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Exploring Mechanism Innovation and Strategic Transformation of Enterprise Digital Management by Combining Blockchain Technology

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Abstract With the development of Internet technology, enterprises are in urgent need of transformation and upgrading, and blockchain has attracted widespread attention due to its features of decentralization, de-trusting, traceability of historical data, non-tampering, and collective maintenance. The study combines the TOE framework to select relevant variables, constructs a structural equation model of the influencing factors of enterprise blockchain technology application, collects data through questionnaire design and conducts tests, and reveals the main influencing factors of enterprise application of blockchain technology. Taking 50 high-tech enterprises as samples, the relationship between the application of blockchain technology and the level of enterprise digital management is verified through multiple regression analysis, and then the application of blockchain technology to promote the innovation of enterprise digital management mechanism and strategic transformation is summarized. Eight significant influencing factors affecting enterprise application of blockchain technology were obtained ($P < 0.05$), among which the influence of enterprise top management support and network effect is most obvious. There is a significant positive correlation between the application of blockchain technology and the level of enterprise digital management, with a regression coefficient of 0.003. The application of blockchain technology can improve the efficiency of enterprise management, safeguard the security of enterprise data and accurately determine responsibility, thus helping the innovation of management mechanism and transformation and upgrading of enterprises.

Index Terms structural equation modeling, multiple regression analysis, correlation analysis, digitalization, blockchain technology

I. Introduction

In the era of economic globalization and knowledge economy explosion, the domestic and international economic pattern and market competition have changed dramatically, and the use of new technologies, discovery of new tracks, and upgrading of enterprise digitization have become the necessary capabilities for sustainable development of enterprises [1], [3]. The five elements of time, quality, cost, service and speed have become the main symbols to measure the overall level and competitiveness of enterprises. In order to occupy the leading edge, enterprises in various countries have long recognized the importance of mastering the "cloud, mobile, big and smart" high-tech, and have carried out digital transformation to improve the competitiveness of enterprises [4], [6]. Among them, the combination of blockchain technology and big data technology, as well as the application and promotion has been sought after by enterprises in various countries. Blockchain technology, with its unique decentralization, security and transparency, provides strong support for enterprise digital transformation. Through blockchain technology, enterprises can realize the secure storage and transmission of data, ensuring the authenticity and trustworthiness of data. This feature is especially important in the data-driven business environment, which can help enterprises establish a solid foundation of trust, thus promoting the rapid development of business [7], [9]. The foundation of enterprise digital transformation is data, and mastering the value chain data, analyzing the meaning behind the data, mining the value of the data, and realizing the precision of customer service is one of the main goals of enterprise digital transformation. Blockchain distributed ledger, asymmetric encryption, anti-tampering and forgery, openness and transparency and other technical features can help enterprises to realize the technical level upgrade of the whole process of data authentication, storage and application. Blockchain is not an all-powerful technology, and combining with the existing technology and actively carrying out the technical layout can significantly improve the application efficiency of the technology landing, and truly realize the upgrading mode of combining high-tech and enterprise digital transformation [10], [11].

Literature [12] proposes a process model consisting of nine microfoundations to reveal the general emergent factors that trigger, enable, and impede the building of dynamic capabilities for digital transformation. The results suggest that digital transformation is an ongoing process of using new digital technologies in everyday organizational life, which views agility as a core mechanism for updating organizational business models, collaboration methods, and cultural strategies. Literature [13] establishes a link between digital transformation, firms and supply chain capabilities based on blockchain technology and accordingly proposes a model to unlock the utility of blockchain technology in the supply chain. The study documented BCT insights, categorized contemporary facts and provided strategic guidance for companies to implement BCT. Literature [14] study examined the impact of trust on citizens' decision-making behavior towards blockchain cryptocurrencies. It concluded that "the internet is at the heart of data transfer, but blockchain is at the heart of value transfer" Therefore, ethical issues and trust in crypto will ensure easy adaptation globally, especially in Africa. Literature [15] describes how blockchain can play a key role by providing a trusted record when moving and switching products in the supply chain. Blockchain itself is not a panacea for making the industry more sustainable. What it can do is provide a platform where the industry can build trust through transparency. Literature [16] summarizes that emerging technologies such as IoT and blockchain have influenced digital transformation. A conceptual model is proposed to identify the key factors influencing the adoption of blockchain for IoT. The model can play an important role in the development of strategies, standards and performance evaluation. Literature [17] describes a blockchain oriented deployment framework,which proves to be able to guide the formation and embedding of watermarks, accurately detect and locate integrity corruptions, and recover intact authenticated data even after a certain degree of tampering, which plays a vital role in the digital transformation of buildings. Literature [18] aims to identify and point out the key social perspectives related to the development of digital business models in railroad companies. The methodology also reveals the important process of business model socialization, which is conceptualized and operationalized through the evolution of social factors based on digital transformation.

Based on the TOE framework, the study selects the influencing factors of enterprise blockchain technology application from the three dimensions of technology, organization and environment, and at the same time puts forward research hypotheses and completes the construction of structural equation model. A questionnaire survey is used to collect data, and the questionnaires are distributed and collected from employees and managers who are directly or indirectly learning or using blockchain technology in enterprises and organizations. After the fit assessment and fitness test of the measurement model, the path coefficients and significance test results of the model are calculated to test the research hypotheses of this paper and explore the main influencing factors of enterprise blockchain technology application. Subsequently, with enterprise digital management level as the explanatory variable and blockchain technology application as the explanatory variable, after collecting variable data from 50 high-tech enterprises, the impact of blockchain technology application on enterprise digital management level is investigated through correlation analysis, model regression analysis and robustness test. Finally, in combination with blockchain technology, its application in the innovation of enterprise digital management mechanism and strategic transformation is analyzed.

II. Study of Factors Influencing the Application of Blockchain Technology by Enterprises

A. Structural Equation Modeling

Structural Equation Modeling (SEM) is a method that can be used to analyze causality by designing, estimating, testing, and evaluating models, and it possesses advantages that other methods do not have. For example, many latent variables that cannot be directly observed are involved in socio-economic research, such as life satisfaction and subjective well-being, etc. Structural equation modeling can well deal with these latent variables, which are beyond the reach of traditional statistical methods. Structural equation modeling consists of three main matrix equations:

$$X = \Lambda_X \xi + \delta, \tag{1}$$

$$Y = \Lambda_Y \eta + \varepsilon, \tag{2}$$

$$\eta = B\eta + F\xi + \zeta. \tag{3}$$

Among them, Eqs. (1) and (2) are measurement models, which mainly describe the relationship between latent variables ξ and η and observed variables X and Y. In the model ξ is the exogenous latent variable, η is the endogenous latent variable, X and Y are their observed variables, Λ_x is the factor loading matrix of x on ξ, Λ_y is the factor loading matrix of y on η, δ is the error term of observed variable x, and ε is the error term of observed variable y.

Equation (3) is the structural model, which is used to describe the relationship between the latent variables, where B represents the relationship between the endogenous latent variables η, F represents the effect of the exogenous latent variables on the endogenous latent variables, and ζ is the residual term, which represents the unexplained part of the model.

Latent variables in the model are variables that are not directly observable and need to be measured by designing appropriate observables. Observed variables, also known as manifest variables, are variables that can be directly observed and measured, and are used as specific observables for the latent variables.

B. Variable Design and Model Construction

TOE theory is applicable to study innovative technology adoption behavior at the firm level and is an open-ended

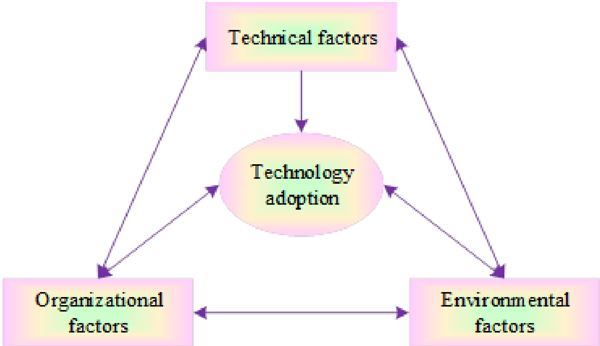

Figure 1: TOE framework model

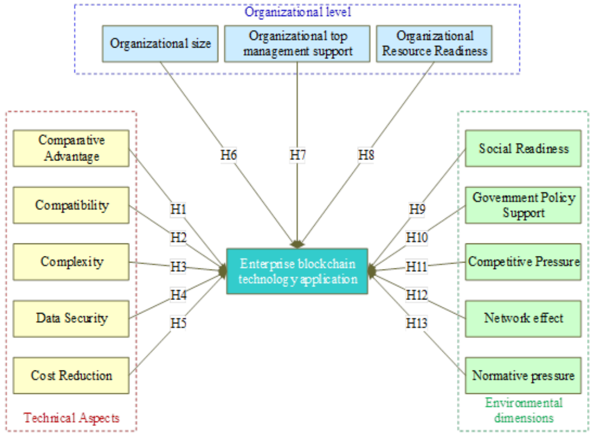

Figure 2: The influence factors model of the application of blockchain technology

framework.The TOE framework model, as shown in Figure 1, distinguishes the influencing factors into three dimensions, i.e., technology, organization and environment. This paper uses the TOE as a framework to construct a research model of influencing factors on the adoption of blockchain technology by companies, forming the measurement variables for this article: relative advantage, compatibility, complexity, data security, cost savings, organizational size, organizational top management support, organizational resource readiness, government policy support, social readiness, competitive pressure, normative pressure, network effect, and blockchain technology adoption. The first 13 are cause variables and the last 1 is an outcome variable.

The model of influencing factors for enterprise application of blockchain technology is shown in Figure 2, where variables are selected and hypotheses are formulated from the three dimensions of technology, organization, and environment, respectively:

H1: Relative advantage positively and significantly influences enterprises' application of blockchain technology.
H2: Compatibility positively and significantly affects the enterprise's application of blockchain technology.
H3: Complexity negatively and significantly affects enterprise adoption of blockchain technology.
H4: Data security positively and significantly affects the adoption of blockchain technology in organizations.
H5: Cost saving positively and significantly influences the adoption of blockchain technology in enterprises.
H6: Organization size significantly influences the adoption of blockchain technology in enterprises.
H7: Top management support of the organization significantly influences the adoption of blockchain technology in the organization.
H8: Resource readiness of the organization positively and significantly influences the adoption of blockchain technology by the firm.
H9: Social readiness negatively and significantly influences the adoption of blockchain technology by the organization.
H10: Government policy support positively and significantly affects enterprise adoption of blockchain technology.
H11: Competitive pressure positively and significantly affects enterprise adoption of blockchain technology.
H12: Network effect positively and significantly affects enterprise adoption of blockchain technology.
H13: Regulatory pressure positively and significantly influences firms' adoption of blockchain technology.

C. Data Collection

The questionnaire design is based on the research hypothesis, and an online questionnaire survey is used, which is targeted at employees and managers who directly or indirectly learn or use blockchain technology in enterprises and organizations nationwide, and the questionnaire is distributed through WeChat groups, QQ groups, and economic and academic forums for learning and using exchanges of blockchain technology. The survey returned 392 questionnaires, of which 361 were valid, with an effective rate of 92.09%, which is a high effective rate.

D. Results of Structural Equation Model Fitting

After the reliability and validity have been tested, the model of factors influencing the application of blockchain technology in enterprises can begin to be fitted and analyzed, the hypotheses can be tested, and finally the results can be interpreted.

1) Model Fit and Fitness Test

After passing the reliability and validity test, the fit of the measurement model was finally evaluated, and the existing studies generally selected three indicators, RMSEA, CFI, and TLI, to evaluate the fit of the model to the data, and in this study, the fit of the measurement model was output according to the Mplus software.

The model fit metrics and results are shown in Table 1. The chi-square value (CMID) is used to test the correlation of data in non-parametric statistics, and the chi-square value in this paper is 1654.153, which is relatively small. The chi-square degrees of freedom ratio (CMID/df) is 1.642, CFI, TLI, and NNFI are all greater than 0.9, the RMSEA value is less than 0.05, and the SRMR value is less than 0.08, which indicates that the model in this paper is well adapted and well fitted. In summary, the research collected data and constructed model match well, the proposed path hypothesis coincides with the actual situation, and the model coefficient results have accuracy and validity.

2) Empirical Results Of Model Assumptions

This part of the argumentative analysis is based on the results of the parameter estimation of the model of influencing factors of enterprise application of blockchain technology, and the results of path coefficients and significance test are shown in Table 2. Among them, the P-value of H2 compatibility, H3 complexity, H5 cost savings, H7 organizational top management support, H8 organizational resource readiness, H10 government policy support, and H12 network effect are all less than 0.05, pass the significance test, and the hypothesis is valid.The P-value of H1 relative advantage, H4 data security, H6 organizational scale, H11 competitive pressure, and H13 normative pressure are all greater than 0.05 and did not pass the significance test, and the hypothesis is not valid.H9 social readiness, although passing the significance test, is inconsistent with the original hypothesis ($0.147 > 0$), and thus also did not pass the test.

The most significant factors influencing blockchain technology are corporate top management support and network effect, with path coefficients both greater than 0.3. The remaining key influencing factors are, in order: cost savings, organizational resource readiness, compatibility, social readiness, government policy support, and complexity.

III. Impact of Blockchain Technology Applications on The Digital Management Of Enterprises

Based on the research on the influencing factors of enterprise application of blockchain technology, this paper uses the multiple regression method to further explore and demonstrate the impact of blockchain technology application on enterprise digital management.

A. Methods of Multiple Regression Analysis

Multivariate statistical analysis studies the statistical regularities of interdependence among multiple variables or multiple factors in an objective matter. It is an important sub-discipline in mathematical statistics. The most commonly used methods of multivariate statistical analysis are: regression analysis, analysis of variance, factor analysis, discriminant analysis, time series analysis, logistic regression, cluster analysis and conjoint analysis.

Regression analysis is an effective tool to study the closeness of the relationship between variables, the structure of the state, and the prediction of the model through the establishment of statistical models.

Let the linear regression model of random variable y and general variable $x_1, x_2, \cdots, x_p$ be:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p \beta_p + \varepsilon, \tag{4}$$

where, $\beta_0, \beta_1, \cdots, \beta_p$ is the $p+1$ unknown parameter, $\beta_1, \cdots, \beta_p$ is called the regression coefficient. y is called the explanatory variable (dependent variable), and $x_1, x_2, \cdots, x_p$ is p a general variable (independent variable) that can be measured precisely. ε is the random error, For a practical problem, if we obtain n sets of data $(x_n, x_{i2}, \cdots, x_{ip}; y_i)$, $i = 1, 2, \cdots, n$, the linear regression model (4) equation can be expressed as:

$$\left.\begin{array}{c} y_1 = \beta_0 + \beta_1 x_{12} + \beta_2 x_{12} + \cdots + \beta_p x_{1p} + \epsilon_1 \\ y_2 = \beta_0 + \beta_1 x_{21} + \beta_2 x_{22} + \cdots + \beta_p x_{2p} + \epsilon_2 \\ \vdots \\ y_n = \beta_0 + \beta_1 x_{n1} + \beta_2 x_{n2} + \cdots + \beta_p x_{np} + \epsilon_n \end{array}\right\} \tag{5}$$

is written in matrix form as:

$$y = X\beta + \varepsilon. \tag{6}$$

Among them:

$$y = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix},$$

$$X = \begin{pmatrix} 1 & x_{11} & x_{12} & \cdots & x_{1p} \\ 1 & x_{21} & x_{22} & \cdots & x_{2p} \\ \vdots & \vdots & \vdots & & \vdots \\ 1 & x_{n1} & x_{n2} & \cdots & x_{np} \end{pmatrix},$$

$$\beta = \begin{pmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_p \end{pmatrix}, \varepsilon = \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{pmatrix}. \tag{7}$$

The regression coefficients according to the least squares method have:

$$\hat{\beta} = (X'X)^{-1} X'y. \tag{8}$$

Then, vector $\hat{y} = X\beta = (\hat{y}_1, \widehat{y_2}, \cdots, \hat{y}_n)'$ is the regression value of the dependent variable vector $y = (y_1, y_2, \cdots, y_n)'$.

In order to facilitate the parameter estimation of the model, there are some basic assumptions on the regression equation (5) as follows:

(1) The independent variable $x_1, x_2, \cdots, x_p$ is a deterministic variable, not a random variable, and is required to be $rank(X) = P + 1 < n$. i.e., the independent variables are uncorrelated with each other and the number of sample sizes should be greater than the number of explanatory variables.

(2) The random error term has zero mean and equal variance, i.e:

$$\left\{ \begin{array}{l} E(\varepsilon_i) = 0, i = 1, 2, \cdots, n \\ cov(\varepsilon_i, \varepsilon_j) = \left\{ \begin{array}{l} \sigma^2, i = j \\ 0, i \neq j \end{array} \right. \quad (i, j = 1, 2, \cdots, n) \end{array} \right. \tag{9}$$

The fitting index	Structural model	Check out	Reference standard
CMID	1654.153	Yes	The smaller the better
CMID/df	1.642	Yes	1$\sim$3
CFI	0.948	Yes	>0.900
TLI	0.916	Yes	>0.900
NNFI	0.935	Yes	>0.900
RMSEA	0.034	Yes	<0.05
SRMR	0.065	Yes	<0.08

Table 1: The fitting index and result of the model

Research hypothesis	Hypothetical content	Path coefficient	P value	Hypothesis test results
H1	Relative advantage–>Block chain application	-0.154	0.672	Not support
H2	Compatibility –>Block chain application	0.156	0.027	Support
H3	Complexity –>Block chain application	-0.114	0.031	Support
H4	Data security –>Block chain application	0.241	0.135	Not support
H5	Cost savings –>Block chain application	0.211	0.015	Support
H6	Organization size –>Block chain application	-0.028	0.205	Not support
H7	High-level management support –>Block chain application	0.312	0.003	Support
H8	Organization resources preparation –>Block chain application	0.164	0.026	Support
H9	Social preparation –>Block chain application	0.147	0.002	Not support
H10	Government policy support –>Block chain application	0.132	0.005	Support
H11	Competitive pressure –>Block chain application	-0.241	0.159	Not support
H12	Network effect –>Block chain application	0.316	0.022	Support
H13	Normative pressure –>Block chain application	-0.059	0.238	Not support

Table 2: Path coefficients and significance test results

It is called the Gauss-Markov condition. $E(\varepsilon_i)=0$, which assumes that there is no systematic error in the observations and that the mean of the random error ε_i is zero. The covariance of the random error term ε_i is zero indicating that the random error term is uncorrelated across sample points and there is no serial correlation.

(3) The random error term, ε, satisfies a normal distribution:

$$\varepsilon \sim N\left(0,\sigma^2\right). \tag{10}$$

Once the linear regression equation is derived, the regression equation must also be tested for significance. This includes the F-test for the significance of the regression equation, the t-test for the significance of the regression coefficients, and the goodness-of-fit test to measure the degree of regression fit.

F Test: The test of significance of the multiple linear regression equation is to see whether the independent variable $x_1, x_2, \cdots, x_p$ has a significant effect on the random variable y as a whole. The original hypothesis is formulated for this purpose:

$$H_0:\beta_1=\beta_2=\cdots=\beta_P=0, \tag{11}$$

if H_0 is accepted, it indicates that the relationship between random variables y and $x_1, x_2, \cdots, x_p$ has a linear regression model representation that is not appropriate. Using the sum of squares decomposition equation there is:

$$\sum_{i=1}^{n}\left(y_i-\bar{y}\right)^2=\sum_{i=1}^{n}\left(\hat{y}_i-\bar{y}\right)^2+\sum_{i=1}^{n}\left(y_i-\widehat{y_i}\right)^2, \tag{12}$$

where $\sum_{i=1}^{n}\left(y_i-\bar{y}\right)^2$ is called the total sum of squares, abbreviated as SST. $\sum_{i=1}^{n}\left(\hat{y}_i-\bar{y}\right)^2$ is called the regression sum of squares, abbreviated as SSR. $\sum_{i=1}^{n}\left(y_i-\hat{y}_i\right)^2$ is called the residual sum of squares, abbreviated as SSE. hence the sum of squares decomposition can be abbreviated as $SST=SSR+SSE$.

Construct F test statistic as follows:

$$F=\frac{SSR/p}{SSE/(n-p-1)}. \tag{13}$$

From the given significance level α, check the F distribution table for the critical value $F_a(p,n-p-1)$.

When $F>F_\alpha(p,n-p-1)$, the original hypothesis H_0 is rejected and it is considered that there is a significant linear relationship between y and $x_1, x_2, \cdots, x_p$ at significance level α, i.e. the regression equation is significant. Conversely, when $F \geq F_a(p,n-p-1)$, the regression equation is considered insignificant.

t Test: In multiple linear regression, the fact that the regression equation is significant does not mean that every independent variable has a significant effect on y. Usually, minor and dispensable variables are eliminated from the regression equation and a simpler regression equation is re-established. So it is necessary to test each variable for significance. If an independent variable x_j is not significant for y, then its coefficient β_j takes the value of zero in the regression model. Therefore testing whether variable x_j is significant is equivalent to testing the hypothesis:

$$H_{0j}:\beta_j=0, j=1,2,\cdots,p, \tag{14}$$

if the original hypothesis H_{0j} is accepted, then x_j is not significant: if the original hypothesis H_{0j} is rejected, then x_j is significant. Due to $\hat{\beta} \sim N\left(\beta,\sigma^2 c_{ij}\right)$, there is $\hat{\beta}_j \sim N\left(\beta_j,\sigma^2 c_{ij}\right)$, from which the t statistic is constructed:

$$t_j=\frac{\hat{\beta}_j}{\sqrt{c_{ij}}\hat{\sigma}} \sim t(n-p-1). \tag{15}$$

Given the level of significance α, find the critical value of the two-sided test $t_{\alpha/2}$. Reject the original hypothesis $H_{0j} : \beta_j = 0$ when $|t| \geq t_{\alpha/2}$ and consider β_j as significantly non-zero and the linear effect of independent variable x_j on dependent variable y as significant. Accept the original hypothesis $H_{0j} : \beta_j = 0$ when $|t_j| < t_{\alpha/2}$, consider β_j to be null and the linear effect of independent variable x_j on dependent variable y is not significant.

Goodness of Fit: Goodness of fit is used to test how well the regression equation fits the sample observations. In multiple linear regression, the sample coefficient of determination is defined as for:

$$R^2 = \frac{SSR}{SST} = 1 - \frac{SSE}{SST}. \tag{16}$$

The value of the sample coefficient of determination R^2 is in the range of $[0, 1]$. The closer R^2 is to 1, the better the regression fit. The closer R^2 is to 0, the worse the regression fit is. Compared with the F test, R^2 can reflect the effect of regression fitting more clearly and intuitively, but it cannot be used as a strict test of significance.

B. Variable Selection and Data Sources

1) Explained Variables

In this paper, digital system application level Y1, business process standardization Y2 and digital organization construction Y3 are selected as the dimensions reflecting the enterprise's digital management level Y.

The digital system application level aims to measure the application level and capability level of digital technology in each link of the value chain within the enterprise by assessing the application of digital systems in R&D, production, marketing, etc., which can reflect the enterprise's ability to master the application of digital systems.

The level of enterprise digital management reflects the adaptability of technology application and business process. Digital system as a technical tool itself is difficult to play a role, and can only release great value if it is truly integrated into the enterprise's business process. The degree of business process standardization is aimed at assessing the construction of the enterprise process system, measuring the cross-sectoral business interface, and the management ability to standardize and quantify workflow.

Digital strategic planning and organizational construction play an important role in the process of carrying out enterprise information management. The digital organization construction situation aims to measure the level of human, financial, and material resources of the enterprise to support digitalization by assessing the formulation and implementation of the enterprise's digital development plan and the construction of basic resources.

2) Explanatory variables

Blockchain application X is used as an explanatory variable. This variable is the interaction term of the event dummy variable Treat and the time dummy variable Time, reflecting the blockchain application of enterprises. There are two main sources of data involving blockchain technology application in the existing literature: first, using python to extract the keywords of the enterprise annual report, if the annual report mentions blockchain-related keywords, it is assumed that the enterprise has applied blockchain. Secondly, the keywords "enterprise name" + "blockchain" are used to conduct a network search, and based on the search results, it is determined whether the enterprise has blockchain application or not. In order to improve the accuracy of the data, this paper combines the two ways to collect data on the application of enterprise blockchain technology.

3) Control variables

The selection of control variables is based on the factors that may have an important impact on the digital management of the enterprise in the process of enterprise operation, including the enterprise's asset structure, operating conditions, corporate governance and so on, all of which will affect the growth and development of the company, therefore, this paper mainly selects the asset-liability ratio Z1, the growth rate of the main business income Z2 and the equity concentration Z3 as the regulating variables.

Based on this, this paper proposes the hypothesis:

H14: Blockchain application has a significant positive correlation with enterprise digital management level.

H15: Blockchain application is significantly positively correlated with the level of digital system application.

H16: Blockchain application has a significant positive correlation with business process standardization.

H17: There is a significant positive correlation between blockchain application and digital organization construction.

In this paper, normal listed high-tech enterprises are selected as the research object, and a total of 50 research samples are finally determined, using the keyword analysis of the text of the annual report of the enterprise on the basis of combining the investor interaction platform, mainstream media reports, white papers, research reports and other channels to collect and collate the data on the application of blockchain technology of the enterprise, and the data on the level of digital management of the enterprise comes from questionnaire surveys.

C. Correlation Analysis

Before carrying out multiple linear regression, the correlation between the variables needs to be tested first to preliminarily predict the positive and negative relationship between the dependent variable and the independent variable, and the correlation test results are shown in Table 3 below. The digital system application level Y1, business process standardization Y2, digital organization construction Y3, enterprise digital management level Y and blockchain application X all show strong significance and are positively correlated, in which the correlation coefficient of enterprise digital management level Y and blockchain application X is 0.565. The research hypotheses have been preliminarily verified, which indicates that it is possible to continue to do the next regression empirical evidence.

Variable	Y	Y1	Y2	Y3	X	Z1	Z2	Z3
Y	1.000							
Y1	0.245***	1.000						
Y2	0.363***	0.487**	1.000					
Y3	0.384***	0.405**	0.599**	1.000				
X	0.565***	0.547***	0.542***	0.477***	1.000			
Z1	-0.062**	-0.028**	-0.013*	0.018**	0.188**	1.000		
Z2	0.044	0.021	0.034	0.691	0.042	0.053	1.000	
Z3	0.051	0.019	0.094	0.027	0.087*	0.209***	0.079	1.000

Table 3: Correlation test results

Variable	VIF	1/VIF
Y	1.27	0.78740
Y1	1.23	0.81301
Y2	1.20	0.83333
Y3	1.31	0.76336
X	1.79	0.55866
Z1	1.64	0.60976
Z2	1.04	0.96154
Z3	1.17	0.85470

Table 4: Multiple common linear test results

In addition, in order to verify the accuracy of the model, this paper utilizes the variance inflation factor, i.e., the VIF value test, to conduct a multicollinearity test to observe whether there is a multicollinearity problem among the variables. Table 4 shows the results of the multicollinearity test. The VIF values of the dependent variables are all below 2 (less than 10), so there is no multicollinearity problem and the multiple regression study can be continued.

D. Model Regression and Analysis

The model regression results of the impact of blockchain technology application on enterprise digital management are shown in Table 5, such as (1) in the case of no control variables and no control year and individual, (2) in the case of control variables but control year and individual, (3) in the case of control variables but not control year and individual, and (4) in the case of control variables and control year and individual effect. Also, in order to eliminate possible heteroskedasticity, this paper adds the heteroskedasticity robustness criterion roboust to the regression to make the test results more robust. ***, ** and * denote significant at 1%, 5% and 10% confidence levels, respectively.

From the results of the four regressions, it can be seen that the relationship between blockchain application X and enterprise digital management level Y all present a high degree of consistency, i.e., blockchain application is significantly positively correlated with enterprise digital management level. In model (2) presents a significant positive correlation at 1% confidence level, and the remaining three regressions are significantly positively correlated at 5% confidence level, the hypothesis of this paper is verified.

The relationship between control variables such as asset-liability ratio Z1, main business revenue growth rate Z2, and equity concentration Z3 and enterprise digital management level Y is basically in line with expectations, and all of them are strongly significant at 5% confidence level interval.

E. Robustness Tests

In order to further verify the credibility of the empirical results, this paper adopts the replacement variable method for the robustness test. The robustness test regression results are shown in Table 6. The test results show that the relationship and significance between the explanatory variables and the explained variables are basically consistent with the regression results presented in the previous paper, all of them are significantly positively correlated at least at the 10% level, and only the regression coefficients have a small change, and the robustness test passes.

IV. Institutional Innovations and Strategic Transformations in Enterprise Digital Management

The application of blockchain technology to enterprise management can help enterprises quickly realize transformation and upgrading, and reduce many problems such as data falsification, inefficiency and information asymmetry caused by human intervention. This paper combines blockchain technology and applies it to the mechanism innovation and strategic transformation of enterprise digital management.

A. Improved Management Efficiency

The traditional enterprise management mode, as shown in Figure 3, adopts a centralized management mode, which leads to the problems of low enterprise management efficiency and high management costs. The enterprise management mode based on blockchain can well solve these problems, because the most obvious characteristics of blockchain are decentralization and de-trust, i.e., it does not rely on a third party. Once the intermediate links are eliminated, enterprise management will be relatively easy, and the management cost will be significantly reduced. In addition, all nodes on the entire blockchain network will have the same book information (i.e., key data generated by each department), if you need to call these key data directly, the nodes use the P2P (peer-to-peer) transmission mechanism, the results will be quickly returned to the client. For example, the Human Resources Department can store the information of newly recruited employees on the blockchain, and other departments can quickly query the information of these employees if needed, so as to understand them in an all-round way and match them with suitable jobs.

	(1)	(2)	(3)	(4)	Anticipation symbol
X	0.002** (2.124)	0.003***(3.048)	0.003**(3.054)	0.002**(3.228)	+
Z1			-0.431**(-2.864)	-0.434**(-2.761)	-
Z2			0.012** (3.247)	0.014**(3.189)	+
Z3			0.654**(2.351)	0.411(2.337)	+
_cons	-0.284**(-2.381)	-0.214**(-2.541)	-0.391**(-2.259)	-0.352**(-1.736)	
Control year	NO	YES	NO	YES	
Control individual	NO	YES	NO	YES	
N	249	249	249	249	
R^2	0.035	0.124	0.207	0.231	

Table 5: The regression results of the model

	(1)	(2)	(3)	(4)	Anticipation symbol
X	0.001* (1.574)	0.002***(2.637)	0.001**(2.967)	0.002**(2.735)	+
Z1			-0.327**(-3.424)	-0.336**(-3.632)	-
Z2			0.015** (3.322)	0.013**(3.327)	+
Z3			0.531**(3.078)	0.468(3.129)	+
_cons	-0.135**(-2.431)	-0.142**(-1.971)	-0.208**(-2.637)	-0.212**(-2.168)	
Control year	NO	YES	NO	YES	
Control individual	NO	YES	NO	YES	
N	249	249	249	249	
R^2	0.038	0.129	0.214	0.235	

Table 6: Robustness test regression results

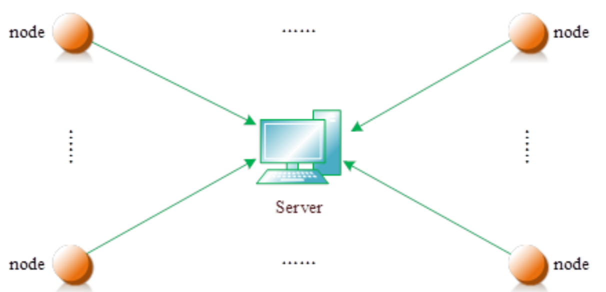

Figure 3: Traditional enterprise centralized management mode

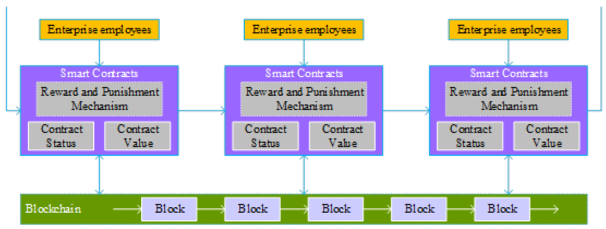

Figure 4: Precision accountability plan based on the blockchain

B. Securing Data

The tamper-proof feature of blockchain has special significance for guaranteeing the security of data on the chain, and the main principle is to utilize the Hash algorithm to process the original data to get a section of a string with a fixed length (i.e., the Hash value, which is ultimately transformed into a Merkel root and saved in the block header), and once the original data is maliciously altered, the conclusion can be drawn at the first time by comparing the Hash value with whether or not it has changed. Enterprises generate a large amount of data every moment during operation, and some of the key data can be stored on the blockchain, and then encryption technology is used to safeguard these key data from being maliciously tampered with. It is worth mentioning that all the data stored on the blockchain are valuable data, which can be utilized by enterprises to generate greater value.

C. Precise Assignment of Responsibility

People play a dominant role in traditional enterprise management, and thus unfairness often occurs when fixing responsibility, such as enterprise managers favoritism, shift the responsibility to others, and those who should be punished are exempted from punishment, which is very unfavorable to the development of the enterprise. In order to eliminate the occurrence of the above problems, enterprises can accurately determine responsibility without human intervention through smart contracts, and the blockchain-based accurate determination of responsibility scheme is shown in Figure 4. When a problem occurs in a certain part of the business process, the smart contract can quickly trace back to the historical data related to that part, and the responsible person can be found at the first time by analyzing these historical data, so as to avoid blindly delimiting the scope of responsibility, make the responsible person consciously admit his mistakes and accept the corresponding punishment, and reduce the disputes.

V. Conclusion

This study summarizes the main influencing factors of enterprise blockchain technology application with TOE as the basic framework, constructs the structural equation model, and uses the method of empirical analysis to test it. The method of multiple regression analysis is used to empirically test the relationship between blockchain technology application and enterprise digital management level. And explain the application of blockchain technology to promote the innovation of enterprise digital management mechanism and strategic transformation. The research results are as follows:

1) Compatibility, complexity and cost saving in the technology dimension, organizational top management support and organizational resource preparation in the organizational dimension, and social preparation, government policy support and network effect in the environmental dimension all satisfy $P < 0.05$ and pass the significance test, and all of them have a significant effect on the application of enterprise blockchain technology. Among them, the path coefficients of enterprise top management support and network effect are all greater than 0.3, with the most significant impact.
2) Blockchain technology application and enterprise digital management level are significantly positively correlated, indicating that the application of enterprise blockchain technology is generally conducive to the improvement of the level of digital management, but the regression coefficient is small, only 0.003, and the enterprise needs to focus on the transformation of digital management, and further improve the contribution rate of the application of blockchain technology to the level of digital management.
3) Blockchain, as a new generation of information technology, helps to create a new enterprise management model, which has a good response to improve management efficiency, protect enterprise data security, and accurately set responsibilities. This paper has a certain significance and reference value, which can provide a reference for the strategic transformation of enterprises, and at the same time provide a basis for creating digital and intelligent enterprises.

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