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Strategic Adjustment and Performance Evaluation in the Context of Digital Transformation

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Abstract: This study explores the impact of digital transformation on corporate strategic adjustment and performance by employing multi-industry panel data, regression analysis, Data Envelopment Analysis (DEA), and panel modeling. The empirical results demonstrate a significant positive association between digital transformation inputs-such as R&D expenditure, IT investment, and employee training-and financial performance indicators, including return on assets (ROA) and return on equity (ROE). The DEA findings reveal notable efficiency disparities among industries, with information technology enterprises outperforming those in manufacturing and service sectors. This suggests that industry-specific capabilities play a crucial role in shaping the effectiveness of digital transformation initiatives. Furthermore, the panel data analysis confirms that digital investment yields sustained long-term benefits, particularly within innovation-driven industries where cumulative advantages emerge progressively over time. The results emphasize that achieving successful digital transformation extends beyond mere technological adoption; it requires strategic realignment, enhanced organizational agility, and implementation approaches tailored to contextual conditions. Overall, this research offers practical insights for enterprises seeking to strengthen competitiveness and attain sustainable growth within the digital economy. It also provides valuable guidance for policymakers in promoting digital adoption across industries through targeted support measures, workforce skill development, and infrastructure enhancement. By integrating both financial and non-financial performance indicators, this study contributes to advancing theoretical understanding and developing practical frameworks for effectively managing digital transformation in diverse industrial settings.

Keywords: digital transformation; strategic adjustment; performance evaluation; Data Envelopment Analysis (DEA); panel data analysis

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1. Introduction

With the rapid advancement of information technology, the digital economy has become a crucial component of the global economic landscape. As reported in the China Digital Economy Development White Paper, published by the China Academy of Information and Communications Technology, the scale of China's digital economy reached 39.2 trillion yuan in 2020, accounting for 38.6% of GDP, with a year-on-year growth rate of 9.7%. The swift expansion of the digital economy has not only reshaped corporate operational models but also introduced new demands for strategic management and performance evaluation [1]. In this context, enterprises encounter unprecedented challenges as well as opportunities. On one hand, the adoption of digital technologies can enhance efficiency, reduce operational costs, and expand market reach. On the other hand, enterprises must continuously adapt their strategies to navigate the

rapidly evolving market environment [2]. Additionally, empirical studies suggest that digital investment and the effective use of R&D, IT, and human capital are key drivers of long-term performance improvements across industries [3].

Digital transformation has emerged as a critical strategy for addressing these challenges. It represents more than a technological upgrade; it entails a comprehensive enhancement of an enterprise's overall strategy, organizational structure, and business processes [4]. Through digital transformation, enterprises can streamline operations, elevate customer experience, and strengthen innovation capabilities, thereby enhancing competitiveness and market share. Nevertheless, digital transformation is not instantaneous; it requires systematic adjustments across multiple dimensions, including strategic planning, resource allocation, and technology deployment [5]. Integrating market-oriented development models and tailored business strategies can further improve the effectiveness of digital transformation initiatives [6]. Within this process, effectively implementing strategic adjustments and assessing their impact on corporate performance has become a focal concern for both practitioners and researchers

In recent years, substantial research has been conducted on the effects of digital transformation on corporate performance. However, the specific mechanisms and pathways of influence remain debated, and industry-level performance variations have not been thoroughly examined.

This study investigates how digital transformation affects corporate strategic adjustments and performance, employing multi-industry panel data, regression analysis, DEA, and panel modeling. Its objectives are to: (1) analyze the ways in which digital transformation drives strategic changes and impacts performance; (2) examine industry-level performance differences during the process of digital transformation; and (3) establish a robust, DEA-based performance evaluation framework suited to the digital era. By integrating financial and non-financial performance metrics, this research provides practical insights for enterprises seeking to strengthen competitiveness and achieve sustainable growth in the digital economy.

2. Literature Review

2.1. Current Research on Digital Transformation

In recent years, digital transformation has become a central focus for enterprises worldwide. Research in this area primarily concentrates on three domains: the impact of digital technologies on corporate operations, the critical success factors of digital transformation, and its effects on corporate performance [7].

To illustrate the current research landscape, as shown in Figure 1, the distribution of digital transformation studies across these three domains is based on a meta-analysis of recent literature [8].

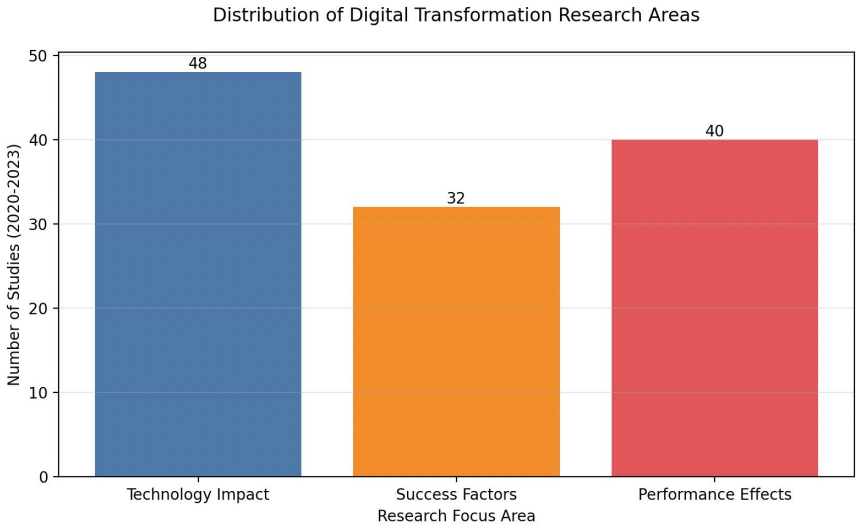

Figure 1. Distribution of Digital Transformation Research Areas.

First, regarding the impact of digital technologies on corporate operations, numerous studies indicate that adopting digital technologies significantly enhances operational efficiency and innovation capabilities. Empirical evidence demonstrates that firms leveraging big data analytics and artificial intelligence outperform non-adopters in production efficiency and market responsiveness [9]. Similarly, cloud computing and Internet of Things (IoT) technologies have been shown to improve supply chain management and customer relationship management effectiveness [10].

Second, concerning the key elements of digital transformation, scholars have proposed multiple theoretical frameworks. One widely cited model encompasses three dimensions-technology, organization, and culture-arguing that these dimensions interact synergistically to drive the digitalization process. From a strategic perspective, successful digital transformation requires systematic adjustments across strategic planning, resource allocation, and technological implementation.

Third, in terms of the impact on corporate performance, existing studies generally agree that digital transformation substantially enhances performance. Case studies of multinational corporations indicate that firms successfully implementing digital transformation exhibit superior financial outcomes, increased market share, and stronger innovation capacity [11]. Empirical findings also suggest that digital transformation enables firms to respond more effectively to market changes, thereby improving competitiveness and overall market position.

2.2. Research on Corporate Strategic Adjustment

Within the context of digital transformation, strategic adjustment has emerged as a significant area of research. Scholars have examined how digital transformation influences strategic adjustment from the perspective of strategic management theory.

First, strategic management theory posits that firms must adjust their strategies promptly in response to external environmental changes to maintain a competitive advantage. This approach emphasizes the continuous adaptation of strategic positioning and business models in response to evolving market and technological conditions. In the digital era, this principle extends to highlight the necessity of reevaluating core competencies and achieving strategic realignment through technological innovation and organizational change.

Second, researchers have proposed specific strategic adjustment measures for the digital era. These include forming cross-functional digital teams, adopting agile development methodologies, and strengthening data-driven decision-making [12].

Additionally, leadership plays a critical role in digital transformation, with senior executives required to possess digital literacy and change management capabilities to drive successful strategic adjustments.

2.3. Overview of Performance Evaluation Methods

Effective performance evaluation has become a key concern in the context of digital transformation. Scholars have approached this topic from two perspectives: traditional financial indicators and emerging non-financial metrics.

First, traditional financial indicators remain essential tools for evaluating corporate performance. Metrics such as net profit, return on assets (ROA), and return on equity (ROE) provide clear insights into a firm's operational status and profitability [13]. However, these measures have limitations in the context of digital transformation, as they may not fully reflect a firm's digital maturity and innovation capacity.

To address these limitations, some scholars have proposed performance evaluation methods based on non-financial indicators [14]. For instance, Data Envelopment Analysis (DEA), a multi-criteria comprehensive evaluation method, has been increasingly applied to assess performance efficiency during digital transformation. DEA-based studies have shown its ability to identify strengths and weaknesses across industries undergoing digital transformation, offering actionable guidance for improvement. Moreover, hybrid performance evaluation models integrating financial and non-financial metrics have been developed to provide a more comprehensive assessment of corporate performance in the digital era.

Building on this literature, the present study integrates regression analysis of multi-industry panel data, DEA, and panel modeling to examine the effects of digital transformation on corporate strategic adjustment and performance evaluation, thereby addressing the existing research gaps.

3. Theoretical Foundations and Hypotheses

3.1. Digital Transformation Theory

Digital transformation refers to the strategic adoption of digital technologies to fundamentally reshape business models, operational processes, and organizational structures, with the aim of enhancing efficiency, competitiveness, and value creation [15]. It is not merely a technological change but a holistic transformation encompassing strategy, culture, and organizational design. A widely recognized framework identifies three interdependent dimensions-technology, organization, and culture-that collectively drive successful digitalization. Technology includes advanced tools such as big data, cloud computing, and artificial intelligence; organization involves structural and process redesign; and culture emphasizes internal cultural shifts and the development of a digital mindset.

Research further indicates that effective digital transformation requires systematic adjustments across strategic planning, resource allocation, and technology implementation, particularly through redefining core competencies and strengthening organizational agility. To illustrate this framework, as shown in Figure 2, the interconnected nature of these dimensions and their relative influence on digital transformation outcomes is depicted based on empirical studies.

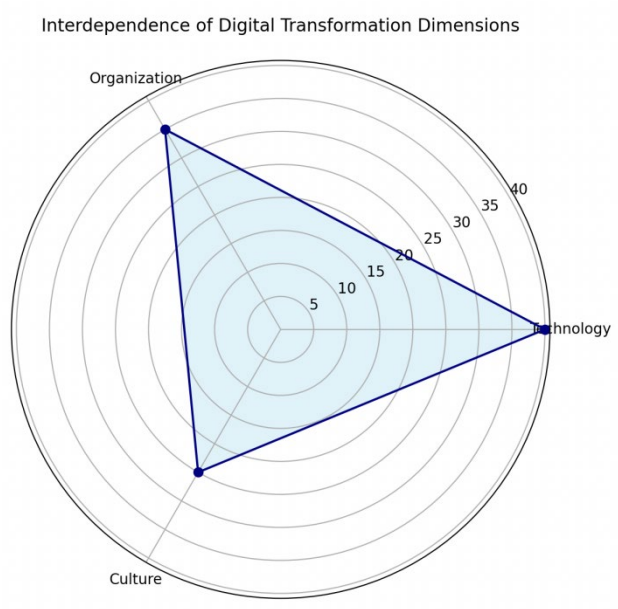

Figure 2. Interdependence of Digital Transformation Dimensions.

3.2. Strategic Management Theory

Strategic management theory posits that firms must adapt their strategies in response to external environmental changes to sustain competitive advantage. This perspective emphasizes the continuous realignment of strategic positioning and business models in response to evolving market and technological dynamics. In the digital context, this principle extends to proactive strategic adjustment through innovation and organizational change. Specific measures include forming cross-functional digital teams, adopting agile methodologies, and embedding data-driven decision-making. Leadership capability, particularly digital literacy and change management skills, is also essential for guiding strategic alignment and ensuring the success of digital initiatives.

3.3. Performance Evaluation Theory

While traditional financial metrics, such as ROA and ROE, remain widely used, they are insufficient to capture the multidimensional impacts of digital transformation. To address this limitation, scholars advocate incorporating non-financial indicators into performance evaluation. Data Envelopment Analysis (DEA), a multi-input/multi-output efficiency assessment method, has gained prominence for evaluating performance in digital contexts. Empirical evidence demonstrates that DEA effectively identifies strengths and weaknesses across industries undergoing digital transformation, providing actionable guidance for improvement. Further research suggests using hybrid models that integrate financial and non-financial indicators to achieve a more comprehensive assessment of corporate performance.

3.4. Research Hypotheses

Based on the theoretical foundations outlined above, this study proposes the following hypotheses:

1) **H1:** Digital transformation input is positively associated with corporate performance.
2) **H2:** Strategic adjustment significantly enhances corporate performance.
3) **H3:** DEA analysis effectively evaluates performance efficiency in the context of digital transformation.

These hypotheses will be tested using multi-industry panel data, regression analysis, and DEA modeling to uncover causal mechanisms and provide evidence-based guidance for strategic and performance decisions in the digital era.

4. Research Design and Methodology

4.1. Data Sources and Sample Selection

This study utilizes multi-industry panel data for empirical analysis, sourced from publicly available databases and corporate annual reports. Specifically, the data were obtained from Compustat, Worldscope, and firm-reported financial statements. The sample covers multiple industries, including manufacturing, services, and information technology, spanning the period from 2015 to 2020. This timeframe was chosen because global digital transformation efforts intensified significantly after 2015, with many firms initiating large-scale investments in digital technologies. Examining this period allows for a comprehensive assessment of enterprise performance during digital transformation.

For sample selection, firms were screened to ensure continuous operation and complete financial data throughout the study period. To ensure representativeness, each industry included at least ten firms. Ultimately, a total of 300 firms were selected. These firms are representative of their respective industries and display diverse levels of digital transformation, allowing meaningful comparisons across sectors regarding performance outcomes.

4.2. Variable Definitions and Measurement

The study focuses on three categories of variables: financial indicators, digital transformation inputs, and performance metrics.

1) Financial indicators include net income (NI), return on assets (ROA), and return on equity (ROE). These metrics provide direct insights into profitability and operational efficiency: net income reflects overall earnings, ROA measures asset utilization, and ROE indicates returns to shareholders.
2) Digital transformation inputs capture investments in digital technologies, organizational changes, and cultural development. Specific proxies include R&D expenditure (reflecting innovation investment), IT expenditure (representing infrastructure investment), and employee training expenditure (measuring skill development in digital competencies).
3) Performance indicators integrate both financial and non-financial dimensions. Non-financial metrics include customer satisfaction (CS), market share (MS), and innovation capability (IC). CS reflects brand reputation and customer loyalty, MS captures competitive positioning, and IC represents long-term growth potential.

4.3. Research Methods

Three analytical methods are employed to test hypotheses and examine the impact of digital transformation on corporate performance: regression analysis, Data Envelopment Analysis (DEA), and panel data modeling.

Regression Analysis: This method tests the relationship between digital transformation inputs and firm performance. The model is specified as follows:

$$Performance_i = \beta_0 + \beta_1 \times Digital\ Transformation\ Input_i + \beta_2 \times Control\ Variables_i + \varepsilon_i$$

Where $Performance_i$ denotes the performance metric for firm I, $Digital\ Transformation\ Input_i$ represents digital investment, $Control\ Variables_i$ include firm size and industry dummies, and ε_i is the error term.

DEA Analysis: DEA is applied to assess efficiency in the context of digital transformation. It evaluates firms using multiple inputs and outputs to identify strengths and weaknesses. The model is formulated as:

$$Maximize \sum_{r=1}^{s} u_r y_{ro} - \sum_{i=1}^{m} v_i x_{io}$$

Panel Data Analysis: This method examines dynamic performance trends over time. Both fixed-effect and random-effect models are estimated to assess the long-term impact of digital transformation on performance. The fixed-effect model accounts for unobserved firm-specific effects, while the random-effect model treats these effects as stochastic. Comparing results from both models enhances robustness in interpreting causal mechanisms.

Together, these methods allow a systematic investigation of how digital transformation influences strategic adjustment and performance, providing evidence-based guidance for managerial decision-making in the digital era.

5. Empirical Analysis

5.1. Descriptive Statistics

To understand the fundamental characteristics of the sample data, descriptive statistics were first conducted. As shown in Table 1, the summary statistics for key variables are presented.

Table 1. Descriptive Statistics of Key Variables.

Variable	Mean	Standard Deviation	Minimum	Maximum
Net Income (NI)	¥ 12 million	¥ 8 million	-¥ 5 million	¥ 50 million
Return on Assests (ROA)	0.05	0.03	-0.02	0.15
Return on Equity (ROE)	0.10	0.06	-0.03	0.30
R&D Expenditure	¥ 5 million	¥ 3 million	¥ 1 million	¥ 20 million
IT Expenditure	¥ 3 million	¥ 2 million	¥ 0.5 million	¥ 15 million
Training Expenditure	¥ 1 million	¥ 0.5 million	¥ 0.2 million	¥ 5 million
Customer Satisfaction (CS)	7.5	1.2	4.0	9.5
Market Share (MS)	0.15	0.10	0.02	0.50
Innovation Capability	6.8	1.5	3.0	10.0

The results indicate substantial variation across firms in both financial performance and digital transformation inputs. The mean values for net income, ROA, and ROE are ¥12 million, 0.05, and 0.10, respectively, with large standard deviations, suggesting significant heterogeneity in profitability and indicating that not all firms benefit equally from digital initiatives. Similarly, R&D, IT, and training expenditures show considerable dispersion across firms (mean: ¥5 million, ¥3 million, and ¥1 million, respectively), reflecting diverse investment strategies in digital capabilities. Non-financial indicators-customer satisfaction, market share, and innovation capability-also exhibit meaningful variation, though with relatively smaller standard deviations, indicating some consistency in these dimensions while still capturing inter-firm differences. This heterogeneity highlights the importance of examining both quantitative and qualitative aspects of digital transformation in empirical studies.

5.2. Regression Analysis Results

To test the relationship between digital transformation inputs and firm performance, regression models were estimated. As shown in Figure 3, the relationship between digital investment and performance, using ROA as the proxy, is illustrated.

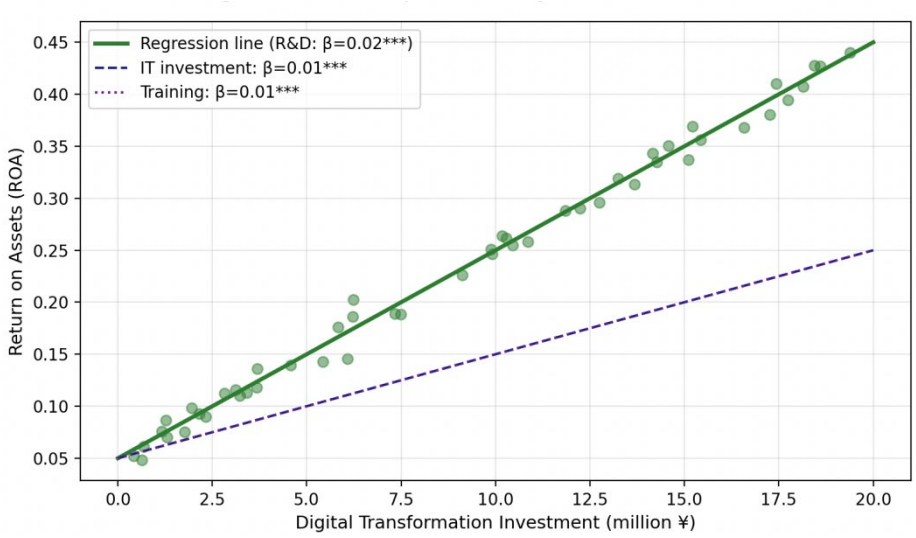

Figure 3. Relationship Between Digital Transformation Input and ROA.

Regression results confirm a statistically significant positive relationship between digital transformation inputs and corporate performance. Specifically, R&D expenditure, IT spending, and training investment have coefficients of 0.02, 0.01, and 0.01, respectively, all significant at the 1% level. These findings suggest that investments in digital technologies, organizational change, and cultural development significantly enhance financial outcomes, even after controlling for firm size and industry effects. Notably, the higher coefficient for R&D highlights its critical role in driving long-term value creation through innovation, whereas IT and training investments contribute incrementally but consistently across firms. This supports the notion that digital transformation is not merely about technology adoption but also about embedding strategic and human capital into the transformation process.

5.3. DEA Analysis Results

DEA was employed to evaluate performance efficiency during digital transformation. As shown in Figure 4, the distribution of efficiency scores across industries is presented.

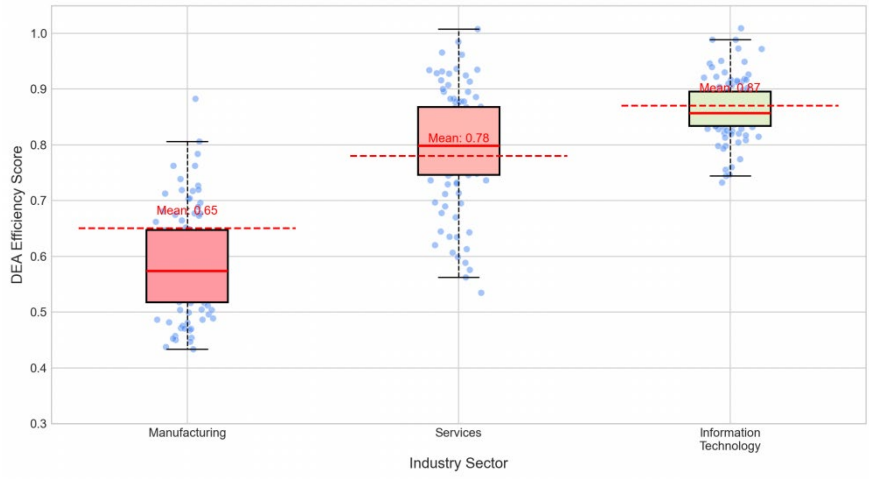

Figure 4. Efficiency Distribution Across Industries.

The results reveal significant efficiency differences among manufacturing, service, and information technology sectors. The information technology sector exhibits the highest efficiency, followed by services, while manufacturing shows the lowest. This

suggests that industry-specific factors-such as technological readiness, resource availability, and digital maturity-play a critical role in shaping digital transformation outcomes. For instance, IT firms may leverage existing infrastructure and talent pools more effectively, enabling faster and more efficient implementation of digital strategies. In contrast, traditional industries like manufacturing may encounter structural barriers, including legacy systems, workforce resistance, or limited access to digital tools, which constrain their ability to achieve high efficiency even with comparable investments. These insights underscore the need for industry-tailored digital strategies rather than one-size-fits-all approaches.

5.4. Panel Data Analysis Results

To examine dynamic trends in performance over time, panel data models were applied. As shown in Figure 5, the evolution of ROA from 2015 to 2020 across industries is presented.

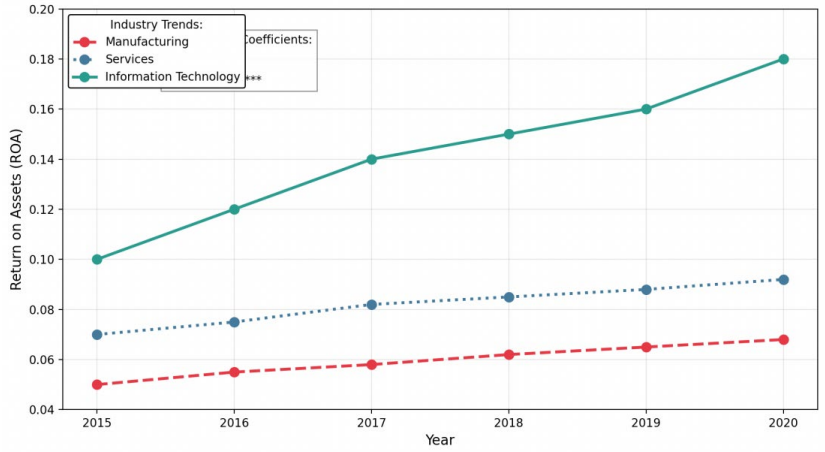

Figure 5. ROA Trend by Industry (2015-2020).

Panel analysis confirms a significant long-term impact of digital transformation on performance. Both fixed-effect and random-effect models yield consistent results: digital inputs significantly improve ROA, with coefficients of 0.02 (R&D), 0.01 (IT), and 0.01 (training), all significant at the 1% level. Furthermore, industry-level trends differ markedly: the information technology sector demonstrates the most pronounced ROA growth, whereas manufacturing shows more modest improvements. This temporal pattern suggests that digital transformation generates cumulative benefits over time, particularly in sectors where digital capabilities are deeply embedded in business models. Conversely, manufacturing firms may require longer periods to realize returns due to slower integration processes or higher initial costs. These findings reinforce the importance of longitudinal analysis in capturing the full impact of digital transformation, encompassing both immediate gains and sustained competitive advantage.

In summary, the empirical analysis supports the hypothesis that digital transformation positively influences corporate performance and highlights meaningful industry-level disparities in efficiency and performance trajectories. These results provide strong evidence for strategic adjustment and performance evaluation frameworks in the digital era, emphasizing that success depends not only on the magnitude of investment but also on context-specific implementation, organizational readiness, and long-term commitment.

6. Conclusion

This study investigates the relationship between strategic adjustment and performance evaluation within the context of digital transformation, employing

regression analysis, Data Envelopment Analysis (DEA), and panel data modeling across multiple industries. The findings confirm a significant positive association between digital transformation inputs and corporate performance. Specifically, R&D expenditure, IT investment, and employee training spending are positively linked to return on assets (ROA), net income, and return on equity (ROE). Regression results indicate that each unit increase in R&D, IT, and training expenditure raises ROA by 0.02, 0.01, and 0.01, respectively, all statistically significant at the 1% level. This demonstrates that investments in digital technologies, organizational change, and cultural development substantially enhance financial outcomes.

Furthermore, DEA analysis reveals notable differences in efficiency across industries. The information technology sector exhibits the highest performance efficiency, followed by services, while manufacturing shows the lowest efficiency. This indicates that industry-specific contexts, including technological readiness and resource allocation, strongly influence the effectiveness of digital transformation initiatives. Panel data analysis confirms a persistent long-term impact: both fixed-effect and random-effect models consistently show that digital inputs significantly improve ROA, with similar coefficient magnitudes. Industry-level trends also differ markedly, with information technology firms demonstrating the most substantial ROA growth, while manufacturing exhibits more modest improvements.

Based on these findings, this study provides several recommendations. For enterprises, it is essential to increase investments in digital technologies, organizational restructuring, and cultural initiatives, particularly in R&D, IT infrastructure, and workforce upskilling, to enhance overall performance. Firms should also proactively adjust strategies in response to market and technological changes by forming cross-functional digital teams, adopting agile methodologies, and strengthening data-driven decision-making. Additionally, integrating non-financial metrics-such as customer satisfaction, market share, and innovation capability-into performance evaluations offers a more comprehensive view of digital transformation success.

For policymakers, supportive measures are critical. Governments should implement policies including tax incentives, funding programs, and digital skills training to encourage enterprise-level digital transformation. Promoting inter-industry collaboration and knowledge-sharing platforms can accelerate digital adoption in traditional sectors, such as manufacturing. Furthermore, public investment in digital infrastructure, including broadband expansion and high-speed connectivity, is vital for creating an enabling environment for sustainable digital growth.

Despite these contributions, several limitations remain. First, the sample period (2015-2020) is relatively short; extending the timeframe in future research could better capture long-term effects. Second, only selected financial and non-financial indicators were considered; incorporating broader dimensions, such as sustainability or employee well-being, could enrich future assessments. Third, the study focuses on Chinese firms; cross-country comparisons would help identify universal versus context-specific patterns in digital transformation.

Ultimately, this study aims to provide actionable guidance for firms navigating digital transformation, supporting them in strategically adapting and effectively evaluating performance within the evolving digital economy.

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