared to self-built teams);

③ Pooling of R&D resources reduces trial and error costs: Enterprises share technical modules through cloud-based R&D platforms (such as ByteDance's Volcano Engine open AI algorithm library), reduce repetitive R&D investment, and increase the flexibility of adjusting R&D costs as project progresses (for example, after an Internet company used cloud-based R&D tools, the R&D cost stickiness coefficient dropped from 1.4 to 0.9).

Typical case: ByteDance provides modular services through the "Feishu + Volcano Engine" platform, and each business line can call cloud resources on demand. When some businesses shrink in 2023, the stickiness of R&D expenses is only 0.9, which is significantly lower than the industry average.

4. Policy Recommendations and Development Prospects

4.1. Policy Recommendations

4.1.1. Strengthening Digital Infrastructure and Common Technology Supply

Government level: Increase investment in new infrastructure such as 5G base stations, industrial Internet identification resolution systems, and computing centers to lower the fixed cost threshold for digital transformation of enterprises (such as establishing a national industrial Internet public service platform to provide low-cost digital solutions);

Industry level: Support industry associations to take the lead in building common technology platforms (such as industry cost databases and intelligent decision-making model libraries), promote small and medium-sized enterprises to share digital tools, and reduce duplication of investment (such as the "Special Action for Digital Empowerment of Small and Medium-sized Enterprises", providing 30%-50% fee subsidies to enterprises that access cloud-based sharing platforms).

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4.1.2. Improve the Data Factor Market and Governance Mechanism

Institutional innovation: speed up the formulation of data rights confirmation, transaction, and circulation rules (such as piloting the "data asset inclusion" system, clarifying the data cost sharing and benefit distribution mechanism), and promote data sharing among enterprises (such as establishing a cross-industry database of cost stickiness influencing factors to provide support for accurate decision-making);

Talent cultivation: Encourage colleges and universities to open the interdisciplinary subject of "data-driven cost management" and work with enterprises to cultivate compound talents who understand financial management and have data analysis capabilities (such as implementing a "digital cost manager" certification system to enhance the data decision-making capabilities of practitioners).

4.1.3. Guide Enterprises to Build a Flexible Cost Management System

Standard construction: Release the "Guidelines for Enterprise Cost Management under New Quality Productivity", extract the best practices of intelligent manufacturing, platform collaboration and other models, and clarify the cost stickiness monitoring indicators (such as revenue-cost elasticity coefficient, adjustment cost ratio, etc.) and evaluation methods;

Pilot promotion: Select digital transformation benchmark enterprises in key industries (such as high-end equipment and electronic information) and promote cost optimization experience through on-site meetings, case libraries, etc. (such as summarizing the "data-process-organization" collaborative mechanism of Haier COSMOPlat platform to reduce cost stickiness);

Regulatory guidance: Encourage listed companies to disclose factors affecting cost stickiness and the effects of digital transformation in their financial reports (such as requiring the disclosure of correlation analysis between digital investment and cost stickiness coefficient) to enhance the market's awareness of flexible cost management.

4.1.4. Optimizing the External Environment and Risk Response Mechanism

Fiscal and taxation policies: Tax incentives will be given to enterprises that implement intelligent transformation and introduce flexible contracts (such as accelerated depreciation of equipment and an increase in the additional deduction rate for R&D expenses to 120%).

Financial support: Develop "digital transformation cost insurance" products to share the fixed cost risks of enterprises caused by a sudden drop in revenue (such as insurance companies providing a certain percentage of compensation for equipment depreciation losses of smart manufacturing companies).

4.2. Development Prospects

4.2.1. Research on Industry Heterogeneity and Differentiation Paths

Explore the key differences in how digital transformation affects cost stickiness in different industries, such as manufacturing, services, and agriculture (e.g., the stickiness of labor costs in the service industry and the substitution effect of digital customer service, and the stickiness of agricultural inventory costs and the application effect of IoT monitoring technology);

Analyze the capability gap between SMEs and large enterprises in optimizing cost stickiness, and design digital tools suitable for enterprises of different sizes (such as a lightweight SaaS cost management system for small and micro enterprises).

4.2.2. Dynamic Evolution and Phased Optimization Model Construction

Track the cost stickiness changes in the three stages of enterprise digital transformation (startup, expansion, and maturity), and reveal the dynamic matching relationship between technology investment and cost elasticity (such as the short-term strengthening effect of high fixed cost investment on stickiness in the startup stage , and the long-term weakening effect of data-driven on stickiness in the maturity stage);

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Construct a corresponding model of "transformation stage-cost stickiness characteristics-optimization strategy" to provide enterprises with a phased implementation roadmap (such as mature enterprises focusing on optimizing ecological synergy costs, and start-up enterprises focusing on production-side automation transformation).

4.2.3. External Environment Interaction and Uncertainty Response

Analyze the buffering effect of digital transformation on cost stickiness by combining economic cycles (booms, recessions) and policy fluctuations (such as carbon tariffs and data security laws) (e.g., during recessions, the cost stickiness of companies with strong data decision-making capabilities decreases faster);

Study the special impact of platform collaboration model and cloud sharing model on cost stickiness during extreme events (such as epidemics and supply chain disruptions), and refine flexible cost management strategies under crisis scenarios (such as building a "dual-track" cost structure: core businesses retain moderate rigidity, and non-core businesses are fully flexible).

4.2.4. Internationalization Comparison and Global Value Chain Adaptation

Compare the cost stickiness management experience of enterprises in Europe, America, Japan, South Korea and other countries in digital transformation (such as the path of German "Industry 4.0" enterprises to reduce production cost stickiness through vertical integration), to provide reference for Chinese enterprises to participate in global competition;

Study the impact of cross-border data flows and global supply chain restructuring on the cost stickiness of multinational corporations (e.g. Apple adjusted its cost structure through a regionalized production network during the Sino-US trade friction and reduced the cost stickiness of cross-border transactions).

5. Conclusion

Based on the perspective of new quality productivity, this paper reveals the impact mechanism of digital transformation on enterprise cost stickiness through four major paths: technology reconstruction, data empowerment, organizational change, and ecological synergy, and summarizes four typical models. Research shows that digital transformation does not simply reduce or enhance cost stickiness, but reshapes the dynamic characteristics of cost fluctuations with income by changing cost structure, decision-making logic and contractual relationship. In the critical period of global industrial chain reconstruction and China's economic transformation and upgrading, enterprises need to take new quality productivity as the guide, deeply integrate digital tools with cost management, and build a flexible cost system of "accurate prediction, agile adjustment, and ecological synergy", so as to enhance financial resilience and sustainable development capabilities in a complex environment. Future research can further combine empirical data with cross-national comparisons to provide more targeted solutions for enterprises of different industries and sizes, and promote the implementation of new quality productivity at the micro level.

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