The Impact of Digital Transformation Driven by Information Technology on Corporate Competitiveness: An Empirical Study of the Digital Transformation of Listed Companies in the Southwest Region

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Abstract. In the context of the rapid development of information technology, digital transformation has become a crucial means for enterprises to enhance their competitiveness. However, the effects of digital transformation vary significantly among enterprises in different regions. This study selects listed companies on the Shanghai and Shenzhen Stock Exchanges from Guangxi, Yunnan, and Guizhou during 2017-2022 as samples and employs empirical analysis methods to explore the impact of information technology-driven digital transformation on corporate competitiveness. The results show that there is a complex nonlinear relationship between digital transformation and corporate competitiveness. The effectiveness of digital transformation in enterprises in the Southwest region is poor, and in the short term, it does not significantly enhance corporate competitiveness. Based on this, the study proposes relevant policy recommendations, including increasing the construction of digital infrastructure, improving support policies, promoting cross-enterprise cooperation, and strengthening internal management optimization to better promote digital transformation and competitiveness improvement of enterprises in underdeveloped regions. This study provides new perspectives and empirical evidence for further exploration of regional digital transformation strategies.

Keywords: Information Technology, Digital Transformation, Corporate Competitiveness, Southwest Region, Regional Differences.

1 Introduction

In today's era, the rapid development of the digital economy is reshaping the competitive landscape of enterprises, and digital transformation has become a key strategic initiative for enhancing corporate competitiveness. According to data from the Ministry of Industry and Information Technology of China, the scale of China's digital economy has seen a leap from 11 trillion yuan to 45.5 trillion yuan in just a decade (2012 to 2022), with its share of the Gross Domestic Product (GDP) rising from 21.6% to 39.8%. Despite the strong momentum in the development of the digital

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economy in China, significant disparities in digital development levels still exist across regions. Particularly in the Southwest region, the pace of digital transformation of enterprises is relatively slow, which directly impacts the overall competitiveness of enterprises in the region.

Currently, academic research on digital transformation has primarily focused on enterprises in economically developed regions, while attention to economically underdeveloped areas, especially the Southwest region, remains insufficient. Additionally, the academic community has yet to reach a consensus on the impact of digital transformation on corporate competitiveness. Some studies suggest that digital transformation can significantly enhance an enterprise's innovation capabilities and market competitiveness; however, other studies indicate that due to the high investment and potential risks associated with digital transformation, enterprises may face a decline in competitiveness in the short term.

Given the current state of research, this study selects financial data from listed companies in the Southwest region (Guangxi, Yunnan, Guizhou) during 2017-2022 as the research sample to empirically analyze the impact of digital transformation on corporate competitiveness. Through in-depth exploration, we aim to reveal the differences in the effects of digital transformation across different regions and to uncover the possible nonlinear relationship between digital transformation and corporate competitiveness. The results of this study will provide valuable references and evidence for future theoretical exploration and policy formulation.

2 Literature Review

In recent years, the impact of digital transformation on enterprise development has become a hot topic in academic research. Numerous studies have shown that digital transformation can effectively enhance an enterprise’s innovation capabilities and market competitiveness. For example, Wu Jiang et al. (2021) [1] pointed out that digital transformation helps enterprises gain an advantage in market competition by optimizing resource allocation and improving management efficiency. Han Jiaping and Li Yang (2022) [2] further emphasized that digital transformation not only enhances innovation capabilities but also improves operational efficiency, thereby boosting overall competitiveness.

Over the past two years, researchers have conducted more in-depth explorations of the impact of digital transformation. Xu Lan and Wu Chaolin (2022) [3], in their study of China’s manufacturing sector, found that the application of digital technology significantly improved production efficiency and market responsiveness. Particularly in complex and volatile market environments, digital transformation enables enterprises to more flexibly adjust their strategies and operational models. Sun (2022) [4] also found that digital transformation not only enhances innovation capabilities but also helps enterprises better adapt to market changes, thereby improving their long-term competitiveness.

However, some studies have indicated that digital transformation may also bring certain negative effects. Zhou Xiao (2022) [5] found that in the early stages of digital

transformation, enterprises might face risks such as reduced operational efficiency and short-term profit declines due to the need for substantial investment of funds and resources. Gong Xinshu and Jin Mei (2023) [6] further pointed out that digital transformation could lead to the complication of internal management structures, especially if digital technologies are improperly implemented, potentially having a negative impact on overall operations.

In recent years, some researchers have proposed a nonlinear relationship between digital transformation and corporate competitiveness. Ma Jun and Guo Mingjie (2022) [7] discovered through empirical analysis that the impact of digital transformation on enterprises follows a U-shaped curve. That is, in the early stages of transformation, corporate competitiveness may decline, but as the transformation deepens and improves, competitiveness gradually rebounds. This finding aligns with the research results of Chen Mengting et al. (2024) [8], who pointed out that while digital transformation may cause short-term growing pains, it significantly enhances market position and financial performance in the long term.

Regional differences have also been particularly evident in the effectiveness of digital transformation. Qi Yudong et al. (2020)[9] noted that enterprises in developed regions typically possess better infrastructure and a stronger reserve of digital talent, making it easier for them to achieve success in digital transformation. In contrast, enterprises in underdeveloped regions face greater difficulties in the transformation process due to resource shortages. This point has received further empirical support in recent years. Wang Shanshan and Nan Kaiqiang (2023) [10] showed that the digital transformation process of enterprises in underdeveloped regions is often hindered by a lack of funds and talent, resulting in less significant transformation effects compared to those in developed regions.

In summary, although there are some disagreements in the existing research regarding the impact of digital transformation on corporate competitiveness, there is general agreement on its positive long-term effects. This study will further explore the specific manifestations of digital transformation in the Southwest region, aiming to provide new perspectives and empirical evidence for research in this field.

3 Research Hypotheses

The digital transformation of enterprises focuses on deeply integrating digital technology with business processes, which is expected to impact corporate competitiveness as follows: Firstly, digital transformation helps enterprises utilize big data for research and development, production, and management, thereby promoting efficient resource utilization (Moeuf, 2018) [11]. Secondly, digital transformation facilitates networked management, effectively improving management efficiency and thus enhancing overall corporate competitiveness (Shang Hongtao & Wu Tong, 2022) [12]. Thirdly, the enhancement of digital capabilities helps enterprises learn from and adopt the technology and management knowledge of other external stakeholders, creating better conditions for enterprise development and the improvement of overall competi-

tiveness (Zhang Zenan et al., 2023) [13]. Based on this, the following hypotheses are proposed:

H1: Digital transformation has a significant positive impact on overall corporate competitiveness.

Qi Yudong et al. (2020) [9] believe that digital technology, through simplifying decision-making processes and precise production, helps enterprises generate more revenue and expand market share, thereby enhancing competitiveness. The "2020 Huawei Annual Report" pointed out that thanks to digital empowerment, Huawei's sales revenue in 2020 exceeded 721.202 billion yuan, with digital-related businesses growing by 23.8% year-on-year. Based on this, the following hypothesis is proposed:

H2: Digital transformation has a significant impact on basic corporate competitiveness.

A survey by the Irish digital transformation strategy consulting company Accenture of 450 Chinese enterprises in 2018 showed that digital transformation leaders, aiming for business innovation, have seen new business contributions exceed 50% of total revenue, with a three-year compound revenue growth rate 5.5 times higher than that of other companies. Based on this, the following hypothesis is proposed:

H3: Digital transformation has a significant impact on operational corporate competitiveness.

Ma et al. (2020) [14] found that improving production efficiency and resource utilization enhances corporate competitiveness. Rumyantseva et al. (2020) [15] found that the digital economy positively impacts financial corporate competitiveness through technological innovation and promoting management efficiency. Based on this, the following hypothesis is proposed:

H4: Digital transformation has a significant impact on financial corporate competitiveness.

4 Research Design

4.1 Model Setting

According to the above research hypotheses, this paper designs the following research models (1-4):

$$COM_{ijpt} = \alpha_0 + \alpha_1 DI_{ijpt} + \alpha_2 SIZE_{ijpy} + \alpha_3 AGE_{ijpt} + \delta_{pt} + \gamma_{jt} + \mu_i + \varepsilon_{ijpt} \quad (1)$$

$$COM1_{ijpt} = \alpha_0 + \alpha_1 DI_{ijpt} + \alpha_2 SIZE_{ijpy} + \alpha_3 AGE_{ijpt} + \delta_{pt} + \gamma_{jt} + \mu_i + \varepsilon_{ijpt} \quad (2)$$

$$COM2_{ijpt} = \alpha_0 + \beta_1 DI_{ijpt} + \alpha_2 SIZE_{ijpy} + \alpha_3 AGE_{ijpt} + \delta_{pt} + \gamma_{jt} + \mu_i + \varepsilon_{ijpt} \quad (3)$$

$$COM3_{ijpt} = \alpha_0 + \alpha_1 DI_{ijpt} + \alpha_2 SIZE_{ijpy} + \alpha_3 AGE_{ijpt} + \delta_{pt} + \gamma_{jt} + \mu_i + \varepsilon_{ijpt} \quad (4)$$

In Model (1), COM_{ijpt} is the explained variable, which represents the comprehensive competitiveness level of the i_{th} enterprise in the J_{th} industry in the P_{th} province in

the T_{th} year; DI_{ijpt} is the explanatory variable, represents the digital transformation level of the i_{th} enterprise in the J_{th} industry in the P_{th} province in the T_{th} year; $SIZE_{ijpt}$ is the control variable, represents the enterprise size of the ith enterprise in the J_{th} industry in the P_{th} province in the T_{th} year; AGE_{ijpt} is the control variable, represents the enterprise age of the i_{th} enterprise in the J_{th} industry in the P_{th} province in the T_{th} year; $\alpha_1 ... \alpha_3$ is the regression coefficient. When the regression coefficient is significantly positive, it indicates that digital transformation has improved the level of enterprise competitiveness; otherwise, it indicates that digital transformation has reduced the level of enterprise competitiveness; δ_{pt} denotes the province-year fixed effect to control the characteristics of different regions over time; γ_{jt} denotes the industry-year fixed effect to control the characteristics of different industries over time; μ_i denotes the enterprise fixed effect; ε_{ijpt} denotes the random error term. In Model (2), $COM1_{ijpt}$ represents the basic competitiveness of enterprises; in Model (3), $COM2_{ijpt}$ represents the operational competitiveness of enterprises; in Model (4), $COM31_{ijpt}$ represents the financial competitiveness of enterprises; and the meanings of other variables and coefficients are consistent with Model (1).

4.2 Variable Description

Explained Variable.

The explained variable in this paper is enterprise competitiveness (COM). Referring to the definition and index segmentation method of enterprise competitiveness elements by Jin Bei (2003), three first-level indicators such as basic ability, operational ability and financial ability are divided from the comprehensive competitiveness of enterprises, and seven second-level indicators such as human resources and seven third-level indicators such as per capita profit rate are detailed. Each index is shown in Table 1:

Table 1. Enterprise competitiveness index system

First-level indicators	Secondary indicators	Tertiary indicators	Indicator description
Basic competencies	Human Resources	Profit margin per capita	Total profit/total number of employees
	Fixed assets	Fixed assets Growth rate	(Gross fixed assets at beginning of period - fixed assets at end of period Total value)/Total value of fixed assets at the beginning of the period ×100%
Operating capacity	Production	Cost expenses Profit margin	Total profit/Total cost expenses ×100%
	Sales	Gross margin on sales	(Net revenue from sales - cost of products)/Net revenue from sales ×100%
	Products and Services	Principal Activities	(Revenue from principal operations -Cost from principal operations - Principal operations Busi-

		Profit margin	ness taxes and surcharges)/income from main business ×100%
Financial capacity	Debt ratio and Solvency	Asset-liability ratio	Total liabilities/total assets ×100%
		Current ratio	Total current assets/total current liabilities
	Capital operations	Current assets Turnover	Income from principal operations/average total current assets ×100%

Explanatory Variables.

The explanatory variable of this paper is enterprise digital transformation (DI). Referring to the research results of Qi et al. (2020)[9], the frequency of "digitalization" related words in the annual reports of sample companies from 2017 to 2022 is used to describe the measurement of digitalization of listed companies. To be specific, firstly, according to the sample list of listed companies in Guangxi, Yunnan and Guizhou from 2017 to 2022, download the PDF version of annual reports from Shanghai and Shenzhen stock exchanges; the second is to manually collect the annual reports converted from PDF to TXT format and classify them into various folders.

Control Variables.

This paper selects enterprise age and enterprise size as control variables. The age of the enterprise can reflect the length of operation of the enterprise. The older the enterprise is the more experience it has gained and the richer the experience is. The larger the enterprise scale is, the stronger the enterprise's ability to obtain resources is, which is more conducive to the enterprise's digital transformation (Jing et al., 2022). In this paper, the age of the enterprise is measured by subtracting the establishment year from the current year, and the logarithm of the total assets of the enterprise is selected as the measurement index for the enterprise size.

4.3 Data Sources and Sample Selection

The data in this paper come from the annual reports of listed companies in Shanghai and Shenzhen Stock exchanges in Guangxi, Yunnan and Guizhou from 2017 to 2022. The first is to determine the language expression characteristics related to digitalization in the annual reports, and use the text data mining method to analyze the word frequency through manual sorting and automatic word segmentation by using the jupyter algorithm in Python. The second is to use the enterprise digital term dictionary, and count the frequency of 197 digital dictionaries in each annual report. In order to eliminate the influence of outliers on the data analysis, this paper winsorizes the samples by 1% and 99%, and finally obtains 75 sample enterprises and 375 data samples.

5 Empirical Analysis

5.1 Descriptive Statistical Analysis

The descriptive statistical results report that the maximum value of the digital transformation of the sample enterprises is 0.014876, and the minimum value is 0.000195, which is quite different, indicating that the digital transformation of the selected enterprises in the sample is significantly different, and the average value is 0.001260, which is larger than the median value of 0.000793, indicating that more than 50% of the enterprises' digital transformation degree falls below the average level, reflecting the low degree of digital transformation of listed companies in southwest China. The average value of comprehensive competitiveness of enterprises is 0.4537, indicating that the comprehensive competitiveness of listed companies in southwest China is generally low; The maximum value is 0.7406, the minimum value is 0.2695, the span is relatively large, indicating that the competitiveness gap of enterprises in various industries is evident.

5.2 Correlation Analysis

The correlation analysis results report that the correlation coefficient between enterprise digital transformation (DI) and enterprise competitiveness(COM) is -0.161, indicating that enterprise digital transformation and enterprise competitiveness are negatively correlated. At the same time, the correlation coefficient between enterprise digital transformation (DI) and business capability (COM2) is -0.149, indicating a negative correlation. But the correlation coefficient between enterprise digital transformation and basic capability (COM1) and financial capability (COM3) is not significant. The correlation coefficients of independent variables are all lower than 0.6, indicating that there is no multicollinearity problem, which can be used for subsequent regression analysis.

5.3 Regression Analysis

In this paper, stata15.0 is used as statistical analysis software to conduct random effect analysis on digital transformation (DI), enterprise competitiveness (COM), enterprise basic capability (COM1), enterprise operation capability (COM2) and enterprise financial capability (COM3). It verifies the impact of enterprise digital transformation on comprehensive competitiveness and three first-level indicators.

5.3.1. Regression Analysis of Digital Transformation and Enterprise Competitiveness.

As shown in Table 2, the random effects analysis of digital transformation (DI) and enterprise competitiveness (COM) shows that when no variables are added, the standardized coefficient of comprehensive competitiveness is -5.0135, which is negative and significant at 10%. After controlling the effect of time and industry, the standard-

ized coefficient of enterprise competitiveness is -1.8140, and after adding the control variables of enterprise size and enterprise age, the standardized coefficient is -1.8133, indicating that the effect of digital transformation on enterprise competitiveness is not significant, which is contrary to Hypothesis H1. Digital transformation can promote the innovation of enterprise business model. However, due to the relatively lagging infrastructure in southwest China, the rapid development of commercial circulation industry in southwest China is restricted, which leads to the insignificant effect of digital transformation on enterprise competitiveness.

Table 2. Random Effect Regression Model of Digital Transformation (DI) and Enterprise Competitiveness (COM)

	(1) com	(2) com	(3) com
DI	5.0135	1.8140	1.8133
	(1.68)	(0.44)	(0.43)
size			0.0006
			(0.07)
age			0.0001
			(0.02)
_cons	0.4601***	0.4097***	0.3951**
	(46.01)	(99.48)	(2.12)
yearfe	No	Yes	Yes
industryfe	No	Yes	Yes
N	375	375	375
r2_a			
F			

T statistics in parentheses
*P < 0.1, **p < 0.05, ***p < 0.01

5.3.2. Regression Analysis of Digital Transformation and Enterprise Basic Capabilities.

Random effects analysis was conducted on digital transformation (DI) and enterprise foundational capabilities (COM1), and the results showed that the standardized coefficient for basic capability is -0.1566, controlling for other variables. This result suggests that digital transformation has no statistically significant effect on firms' basic capabilities, contradicting Hypothesis H2. Basic capability is calculated as a weighted sum of profit rate per capita and the growth rate of fixed assets. Yunnan, Guizhou, and Guangxi are located at the forefront of China-ASEAN economic and trade cooperation, with existing productive capacity and considerable growth potential. However, southwest China faces a shortage of skilled digital professionals, and fixed asset investment has been sluggish. This combination of factors may explain the statistically insignificant effect of digital transformation on basic capabilities.

5.3.3. Regression Analysis of Digital Transformation and Enterprise Operation Capability.

Random effects analysis was conducted on digital transformation (DI) and enterprise operational capability (COM2), and the results showed that the standardized coefficient of operation capability under the influence of control variables is -3.5585, indicating that the effect of digital transformation on enterprise operation capability is statistically insignificant, which is contrary to Hypothesis H3. Operation ability is related to production, sales, products and services. In the process of digital transformation, all employees need training, which increases the management cost of the enterprise. At the same time, it also increases the online exposure frequency of enterprises and reduces the marketing cost of enterprises. Therefore, the two offset each other, resulting in the insignificant effect of digital transformation on the operation capability of enterprises.

5.3.4. Regression Analysis of Digital Transformation and Enterprise Financial Capability.

Random effects analysis was conducted on digital transformation (DI) and corporate financial capability (COM3), and the results showed that the standardized coefficient of financial capability under the influence of control variables is 0.3975, indicating that the effect of enterprise digital transformation on financial capability is not significant, which is contrary to Hypothesis H4. There is a certain relationship between financial capability and debt ratio, debt paying ability and capital operation. Digital transformation requires substantial capital investment, both in hardware and in the integration of digital technologies into business processes. At the same time, the combination of Internet, big data, cloud computing and other digital technologies with traditional finance has innovated financial products and business models. The two offset each other, resulting in the insignificant effect of digital transformation on the financial capability of enterprises.

5.4 Robustness Test

Due to the endogeneity of the baseline regression, the consistency of the estimated results may be affected. In order to solve the above problems, most of the current academic circles take the lag of one phase of the core explanatory variable as an instrumental variable to identify and deal with endogenous problems (Lu Yue et al., 2023). As shown in Table 3, the digital transformation data with a one-stage lag is selected for robustness test. The results of lag regression show that the selection of instrumental variables passes the relevant test, and the conclusion of the benchmark study is not interfered by the endogenous problem.

Table 3. Robustness test: Lag regression

	(1) L.com	(2) L.com1	(3) L.com2	(4) L.com3
DI	3.3143	0.5444	4.6377	0.0252
	(1.13)	(0.98)	(1.46)	(0.03)
size	0.0003	0.0015	0.0003	0.0024
	(0.03)	(0.64)	(0.04)	(1.21)
age	0.0000	0.0007	0.0011	0.0002
	(0.02)	(1.63)	(0.52)	(0.39)
_cons	0.4081**	0.1595***	0.1803	0.0243
	(2.08)	(3.32)	(1.10)	(0.58)
yearfe	Yes	Yes	Yes	Yes
industryfe	Yes	Yes	Yes	Yes
N	300	300	300	300
r2_a				
F				

T statistics in parentheses

*P < 0.1, **p <0.05, ***p < 0.01

6 Conclusions and Recommendations

6.1 Research Conclusions

This study empirically examined the impact of digital transformation on corporate competitiveness by using listed companies in Guangxi, Yunnan, and Guizhou on the Shanghai and Shenzhen Stock Exchanges from 2017 to 2022 as samples. The research results show:

The impact of digital transformation on corporate competitiveness is uncertain. Data analysis indicates that the correlation between digital transformation and corporate competitiveness is not significant, and in some cases, it even shows a negative correlation. This suggests that the relationship between digital transformation and the enhancement of corporate competitiveness is not simply positive but may be influenced by various factors, such as regional infrastructure, enterprise scale, and industry characteristics.

The effectiveness of digital transformation in Southwest region enterprises is poor. The overall level of digital transformation among listed enterprises in the Southwest region is low, and its positive impact on corporate competitiveness is limited. This may be closely related to the region's economic development level, digital infrastructure, and the shortage of digital talent.

There may be an inverted U-shaped relationship between digital transformation and corporate competitiveness. Although the data does not significantly support an inverted U-shaped relationship, this trend has some theoretical rationality. In the early stages of digital transformation, high costs and complexity may lead to a decline in

corporate competitiveness, but as the transformation gradually matures, corporate competitiveness may significantly improve.

6.2 Policy Recommendations

Based on the above research conclusions, the following policy recommendations are proposed to promote the digital transformation process of enterprises in the Southwest region and enhance overall corporate competitiveness:

6.2.1 Government Level.

Increase infrastructure construction: The government should increase investment in digital infrastructure in the Southwest region, including expanding high-speed internet network coverage, building data centers, and cloud computing platforms, to address the hardware bottlenecks faced in digital transformation. Prioritizing the development of digital technology infrastructure will help create a favorable digital environment for enterprises.

Introduce targeted support policies: To address the financial and technical challenges faced by small and medium-sized enterprises in digital transformation, the government can establish special support funds, provide low-interest loans, and offer tax reductions to alleviate the financial pressure of digital transformation. Additionally, the government should encourage enterprises to participate in pilot projects for digital transformation, providing more policy support and resources for high-quality projects.

Promote regional collaboration: The government can promote inter-regional cooperation to form cross-regional digital economic belts and achieve common development of digital technologies through resource complementary within and outside the region. Establishing cross-regional digital transformation cooperation alliances will strengthen experience exchange and resource sharing between regions and promote the flow of technology and talent.

6.2.2 Market Level.

Enhance industry standardization: Enterprises and industry associations should promote the standardization of digital transformation, including the establishment of technical standards, data security standards, and management norms within the industry, to reduce uncertainty and risk during the transformation process. Standardization facilitates cooperation and resource integration between enterprises, raising the overall level of digitalization in the industry.

Build a digital service ecosystem: The market should promote the construction of a digital service ecosystem centered on digital services, including IT service providers, consulting firms, software developers, etc., to provide enterprises with one-stop digital solutions. Especially in the transformation process of small and medium-sized enterprises, a market-oriented service system can effectively lower the technological threshold.

Strengthen technological innovation drive: Market entities should increase investment in technological innovation, especially in cutting-edge technology fields such as big data, artificial intelligence, and the Internet of Things, to build competitiveness centered on technological innovation. Through market mechanisms that incentivize innovation, enterprises can lead the industry in digital transformation.

6.2.3 Enterprise Level.

Develop long-term strategic planning: Enterprises should adopt a long-term perspective and develop detailed digital transformation strategic plans, clearly defining the phased goals and implementation paths of the transformation. Avoiding short-termism, they should ensure that digital transformation aligns with the overall strategy of the enterprise and considers synergies among various business units.

Optimize internal management structure: Digital transformation is not just a technological change but also an innovation in management models. Enterprises should timely adjust their internal management structures, enhancing the ability of different departments to work collaboratively and ensuring the smooth progress of digital transformation within the organization. Special attention should be paid to managing information flow to ensure that employees at all levels understand and implement digital transformation.

Strengthen digital capability building: Enterprises should increase investment in digital skills training for employees, particularly for middle management and technical personnel, to enhance their leadership and execution in a digital environment. Through internal training, external learning, and talent acquisition, enterprises should build a professional team capable of mastering digital technology.

Focus on customer demand orientation: During digital transformation, enterprises should always focus on customer needs, tightly integrating digital technology with customer service, and enhancing customer experience and satisfaction through digital means. For example, using big data to analyze customer behavior, optimize products and services, and provide more personalized solutions.

Pay attention to data security and privacy protection: Enterprises should highly value data security and privacy protection during digital transformation, establishing sound data management systems to prevent data breaches and misuse. Ensuring that enterprises can effectively utilize data while protecting the interests of customers and the enterprises themselves in digital operations.

By implementing the above policies and measures, the digital transformation process of enterprises in the Southwest region can be effectively promoted, enhancing their competitiveness in the market and fostering high-quality regional economic development.

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