International Journal for Housing Science and Its Applications
Publish August 10, 2025. Volume 46, Issue 4 Pages 5019-5029

https://doi.org/10.70517/ijhsa464345

Linear Regression Modeling and Path Optimization for Enterprise Financial Digital Transformation from a Mathematical Economics Perspective

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Abstract The current global economy is undergoing a profound digitalization change, and traditional enterprises are facing unprecedented transformation pressure. As the core link of enterprise operation, the degree of digitalization of financial management directly affects the competitiveness and sustainable development ability of enterprises. Based on the TOE framework and resource-based theory, this study constructed a linear regression model for the digital transformation of enterprise financial management, collected 235 valid sample data by questionnaire survey method, and explored the transformation influencing factors and path optimization strategies by using multivariate linear regression analysis and fuzzy set qualitative comparative analysis (fsQCA). The study found that the standardized regression coefficients of digital skills training on resource utilization ability, technological innovation ability and information integration ability were 0.2515, 0.4823 and 0.4289, respectively, and the influence coefficients of government policy guidance on the three dimensions were 0.3347, 0.3398 and 0.0528, with the overall solution consistency reaching 0.9512 and the overall solution coverage being 0.7388.The results indicate that technical factors, organizational factors and environmental factors have a significant positive impact on the digital transformation of enterprise financial management, in which digital skills training and government policy guidance play a key role. The study provides differentiated digital transformation strategies for different types of enterprises by constructing group paths, which effectively improves the success rate and effect of transformation.

Index Terms Digital transformation, financial management, linear regression, fsQCA, technical factors, government policy guidance

I. Introduction

In the era of digital economy, big data technology and artificial intelligence show a high-speed development trend, the traditional financial management model has been unable to adapt to the current business needs and market environment [1], [2]. Therefore, the transformation of financial management is imminent, and diversification and digitalization have become the main development direction of financial management [3]. Based on this, the digital economy and the digitalization of financial management as an entry point to explore the importance of the digital transformation of enterprise finance and the difficulties of the digital transformation of finance, and put forward the corresponding transformation path, in order to provide ideas and references for the digital transformation of enterprise finance [4]-[7].

Enterprise financial digital transformation is a key strategy in the deepening reform of enterprises. Through the scientific integrated planning of financial digital transformation, optimize the organizational structure of corporate finance, comprehensively promote the digital transformation of finance, so as to effectively improve the level of corporate finance services [8]-[10]. At the same time, digital intelligence technology to drive financial innovation, for the integration of industry and finance to provide technical support for collaborative optimization, digital intelligence technology involved in financial forecasting, analysis and decision-making will be efficient to complete many enterprise operations [11]-[13]. However, from the current financial digital transformation practice effect of many enterprises, there is a general problem of unclear strategic objectives of digital transformation, financial digital management model is not perfect, the financial organizational structure is not comprehensive, and can not meet the requirements of the digital transformation of enterprise finance in the era of digital economy [14]-[17]. Therefore, how to follow the trend of the digital economy to grasp the opportunity of digital transformation, and promote the digital transformation of financial management is of great practical significance.

This study first constructs a theoretical model of digital transformation of enterprise financial management based on the TOE theoretical framework and resource-based theory, divides the influencing factors into three dimensions: technology, organization, and environment, and applies multiple linear regression to verify the influence mechanism of each dimensional factor on transformation performance. Secondly, the fuzzy set qualitative comparative analysis method is used to explore the transformation path under different combinations of factors in depth, identify the optimal grouping scheme applicable to different types of enterprises, and provide scientific basis for enterprises to formulate personalized digital transformation strategies.

II. Digital transformation model of enterprise financial management based on linear regression

II. A. Study on critical success factors for enterprise technology factors

II. A. 1) Success factor dimensioning and hypothesis formulation

The theoretical framework on which this part of the dimensional division is based is the TOE framework, which combines the TOE framework with the resource base theory and the organizational system theory to avoid the lack of explanatory strength of a single model and to make the factors covered by the model more comprehensive and accurate. According to the TOE framework, this paper divides the 13 success factors into three dimensions: technical factors, organizational factors and environmental factors, and puts forward hypotheses. The details are elaborated as follows:

(1) The physical capital mentioned in the resource-based theory of technical factors includes factors such as infrastructure and technological innovation, and the human capital includes factors such as the comprehensive quality of employees. In this paper, the three factors of "IT infrastructure, technological innovation and digital skills training" are categorized under the dimension of technological factors. The proposed hypothesis H1: technology factors have a positive effect on the overall performance of the enterprise technology factors.

(2) Organizational factors

As mentioned in the resource base theory, executives, employees and specialized resources are important human capitals of enterprises, while organizational structure is an important organizational capital of enterprises. The success factors related to the dimension of organizational factors in this study are "flat organizational structure, digital strategic thinking of top executives, technical factors responsibility assignment and appraisal, active participation of employees, technical factors project team and specialized resources". Hypothesis H2: Organizational factors have a positive contribution to the overall performance of corporate technology factors is proposed.

(3) Environmental factors

Government policy guidance and financial support can provide protection for technology factors, the demonstration guidelines of benchmark enterprises in the industry can provide successful transformation experience, and the technology factor practices of enterprises upstream and downstream of the industrial chain will also guide the transformation strategy of enterprises. The success factors related to the dimension of environmental factors in this study are: government policy guidance, government financial support, the traction of upstream and downstream enterprises in the industry chain, and the demonstration guidance of benchmark enterprises in the industry. And hypothesis H3: environmental factors have a positive contribution to the comprehensive performance of enterprise technology factors.

II. A. 2) Research Model on Critical Success Factors for Enterprise Technology Factors

Taking the resource base theory and organizational system theory as the theoretical basis and the TOE framework as the theoretical framework, the 13 success factors are divided into three dimensions: technical factors, organizational factors and environmental factors, and three hypotheses are targeted. Taking technical factors, organizational factors and environmental factors as independent variables and comprehensive performance of technical factors as dependent variables, the research model of this paper is constructed according to the research hypotheses, and the research model of key success factors of enterprise technical factors is shown in Figure 1.

II. A. 3) Questionnaire design and distribution

The research of this paper involves two questionnaires, questionnaire one is a survey of the practice of technology factors in enterprises, mainly investigating the performance of success factors and transformation performance indicators in enterprises that have carried out the practice of technology factors, and questionnaire two is an expert scoring questionnaire, which is mainly for the purpose of determining the weight of each performance indicator.

Questionnaire design process: this paper is based on the observation indicators of success factors and performance indicators of technology factors, based on the research results of existing scholars, and combined with the relevant recommendations of academic and practical experts, to design two research questionnaires, the specific process is as follows: First, literature research. Summarize the research results at home and abroad to provide reference and theoretical basis for the design of the questionnaire, and form the outline of the questionnaire on this basis. Then, we organize the interviews with the postgraduate supervisors of the college to check the rationality of the observation indexes and form the first draft of the questionnaires. Second, expert review. Invite experts in this field to review the questionnaire, analyze the representativeness and reasonableness of the reference indexes of the question expression, assess the relevance, clarity and conciseness of the questionnaire title, maximize the content validity of the questionnaire, and form the final draft of the questionnaire with reference to the experts' opinions. Third, pre-survey. Through a small-scale distribution of the questionnaire, analyze the final draft of the questionnaire to see if there is any problem of unclear semantics and poor expression, and make modifications according to the results of the analysis, and finally form the official questionnaire.

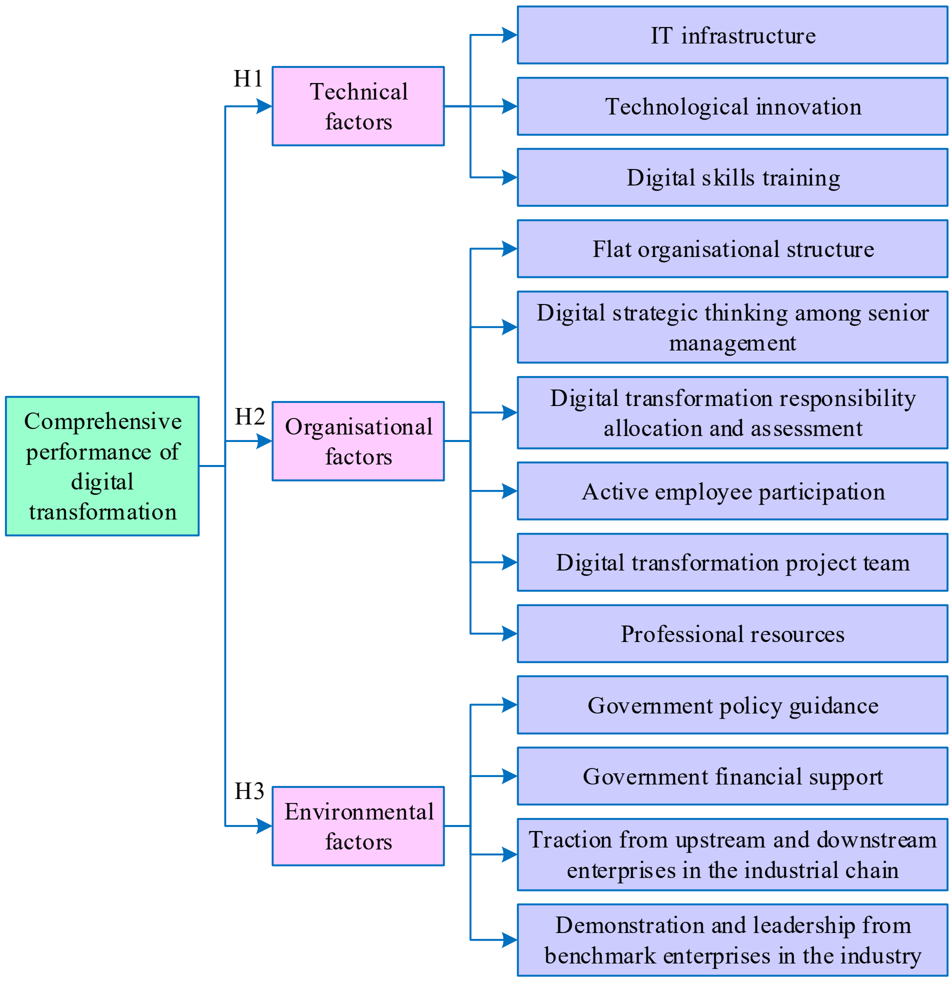

Figure 1: Research model of key success factors of enterprise technical factors

Questionnaire content:

Basic information: mainly involves the individual's position, the nature of the enterprise, the size of the enterprise, the location of the enterprise, the company's current digital applications in the field of investigation of the five question items.

Enterprise technology factor success factor survey items: including 3 items corresponding to 3 factors in the technology factor dimension, 6 items corresponding to 6 factors in the organization factor dimension, and 4 items corresponding to 4 factors in the environment factor dimension, for a total of 13 sub-items. This part of the data is measured using a five-level Likert scale method and scored according to the degree of recognition of the respondents, where 1 indicates the lowest degree of recognition of your company's performance on this indicator, and then increasing step by step, with 5 indicating the highest degree of recognition.

Technical factors performance survey questions: financial dimension includes 3 questions, customer dimension includes 3 questions, internal process dimension includes 3 questions, learning and growth dimension includes 3 questions, a total of 12 sub-items. The scoring method is the same as above.

Questionnaire Distribution and Recovery: A total of 250 questionnaires were distributed in this research, and all of them were recovered, excluding the samples that were obviously filled in randomly, did not pass the screening questions and had missing values, and finally got 235 valid questionnaires, with a valid questionnaire recovery rate of 94%.

II. B.Classical linear regression model and its assumptions

A regression model is a special type of mathematical regression model that determines the correlation between variables and allows for purposeful prediction of a variable. The simplest form of these models is the univariate linear regression model. However, when portraying the data and establishing the relationship between the variables, it is found that the change of the dependent variable is affected by many factors, so in order to portray the comprehensiveness of the information and the accuracy of the model, it is necessary to establish a multiple linear regression model for the data [18].

The specific expressions are as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \mu \tag{1}$$

where β_0 is called the constant term; $\beta_1, \beta_2, \cdots, \beta_k$ are called the regression coefficients; y is the random dependent variable; $x_1, x_2, \cdots, x_k$ are the non-random independent variables; and μ is called the random error term.

If n observations are made on y and x and n sets of observations y_i , $x_{i1}, \cdots, x_{ik} (i = 1, 2, \cdots, n)$ are obtained, then they are related as follows:

$$y_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_k x_{ik} + \mu_i \tag{2}$$

Introducing matrix notation, notation:

$$y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}, \quad X = \begin{bmatrix} 1 & x_{11} & \cdots & x_{1k} \\ 1 & x_{21} & \cdots & x_{2k} \\ \vdots & \vdots & & \vdots \\ 1 & x_{n1} & \cdots & x_{nk} \end{bmatrix}, \quad \beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_k \end{bmatrix}, \quad \mu = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix} \tag{3}$$

Then model (3) can be written in the following form:

$$Y = X\beta + \mu \tag{4}$$

where Y is the $n \times 1$ observation vector; X is the $n \times (k+1)$ known design matrix; μ is the $n \times 1$ random error term, and β is the $(k+1) \times 1$ unknown parameter vector.

The classical assumptions of the linear regression model are as follows:

(1) The random error term μ_i is a random variable with an expected value or mean of 0 that satisfies the unbiasedness assumption:

$$E(\mu_i) = 0, (i = 1, 2, \cdots, n) \tag{5}$$

(2) The random error term has the same variance for all observations of the explanatory variables, satisfying the homogeneity assumption:

$$\text{var}(\mu_i) = \sigma^2, i = 1, 2, \cdots, n \tag{6}$$

(3) The random error terms are uncorrelated with each other:

$$\text{cov}(\mu_i, \mu_j) = E(\mu_i \mu_j) = \begin{cases} \sigma^2, i = j \\ 0, i \neq j \end{cases} \left(i, j = 1, 2, \cdots, n\right) \tag{7}$$

This condition is called the Gauss-Markov condition.

(4) The explanatory variables do not have the property of randomness and are uncorrelated with the random error term:

$$\mathrm{cov}(x_{ij},\mu_j)=0,(i=1,2,\cdots,k,j=1,2,\cdots,n) \tag{8}$$

(5) The explanatory variables do not have a perfectly linear relationship with each other. In mathematical language, the matrix of sample observations of the explanatory variables is full rank:

$$\mu_i \sim N(0,\sigma^2) \tag{9}$$

(6) The random error term obeys normal distribution, which ensures the validity of the F test and t test. Under these conditions, valid results of regression coefficients and σ^2 estimation can be obtained, the significance of the explanatory variables in the regression model as well as the model as a whole can be obtained, and the correct estimation of prediction intervals can be obtained.

II. C.Research Methodology for Differentiating Digital Transformation Enhancement Paths

II. C. 1) Qualitative comparative analysis of fuzzy sets

Fuzzy sets [19] Qualitative Comparative Analysis belongs to a class of qualitative comparative analysis methods, Qualitative Comparative Analysis (QCA) is a systematic comparison method. QCA is divided into three main categories: clear set qualitative comparative analysis, multi-valued qualitative comparative analysis, and fuzzy set qualitative comparative analysis. csQCA is the most widely used QCA method, the core of which is binary, and the prerequisite for its use is that the antecedent variables of the study can be clearly classified as 0 and 1, and the construction of dichotomous data tables, which are easier to operate. However, the use of dichotomous methods for the antecedent and dependent variables strongly reduces the richness of the data, and the inclusion of a large number of "logical residuals" masks the potential differences between them, generating a high number of contradictory groupings. mvQCA, on the other hand, allows for multiple-valued variables, with the scale starting at value [0], and then proceeding to assign values according to the data of the case, csQCA The dichotomous variables in csQCA become specific subtypes of the mvQCA independent variables. Also, mvQCA is stricter in minimization principle than csQCA, in which the same condition is produced as long as only one of the two expressions is different. In this study, because the importance of each influencing factor of the quality of education for international students cannot be dichotomized, and because fsQCA retains the advantages of truth table analysis in dealing with qualitative data, limited diversity, and simplified grouping by converting fuzzy sets of data into truth tables, which makes fsQCA have the dual attributes of qualitative and quantitative analysis, we chose to use fuzzy sets qualitative in this study comparative analysis.

II. C. 2) Procedure for the qualitative comparative analysis of fuzzy sets

The fuzzy set qualitative comparative analysis method is consistent with the operational steps of the other two types of qualitative comparative analysis, which are shown in Figure 2 and basically consist of seven steps.

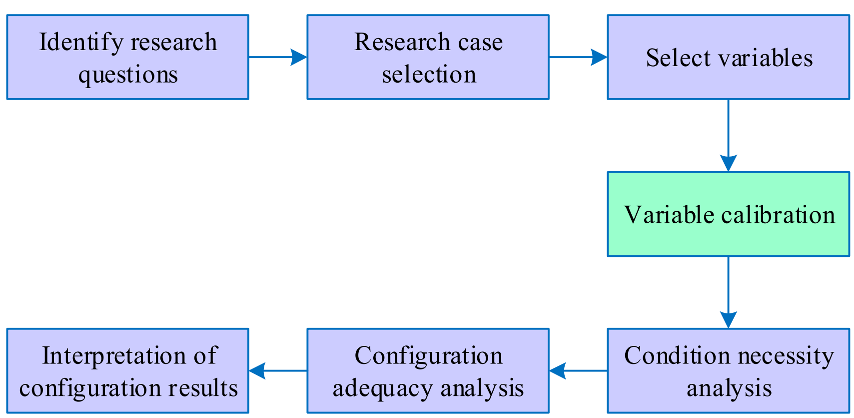

Figure 2: The operation procedure of qualitative comparison analysis

III. The application effect and optimization path of digital transformation of enterprise financial management

III. A. Study of the factors influencing the technological factors of enterprises

III. A. 1) Descriptive statistical analysis of the sample

The main body of survey respondents are small and micro-manufacturing enterprises represented by the textile industry. The basic situation is as follows: the number of enterprises "<30, 30~45, 45~60, >60", accounting for 55.36%, 40.47%, 3.02% and 1.15% respectively. The production and operation status of enterprises, annual turnover "<2.5 million, 2.5~6 million, 6~10 million, >10 million", the sample distribution in the "less than 6 million" more. The synthesis shows that the sample of this study belongs to small and micro-manufacturing enterprises in terms of enterprise size, without significant deviation. Most of the enterprises have a short operating time, reflecting the poor survival conditions and high development difficulties of micro and small enterprises, confirming the necessity of strengthening the survivability of micro and small enterprises through the digital transformation factors of enterprise financial management.

The results of the descriptive statistical analysis of the variables are shown in Table 1. The mean value of each research variable is greater than 3.5 points, indicating that the respondents have some perception of environmental factors, organizational factors and technological factors. According to the standard deviation and variance of the variables, it can be seen that the sample data fluctuate less.

Table 1: Descriptive statistical analysis of variables

Primary indicator	Secondary indicator	Mean value	Standard deviation	Variance
A:Environmental factor	A1:IT infrastructure	3.93	1.6067	1.5848
	A2:Technical innovation	3.64	1.2584	1.6199
	A3:Digital skill training	3.85	1.4633	1.6027
B:Organizational factor	B1:Flat structure	3.57	1.3031	1.614
	B2:Digital strategic thinking of senior managers	4.11	1.3022	1.5897
	B3:The allocation and evaluation of digital transformation responsibility	3.71	1.3183	1.6076
	B4:Active participation of employees	3.92	1.1305	1.6053
	B5:Digital transformation project team	3.79	1.4133	1.5855
	B6:Specialized resources	3.82	1.2355	1.5804
C:Technical factor	C1:Government policy guidance	3.76	1.6199	1.6163
	C2:Government financial support	3.76	1.0501	1.6223
	C3:The traction of the upstream and downstream enterprises in the industrial chain	3.78	1.3089	1.6062
	C4:Demonstration leading by industry benchmarking	3.61	1.2017	1.6006

III. A. 2) Questionnaire Reliability and Validity Tests

The collected data were analyzed for reliability and validity through SPSS software to prove the reasonableness of the questionnaire.

(1) Questionnaire reliability test

Reliability analysis is commonly used to verify the Cronbach coefficient. It is calculated that the overall reliability coefficient value of the data is 0.9527, which is greater than 0.9, indicating that the research data are generally credible. The alpha value of each variable is greater than 0.85, so the internal consistency of the scale is good.

(2) Questionnaire validity test

Validity analysis was verified using KMO and Bartlett test values. The KMO value of the sample data is 0.9608 is greater than 0.9, the overall validity is good; the measurement KMO value of each category is greater than 0.85, which is in line with the requirements; the approximate chi-square value is large and the significance is less than 0.005, which proves that there is a correlation between the factors and the validity of the sample data is good.

In order to verify the structural relationship between the indicators and the factors of the study, AMOS software was applied to conduct validation factor analysis on each of the four categories of the study. As a whole, it was shown that each of the measurement items of environmental, organizational and technological factors presented a significance at the 0.5% level ($p<0.005$), and the values of the standardized loading coefficients were greater than 0.8, thus indicating that overall, there was good validity of the aggregation between the factors and the measurement items.

III. B. Model correlation test and regression result analysis

(1) Correlation test

The purpose of the correlation test is to initially explore whether there is some kind of correlation between the variables, and establish a regression model on the basis of verifying the correlation, and the correlation coefficients of the research variables are shown in Table 2. According to the results of correlation analysis, it can be seen that the correlation coefficients between digital skills training, specialized resources, technological innovation, active participation of employees, technical factors project team, government financial support, government policy guidance, the traction of enterprises upstream and downstream of the industrial chain, the demonstration and leadership of the industry benchmark enterprises and the technical factors of the enterprise show a significant correlation.

Table 2: The correlation coefficient of the study variable

Variable	A1	A2	A3	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4
A1	1												
A2	0.536	1											
A3	0.744	0.592	1										
B1	0.585	0.593	0.611	1									
B2	0.481	0.585	0.599	0.594	1								
B3	0.549	0.578	0.581	0.679	0.667	1							
B4	0.613	0.606	0.596	0.602	0.5	0.332	1						
B5	0.641	0.589	0.723	0.519	0.554	0.335	0.665	1					
B6	0.6	0.619	0.602	0.522	0.601	0.727	0.503	0.644	1				
C1	0.619	0.575	0.586	0.696	0.604	0.669	0.711	0.716	0.534	1			
C2	0.257	0.586	0.598	0.775	0.789	0.48	0.38	0.683	0.667	0.577	1		
C3	0.523	0.591	0.594	0.509	0.713	0.681	0.374	0.401	0.587	0.819	0.518	1	
C4	0.555	0.61	0.568	0.629	0.415	0.384	0.559	0.649	0.717	0.482	0.446	0.665	1

(2) Regression analysis

On the basis of correlation analysis, regression analysis is applied to verify the relationship between individual variables. Regression analysis is a method to study the degree of influence of changes in one or several variables on the changes in another variable, which can be used to verify whether all the independent variables can explain the dependent variable, while multiple covariance will affect the results of regression analysis.

a) Regression Analysis of Environmental Factors and Digital Transformation of Enterprises

Based on the assumptions in the previous section, the regression analysis is carried out with the four dimensions of environmental factors (C) as independent variables and the three indicators of technological factors as dependent variables, and the results of the regression analysis of environmental factors and enterprise digital transformation (D) are shown in Table 3. As can be seen from the table, the standardized regression coefficients of government policy guidance on resource utilization ability (D1), technological innovation ability (D2) and information integration ability (D3) are 0.3347, 0.3398 and 0.0528 ($p < 0.01$) respectively; the standardized regression coefficient of government financial support on technological innovation ability is -0.0061, indicating that there is a significant negative correlation between them. The traction of upstream and downstream enterprises in the industrial chain and the demonstration leadership of industry benchmark enterprises have an obvious positive correlation between resource utilization ability and enterprise digital transformation, and their correlation coefficients are all > 0. From this, it can be concluded that the four factors of the environmental factors have a positive influence on enterprise digital transformation, in which the government's financial support, the traction of upstream and downstream enterprises in the industrial chain and the demonstration leadership of industry benchmark enterprises lead the enterprise digital transformation of the Resource utilization ability, technological innovation ability and information integration ability have a significant positive impact; government financial support has a significant negative impact on the technological innovation ability of enterprise digital transformation.

Table 3: The regression analysis of environmental factors and digital transformation

Environmental factor		D1			D2			D3		
		F	Sig.	Beta	F	Sig.	Beta	F	Sig.	Beta
C	C1	55.089	0	0.3347	39.029	0	0.3398	73.152	0	0.0528
	C2			0.3178			-0.0061			0.044
	C3			0.2179			0.3448			0.3264
	C4			0.2248			0.2504			0.3447

b) Regression analysis of organizational factors and enterprise digital transformation

Based on the assumptions in the previous section, regression analysis is conducted separately with six factors of organizational factors (B) as independent variables and three indicators of enterprise digital transformation (D) as dependent variables, and the results of regression analysis of organizational dimensions and enterprise digital transformation dimensions are shown in Table 4. As can be seen from the table, the standardized regression coefficients of flat organizational structure on resource utilization ability (D1), technological innovation ability (D2), and information fusion ability (D3) are -0.2046, -0.3125, and -0.1512, respectively, which show an obvious negative correlation ($p < 0.01$). The remaining five organizational factors and the three indicators of enterprise digital transformation show positive correlations, and their standardized regression coefficients are all greater than 0.1. It can be concluded that, except for flat organizational structure, the other indicators of organizational factors have a positive impact on the enterprise's enterprise digital transformation.

Table 4: The regression results of organizational dimension and digital transformation

Environmental factor		D1			D2			D3		
		F	Sig.	Beta	F	Sig.	Beta	F	Sig.	Beta
B	B1	72.036	0	-0.2046	49.525	0	-0.3125	52.307	0	-0.1512
	B2			0.3046			0.3079			0.3621
	B3			0.188			0.3168			0.3572
	B4			0.3007			0.2945			0.363
	B5			0.2774			0.3041			0.36
	B6			0.3108			0.3071			0.3565

3) Regression analysis of technology factors and enterprise digital transformation

Based on the assumptions in the previous section, regression analyses were conducted separately with the three factors of technology factors (A) as independent variables and the three indicators of enterprise digital transformation as dependent variables. The results of the regression analysis of technology dimensions and enterprise digital transformation dimensions are shown in Table 5. It can be obtained that the standardized regression coefficients of IT infrastructure on resource utilization ability and information fusion ability are 0.1754 and 0.1406 ($p < 0.01$); the standardized regression coefficient of technological innovation on information fusion ability is 0.3321 ($p < 0.01$); and the standardized regression coefficients of digital skills training on resource utilization ability, technological innovation ability, and information fusion ability are respectively 0.2515, 0.4823 and 0.4289 ($p < 0.01$). As a result, IT infrastructure has a positive effect on resource utilization ability and information integration ability; technological innovation has a significant positive effect on information integration ability; digital skills training has a positive effect on enterprise digital transformation, and has a significant positive effect on all three factors of enterprise digital transformation.

Table 5: The regression analysis of technical dimension and digital transformation

Environmental factor			D1			D2			D3		
			F	Sig.	Beta	F	Sig.	Beta	F	Sig.	Beta
A	A1		33.943	0	0.1754	32.556	0	0.0157	45.728	0	0.1406
	A2				0.0484			0.0026			0.3321
	A3				0.2515			0.4823			0.4289

III. C. Optimization Analysis of Enterprise Digital Transformation Path Based on fsQCA

III. C. 1) Variable calibration

In this paper, the 95%, 50% and 5% quantile values were used to determine “fully affiliated”, “intersection” and “not affiliated at all”, and the variables were calibrated by the Calibrate function in the fsQCA software. The variables were calibrated by the Calibrate function in fsQCA software, and the variable descriptions and calibration results are shown in Table 6. The results show that the degree of full affiliation of the first-level variables is greater than 0.45, the intersection point is between 4.2927 and 4.6344, and the value of full unaffiliated only fluctuates around 1.

Table 6: Description and calibration of variables

Variable	Full membership	Crossing point	Completely unaffiliated
A:Environmental factor	4.7115	4.2927	1.0503
B:Organizational factor	4.6596	4.6344	1.0829
C:Technical factor	4.6596	4.6344	1.0829

III. C. 2) Single-factor necessity analysis

The results of the necessary conditions analysis are shown in Table 7. The results show that the consistency values of the five antecedent variables of “technological innovation, digital skills training, digital transformation responsibility allocation and assessment, active participation of employees and government financial support” range from 0.9088 to 0.9654, which is greater than 0.9; in high digital transformation, the coverage rate of digital strategic thinking of top managers, specialized In high digital transformation, the coverage rates of top management's digital strategic thinking, specialized resources, government financial support and the traction of upstream and downstream enterprises in the industrial chain range from 0.9204 to 0.9887; This shows that these indicators are necessary for the digital transformation of enterprise financial management. In low digital transformation, only the consistency of digital skills training and the traction of upstream and downstream enterprises in the industry chain have coverage values greater than 0.9, and the rest of the indicators are below 0.9, which further reflects that the complexity of digital transformation of enterprise financial management is the result of the synergistic drive of multiple factors.

Table 7: The results of the necessary conditions are analyzed

Conditional variable	High digital transformation		Low digital transformation	
	Consistency	Coverage	Consistency	Coverage
A1:IT infrastructure	0.8217	0.6866	0.7991	0.8066
A2:Technical innovation	0.9088	0.7311	0.6433	0.6469
A3:Digital skill training	0.9214	0.8888	0.9327	0.8347
B1:Flat structure	0.8537	0.5591	0.6354	0.6473
B2:Digital strategic thinking of senior managers	0.8157	0.9798	0.8178	0.569
B3:The allocation and evaluation of digital transformation responsibility	0.4889	0.8085	0.7762	0.8852
B4:Active participation of employees	0.9654	0.7442	0.8495	0.837
B5:Digital transformation project team	0.9128	0.6842	0.9086	0.8924
B6:Specialized resources	0.5532	0.9468	0.8173	0.3537
C1:Government policy guidance	0.8778	0.6808	1.0997	0.7403
C2:Government financial support	0.9193	0.9204	0.6824	0.6929
C3:The traction of the upstream and downstream enterprises in the industrial chain	0.4658	0.9887	0.7155	0.9088
C4:Demonstration leading by industry benchmarking	0.7385	0.5761	0.8282	0.6052

III. C. 3) Analysis of group effects of technological factors

This study draws on the method of Du Yunzhou and Jia Liangding to analyze the group effect and get the final group effect results. The group effect analysis results of the digital transformation of enterprise financial management are shown in Table 8, where ● is the existence of the core condition, ◎ is the existence of the edge condition, ⊗ indicates that the core condition is absent, ⓧ indicates that the edge condition is absent, and blank indicates that the condition may or may not exist. exist or not exist. As a whole, the overall solution consistency is 0.9512 and the overall solution coverage is 0.7388, indicating that these five groupings are sufficient conditions for generating high technology factors. Following this, the following conclusions are obtained:

(1) Grouping pattern H1: Digital technology exists as a core condition and trial-and-error learning exists as a peripheral condition. This grouping is suitable for specialized and new enterprises with strong capital, high level of their own R&D, and large production scale.

(2) Formation H2: Acquisitive learning exists as a core condition, and digital technology input exists as a marginal condition. This configuration applies to specialized, special and new enterprises that do not have regional advantages and have limited innovation ability of their own, and have certain financial advantages.

(3) Group H3: digital technology exists as the core condition and institutional support exists as the marginal condition. This configuration applies to specialized, special and new enterprises with strong capital, strong local government support and large production scale.

(4) Formation H4: Trial-and-error learning exists as a core condition, and digital technology input and institutional support exist as marginal conditions. This organization applies to specialized, special and new enterprises with strong self-innovation ability, certain financial advantages and strong government support.

(5) Formation H5: Acquired learning exists as the core condition, and digital technology application and institutional support exist as the marginal condition. This configuration is applicable to specialized, special and new enterprises with limited innovation ability but abundant social resources and strong government support.

Table 8: The results of the digital transformation of the configuration analysis

Conditional variable	Corporate financial management digital transformation				
	Group h1	Group h2	Group h3	Group h4	Group h5
A:Environmental factor	●	◎	●	◎	⊗
B:Organizational factor	●		●	⊗	◎
C:Technical factor		●	⊗		●
Consistency	0.9714	0.9346	0.9493	0.9912	0.9835
Original coverage	0.4166	0.2781	0.4194	0.3835	0.2573
Unique coverage	0.0373	0.0113	0.0329	0.1088	0.0042
Consistency of general solutions	0.9512				
The coverage of the general solution	0.7388				

IV. Conclusion

This study analyzes the influence mechanism and realization path of digital transformation of enterprise financial management by constructing a multiple linear regression model and using the fuzzy set qualitative comparative analysis method.

The analysis results show that the overall reliability coefficient value of the data reaches 0.9527 and the KMO value is 0.9608, indicating that the research data has good reliability and validity. Technical factors, organizational factors and environmental factors all have a significant positive impact on the digital transformation of enterprise financial management, in which digital skills training shows the strongest facilitating effect, and has a positive effect on all three core competence dimensions of enterprise transformation. The influence of government policy guidance is most prominent among the environmental factors, while all elements of the organizational factors except flat organizational structure show positive effects. The study identifies five effective transformation grouping paths based on fsQCA analysis with a coverage rate of 0.7388, which provides targeted transformation programs for enterprises with different resource endowments and development stages.

Enterprises should choose the appropriate grouping mode according to their own actual situation, and systematically promote the digital transformation of financial management by strengthening digital skills training, improving IT infrastructure construction, optimizing organizational and management structure, and actively seeking policy support, so as to enhance the core competitiveness and sustainable development ability of enterprises.

Funding

This work was supported by Supported by the School level Research Project Fund of Xiangsihu College of GuangXi Minzu University (key projects 2024XJKY02).

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