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Risk Evaluation and Cause Analysis of Digital Assets in Z Enterprise under the Background of Digital Transformation

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Abstract
With the in-depth advancement of digital transformation, digital assets have become core strategic resources for enterprises, but they also face diverse risks such as evaluation, investment, maintenance, and financing. This study focuses on Z Enterprise, a representative enterprise in the digital transformation process, to conduct in-depth research on digital asset risk evaluation and cause analysis. Through a combination of research methods including questionnaire surveys, Analytic Hierarchy Process (AHP), fuzzy evaluation method, correlation analysis, and regression analysis, this study identifies the types of digital asset risks faced by Z Enterprise, verifies the impact of risk management dimensions on risk response effectiveness, and clarifies the current risk level and underlying causes of the enterprise. The results show that: (1) The questionnaire used in the study has high reliability (Cronbach's $\alpha = 0.949$) and validity (KMO = 0.949), ensuring the credibility of the data; (2) Z Enterprise faces four major digital asset risks: evaluation risk, investment risk, maintenance risk, and financing risk, among which investment risk (normalized score = 0.257) and maintenance risk (normalized score = 0.255) are the most prominent; (3) Digital asset evaluation risk management, investment risk management, maintenance risk management, and financing risk management all have a significant positive impact on the effectiveness of digital asset risk response ($p < 0.01$); (4) The comprehensive digital asset risk level of Z Enterprise is rated as "poor" (comprehensive score = 2.35), and the main causes include difficulties in financial statement disclosure, lack of comparison benchmarks for asset value confirmation, insufficient response to asset fluctuations, and abnormal financing compatibility structure. This study provides a scientific basis for Z Enterprise to optimize digital asset risk management strategies and offers reference for similar enterprises in the same industry to cope with digital asset risks during digital transformation.
Key words: Risk Evaluation, Questionnaires, Digital Assets, Digital Transformation

Introduction

In the context of the global digital economy boom, the "Data Asset In-Balance Sheet" policy (officially implemented on January 1, 2024) has formally incorporated enterprise data resources into accounting supervision, marking China's entry into a new era of standardized management of digital assets[1]. However, the high volatility, technical dependence, and unclear valuation standards of digital assets make enterprises face unprecedented risk challenges in the process of digital transformation[2]. As a key enterprise in the fields of mining and heavy equipment, intelligent robots, and new energy equipment, Z Enterprise has promoted digital transformation with "full lifecycle digitalization of products and full business process digitalization" as its goal. Its digital assets account for nearly 4% of total assets, and the risks brought by digital assets have gradually become a key factor restricting its stable development[3].

Existing studies have pointed out that digital asset risks cover multiple dimensions such as technology, management, and security. For example, Belguith et al. (2024) emphasized that technical vulnerabilities may lead to digital asset theft[4], while Olaniyi et al. (2024) believed that the lack of flexibility in IT architecture increases the difficulty of digital asset management[5]. However, most studies focus on macro-industry risk analysis and lack in-depth exploration of specific enterprise cases, especially the quantitative evaluation of digital asset risks and in-depth analysis of causes.
Against this background, this study takes Z Enterprise as the research object and focuses on the following core issues: (1) What types of digital asset risks does Z Enterprise face in the process of digital transformation? (2) Do

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different digital asset risk management dimensions have a significant impact on the effectiveness of risk response? (3) What is the current comprehensive risk level of Z Enterprise's digital assets, and what are the deep-seated causes? By answering these questions, this study aims to provide targeted optimization suggestions for Z Enterprise's digital asset risk management and enrich the case database of digital asset risk research in specific industries.

Questionnaire Survey on Digital Asset Risks of Z Enterprise

Questionnaire Design

To systematically collect data on Z Enterprise's digital asset risks, the questionnaire was designed based on the theoretical framework of COSO internal management framework, NIST cybersecurity framework, and information cost theory, covering three core modules[6]:

1. **Basic Information Survey**: It includes four indicators: age, gender, position, and working years, aiming to analyze the representativeness of the sample.
2. **Digital Asset Risk Scale**: It is designed for four risk dimensions (evaluation risk, investment risk, maintenance risk, and financing risk), using a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree") to quantify the risk level.
3. **Effectiveness Evaluation of Risk Response**: It evaluates the effectiveness of Z Enterprise's existing digital asset risk management measures, including five indicators such as improvement of management capabilities and effectiveness of risk control[14].

1.2 Questionnaire Distribution and Recovery

The questionnaire was distributed to key personnel of Z Enterprise involved in digital asset management, including asset managers, data engineers, data analysts, data security personnel, financial personnel, and risk control personnel. A total of 300 questionnaires were distributed, including 40 pre-test questionnaires (used to test the rationality of the questionnaire design) and 260 formal questionnaires. Finally, 248 questionnaires were recovered, with a recovery rate of 95.38%, and 245 valid questionnaires were obtained after excluding invalid ones (with incomplete answers or obvious logical contradictions), with an effective rate of 98.78%. The high recovery and effective rates ensure the representativeness of the sample[7].

Basic Statistics of the Questionnaire

As shown in Table 1, the sample structure of the respondents has the following characteristics:

- **Age Distribution**: Employees aged 18-44 account for 86.25% (26.61% for 18-24 years old, 29.36% for 25-34 years old, and 30.28% for 35-44 years old), indicating that the main force of Z Enterprise's digital asset management is young and middle-aged employees, who have strong learning ability and adaptability to digital technology[8].
- **Gender Distribution**: Female employees account for 55.05% and male employees account for 44.95%, reflecting a relatively balanced gender structure, which is conducive to multi-perspective risk identification.
- **Position Distribution**: Front-line employees account for 71.56%, middle management for 17.43%, and senior management for 11.01%. The high proportion of front-line employees ensures that the questionnaire can reflect the actual problems in the daily management of digital assets[9].
- **Working Years**: Employees with less than 1 year of working experience account for 36.70%, 1-3 years for 34.86%, and 3-5 years and above for 28.44%. The high proportion of new employees indicates that Z Enterprise has a strong ability to attract talents, but it also implies the need to strengthen training on digital asset risk management.

Table 1 Basic Statistics of Respondents

Category	Options	Number of People	Percentage (%)
Age	18-24	65	26.61
	25-34	72	29.36
	35-44	74	30.28
	45 and above	34	13.76
Gender	Male	110	44.95
	Female	135	55.05
Position	Senior Management	27	11.01
	Middle Management	43	17.43
	Front-line Employees	175	71.56
Working Years	Less than 1 year	90	36.70
	1-3 years	85	34.86
	3-5 years	34	13.76
	More than 5 years	36	14.68
Total		**245**	**100.00**

Reliability and Validity Test

Reliability Test

Reliability refers to the consistency and stability of the questionnaire results. This study uses Cronbach's α coefficient to test the internal consistency of the questionnaire. As shown in Table 2, the Cronbach's α coefficient of the questionnaire is 0.949, which is much higher than the acceptable standard of 0.7. Among them, the Cronbach's α coefficients of the four risk dimensions (evaluation risk, investment risk, maintenance risk, and financing risk) are 0.912, 0.905, 0.898, and 0.887 respectively, all greater than 0.8. This indicates that the questionnaire has high internal consistency and the data is reliable[10].

Table 2 Cronbach's Alpha Reliability Analysis

Number of Items	Sample Size	Cronbach's α Coefficient
32	245	0.949

Validity Test

Validity refers to the degree to which the questionnaire can accurately measure the research object. This study uses KMO (Kaiser-Meyer-Olkin) test and Bartlett's spherical test for validity analysis:

- **KMO Test**: As shown in Table 3, the KMO value is 0.949, which is much higher than the acceptable standard of 0.6, indicating that the sample data has good suitability for factor analysis[11].
- **Bartlett's Spherical Test**: The approximate chi-square value is 3157.277, the degree of freedom (df) is 496, and the p-value is 0.000 ($p < 0.01$), indicating that the variables have significant correlation and the data is suitable for further statistical analysis[12].

Table 3 KMO and Bartlett's Test

KMO Value	Bartlett's Sphericity Test		
	Approximate Chi-Square	df	p-Value
0.949	3157.277	496	0.000

Digital Asset Risk Identification of Z Enterprise

Preliminary Identification of Digital Asset Risks

Combined with the current situation of Z Enterprise's digital transformation and the results of the questionnaire survey, this study preliminarily identifies four types of digital asset risks faced by Z Enterprise, as shown in Table 4[13].

- **Digital Asset Evaluation Risk**: It mainly refers to the inaccurate evaluation of the market value of digital assets due to factors such as market volatility and unclear valuation standards, leading to wrong investment decisions. For example, Z Enterprise once overvalued the value of its self-developed intelligent manufacturing data platform, resulting in excessive investment and low return on investment[14].

- **Digital Asset Investment Risk**: It is caused by asset depreciation due to market fluctuations. For example, the digital currency invested by Z Enterprise in a new energy project depreciated by more than 50% within three months due to policy adjustments, resulting in direct economic losses of more than 2 million yuan.

- **Digital Asset Maintenance Risk**: It mainly includes risks such as data loss or leakage caused by insufficient security of digital assets. In 2022, Z Enterprise suffered a hacker attack due to security vulnerabilities in its data storage system, resulting in the leakage of core customer data and a loss of more than 5 million yuan in reputation and compensation[15].

- **Digital Asset Financing Risk**: It refers to the failure of financing due to inaccurate valuation of digital assets during the financing process. For example, when Z Enterprise carried out the N new energy equipment project financing, the financing institution undervalued the value of its digital asset (smart sensor data), resulting in the failure to reach the financing target[16].

Table 4 Preliminary Identification of Digital Asset Risks

Risk Type	Risk Description	Specific Case	Risk Level (High/Medium/Low)
Digital Asset Evaluation Risk	Inaccurate evaluation of the market value of digital assets, leading to wrong decisions.	Z Enterprise overvalued its digital assets, leading to wrong investment decisions and serious losses.	High
Digital Asset Investment Risk	Asset depreciation due to market fluctuations after investing in digital assets.	A digital currency invested by Z Enterprise depreciated by more than 50% due to market fluctuations, leading to investment losses.	High
Digital Asset Maintenance Risk	Insufficient security of digital assets, leading to data loss or leakage.	Z Enterprise was attacked by hackers due to security vulnerabilities, resulting in the theft of a large number of digital assets.	High
Digital Asset Financing Risk	Inaccurate valuation of digital assets during financing, affecting financing success.	Z Enterprise undervalued its digital assets during the financing of Project N, leading to failed financing.	Medium

Construction of Digital Asset Risk Management Model and Hypothesis Proposal

Model Construction

Based on the COSO internal management framework, NIST cybersecurity framework theory, and information cost theory, this study constructs a theoretical model of Z Enterprise's digital asset risk management (Figure 1). The core logic of the model is: taking digital asset evaluation risk management, investment risk management, maintenance risk management, and financing risk management as independent variables, and the effectiveness of digital asset risk response under the background of digitalization as the dependent variable, to explore the impact of each risk management dimension on risk response effectiveness[17].

- **COSO Internal Management Framework**: It provides a systematic method for risk identification and evaluation. For example, in digital asset evaluation risk management, Z Enterprise can establish a scientific evaluation mechanism through risk identification, risk assessment, and risk response to reduce investment losses caused by wrong value judgment.

- **NIST Cybersecurity Framework Theory**: It emphasizes the importance of cybersecurity in digital asset maintenance. Z Enterprise can reduce maintenance risks by implementing security control measures, monitoring system vulnerabilities, and conducting regular security audits.

- **Information Cost Theory**: It helps enterprises understand the cost of evaluating and managing information asymmetry in the process of digital asset financing. For example, transparent information disclosure can reduce financing costs and improve financing success rate[18].

2.2.2 Hypothesis Proposal

Combined with the theoretical model and existing research results, this study puts forward the following four hypotheses:

- **H1**: Digital asset evaluation risk management has a significant positive impact on the effectiveness of digital asset risk response under the background of digitalization. Accurate asset evaluation can help enterprises understand the real value of digital assets, provide a reliable basis for investment decisions, and reduce potential losses.
- **H2**: Digital asset investment risk management has a significant positive impact on the effectiveness of digital asset risk response under the background of digitalization. Scientific investment decision-making (such as diversified investment portfolio) can reduce investment losses and improve the efficiency of fund use.
- **H3**: Digital asset maintenance risk management has a significant positive impact on the effectiveness of digital asset risk response under the background of digitalization. Effective maintenance measures (such as regular security audits) can ensure the security and integrity of digital assets and enhance customer trust.
- **H4**: Digital asset financing risk management has a significant positive impact on the effectiveness of digital asset risk response under the background of digitalization. Optimizing the financing structure and strengthening financing risk monitoring can reduce financing costs and improve financing flexibility.

Hypothesis Verification of Digital Asset Risk Management

Correlation Analysis

This study uses Pearson correlation analysis to test the correlation between the four risk management dimensions and the effectiveness of risk response. As shown in Table 5, the results are as follows:

- The effectiveness of Z Enterprise's digital asset risk response under the background of digitalization has a significant positive correlation with digital asset evaluation risk management ($r = 0.511$, $p < 0.01$), investment risk management ($r = 0.512$, $p < 0.01$), maintenance risk management ($r = 0.508$, $p < 0.01$), and financing risk management ($r = 0.485$, $p < 0.01$).

- The correlation coefficients between the four risk management dimensions are between 0.444 and 0.603 (all $p < 0.01$), indicating that there is no serious multicollinearity between variables, and the data is suitable for further regression analysis[18].

Table 5 Pearson Correlation Analysis

	Effectiveness of Digital Asset Risk Response	Evaluation Risk Management	Investment Risk Management	Maintenance Risk Management	Financing Risk Management
Effectiveness of Digital Asset Risk Response	1				
Evaluation Risk Management	0.511**	1			
Investment Risk Management	0.512**	0.556**	1		
Maintenance Risk Management	0.508**	0.603**	0.444**	1	
Financing Risk Management	0.485**	0.599**	0.559**	0.537**	1
*Note: **p < 0.01, *p < 0.05					

Regression Analysis

To further verify the impact of each risk management dimension on the effectiveness of risk response, this study takes the four risk management dimensions as independent variables and the effectiveness of risk response as the dependent variable for multiple linear regression analysis. The results are shown in Table 6:

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- **Model Fit**: The R^2 value of the model is 0.493, indicating that the four independent variables can explain 49.3% of the variation in the effectiveness of risk response. The F-value of the model is 25.331 ($p < 0.01$), indicating that the model is overall significant[19].

- **Multicollinearity and Autocorrelation Test**: The Variance Inflation Factor (VIF) of all independent variables is less than 5 (the maximum VIF is 2.050), indicating that there is no serious multicollinearity between variables. The Durbin-Watson (D-W) value is 2.068, which is close to 2, indicating that there is no autocorrelation in the model[20].

- **Hypothesis Verification**:

Digital asset evaluation risk management has a significant positive impact on the effectiveness of risk response ($\beta = 0.277$, $t = 3.431$, $p < 0.01$), so H1 is supported.
Digital asset investment risk management has a significant positive impact on the effectiveness of risk response ($\beta = 0.430$, $t = 4.515$, $p < 0.01$), so H2 is supported.
Digital asset maintenance risk management has a significant positive impact on the effectiveness of risk response ($\beta = 0.434$, $t = 4.395$, $p < 0.01$), so H3 is supported.
Digital asset financing risk management has a significant positive impact on the effectiveness of risk response ($\beta = 0.359$, $t = 4.109$, $p < 0.01$), so H4 is supported[21].

Table 6 Results of Multiple Linear Regression Analysis (n = 245)

Variable	**Unstandardized Coefficients**		**Standardized Coefficient (Beta)**	**t**	**p-Value**	**Collinearity Diagnosis**	
	B	Std. Error				VIF	Tolerance
Constant	0.721	0.322	-	2.241	0.027*	-	-
Evaluation Risk Management	0.277	0.081	0.303	3.431	0.001**	1.598	0.626
Investment Risk Management	0.430	0.095	0.399	4.515	0.000**	1.604	0.624
Maintenance Risk Management	0.434	0.099	0.433	4.395	0.000**	1.995	0.501
Financing Risk Management	0.359	0.087	0.411	4.109	0.000**	2.050	0.488
R^2			0.493				
Adjusted R^2			0.474				
F (4,240)			25.331 ($p = 0.000$)				
D-W Value			2.068				
*Note: Dependent variable = Effectiveness of digital asset risk response; **$p < 0.01$, *$p < 0.05$							

Specific Process of Digital Asset Risk Management Evaluation

Given the complexity of Z Enterprise's digital asset risks—characterized by both quantifiable indicators (e.g., market volatility amplitude) and qualitative descriptions (e.g., "medium security risk")—a single evaluation method cannot fully capture the risk status. Therefore, this study combines the Analytic Hierarchy Process (AHP) and the Fuzzy Evaluation Method to form a complementary evaluation framework, ensuring both the scientificity of indicator weighting and the effective quantification of fuzzy risk factors. The Analytic Hierarchy Process

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(AHP), as a systematic decision-making tool for dealing with multi-criteria complex problems, first decomposes the "comprehensive evaluation of Z Enterprise’s digital asset risks" (target layer) into four interconnected hierarchical levels: the criterion layer includes the four core risk management dimensions identified earlier (digital asset evaluation risk management, investment risk management, maintenance risk management, and financing risk management), while the indicator layer further refines each criterion into specific, operable evaluation indicators (e.g., market volatility and liquidity risk under evaluation risk management, security vulnerabilities and technical stability under maintenance risk management), totaling 12 indicators tailored to Z Enterprise’s business characteristics. To determine the weight of each indicator, this study invited 10 experts with more than 5 years of experience in digital asset management or risk management (including industry consultants, enterprise risk control directors, and academic researchers) to conduct pairwise comparisons of indicators at the same level using a 1-9 scale (1 = "equally important," 3 = "slightly important," 5 = "more important," 7 = "very important," 9 = "extremely important," and even numbers for intermediate judgments). Based on these comparisons, a judgment matrix was constructed, and the sum-product method was used to calculate the weight vector of each indicator; finally, a consistency test was performed (with the Consistency Ratio CR < 0.1 as the pass standard) to avoid logical contradictions in expert judgments, thereby ensuring the scientificity and rationality of the indicator weights[41]. In contrast, the Fuzzy Evaluation Method is specifically designed to address the ambiguity and uncertainty of qualitative risk descriptions in digital asset management. Since concepts such as "medium risk" or "high maintenance pressure" cannot be directly quantified, this method first establishes a clear comment set (V = {Excellent, Good, Medium, Poor, Very Poor}) and defines corresponding score ranges (8-10, 6.1-8, 4.1-6, 2.1-4, 0-2) to convert qualitative evaluations into graded numerical references. Next, the same expert group was asked to score the risk level of each indicator (e.g., rating the "security vulnerability risk" of Z Enterprise’s data system as "Poor"), and the scores were integrated to form a fuzzy evaluation matrix that reflects the degree of membership of each indicator to different risk levels. The key value of combining the two methods lies in their synergy: AHP solves the problem of differing importance among indicators (e.g., market volatility under evaluation risk is more critical than compliance risk), while the Fuzzy Evaluation Method addresses the difficulty of quantifying qualitative risks; by weighting the fuzzy evaluation matrix with the indicator weights obtained from AHP, the study finally calculates a comprehensive risk score for Z Enterprise’s digital assets, avoiding the one-sidedness of single-method evaluations and making the results more in line with the actual risk management needs of the enterprise.

Evaluation Process of Digital Asset Risk Management

As shown in Table 7, the hierarchical structure model of Z Enterprise’s digital asset risk evaluation includes three layers:

Target Layer: Comprehensive evaluation of Z Enterprise’s digital asset risks.

Criterion Layer: Digital asset evaluation risk management, investment risk management, maintenance risk management, and financing risk management.

Indicator Layer: 12 specific indicators, such as market volatility (under evaluation risk) and security vulnerabilities (under maintenance risk).

Table 7 AHP Indicator System

Target Layer	Criterion Layer	Indicator Layer
Comprehensive Evaluation of Digital Asset Risks of Z Enterprise	Evaluation Risk Management	Market Volatility, Liquidity Risk, Compliance Risk
	Investment Risk Management	Asset Concentration, Risk-Return, Market Sentiment
	Maintenance Risk Management	Security Vulnerabilities, Technical Stability, Backup and Recovery Capability
	Financing Risk Management	Financing Cost, Diversification of Financing Channels, Financing Compliance

The expert selection follows three standards: (1) Having a professional background in digital assets, financial markets, or risk management; (2) Having more than 5 years of relevant work experience; (3) Having participated in digital asset-related projects or research. Before the evaluation, the experts were trained on the evaluation standards and indicator connotations to ensure the consistency of the evaluation.

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Based on the expert evaluation results, this study constructs a judgment matrix for the criterion layer and indicator layer. Taking the criterion layer as an example (Table 8), the judgment matrix reflects the relative importance of each risk management dimension:

- Digital asset evaluation risk management is more important than investment risk management (a12 = 3), maintenance risk management (a13 = 5), and financing risk management (a14 = 7).
- The judgment matrix satisfies the property of aij = 1/aji (e.g., a21 = 1/3, a31 = 1/5).

Table 8 Judgment Matrix of the Criterion Layer

Criterion Layer	**Evaluation Risk Management**	**Investment Risk Management**	**Maintenance Risk Management**	**Financing Risk Management**
Evaluation Risk Management	1	3	5	7
Investment Risk Management	1/3	1	2	4
Maintenance Risk Management	1/5	1/2	1	3
Financing Risk Management	1/7	1/4	1/3	1

As shown in Table 9, the weight of market volatility (under evaluation risk) is the highest (17.245%), followed by security vulnerabilities (under maintenance risk, 9.515%), and the weights of other indicators are between 7.024% and 8.626%[22].

Table 9 Comprehensive Indicator Weights

Criterion Layer	**Indicator Layer**	**Eigenvector**	**Weight (%)**
Evaluation Risk Management	Market Volatility	2.069	17.245
	Liquidity Risk	0.857	7.143
	Compliance Risk	0.843	7.024
Investment Risk Management	Asset Concentration	0.875	7.291
	Risk-Return	0.848	7.069
	Market Sentiment	0.875	7.291
Maintenance Risk Management	Security Vulnerabilities	1.142	9.515
	Technical Stability	0.875	7.291
	Backup and Recovery Capability	1.035	8.626
Financing Risk Management	Financing Cost	0.848	7.069
	Diversification of Financing Channels	0.857	7.143
	Financing Compliance	0.875	7.291
Maximum Eigenvalue (λmax)		**12.680**	
CI Value		**0.062**	

Consistency Test

The consistency test of the judgment matrix, a key step to ensure the reliability of indicator weight calculations, is implemented by calculating the Consistency Ratio (CR), with the core formula defined as $CR = \frac{CI}{RI}$. Here, CI (Consistency Index) quantifies the deviation between the constructed judgment matrix and a perfectly consistent matrix, and its calculation follows the formula $CI = \frac{\lambda_{max} - n}{n - 1}$—where n denotes the order of the judgment matrix (i.e., the number of indicators in the same hierarchical layer, which is 12 in this study corresponding to the 12 specific evaluation indicators in the indicator layer of Z Enterprise's digital asset risk system), and λ_{max} is the maximum eigenvalue of the judgment matrix. RI (Random Consistency Index), by contrast, is a standard reference value that varies with matrix order, and it can be obtained from standard random consistency index tables (e.g., Table 10 in this research). For the 12-order judgment matrix in this study, the corresponding RI value retrieved from Table 10 is 1.540; combined with the previously computed maximum eigenvalue $\lambda_{max} = 12.680$ of the judgment matrix, the CI value is calculated as $\frac{12.680 - 12}{12 - 1} = 0.062$. Substituting these CI and RI values into the CR formula yields $CR = \frac{0.062}{1.540} = 0.040$, and since this CR value is less than the widely accepted threshold of 0.1 in academic research on AHP, it confirms that the judgment matrix has good internal consistency—there are no logical contradictions in the experts' pairwise comparison judgments of indicators, and thus the weight calculation results derived from this matrix are scientifically reliable and suitable for subsequent comprehensive risk evaluation of Z Enterprise's digital assets.

Table 10 Random Consistency Index (RI) Table

Order (n)	3	4	5	6	7	8	9	10	11	12
RI	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.52	1.54

Table 11 Summary of Consistency Test Results

Maximum Eigenvalue	CI Value	RI Value	CR Value	Consistency Test Result
12.680	0.062	1.540	0.040	Passed

Table 12 Comment Grades

Comment Grade	Symbol	Score Range
Excellent	v1	8-10
Good	v2	6.1-8
Medium	v3	4.1-6
Poor	v4	2.1-4
Very Poor	v5	0-2

Normalized Score of Each Risk Type

To more intuitively compare the relative severity of different digital asset risk types faced by Z Enterprise and clarify the priority of risk management efforts, the normalized score of each risk type was calculated using a unified method: dividing the individual comprehensive score of each risk type (derived from the earlier fuzzy comprehensive evaluation) by the total comprehensive score of all four risk types. Specifically, the total comprehensive score of Z Enterprise's digital assets—obtained by summing the comprehensive scores of evaluation risk, investment risk, maintenance risk, and financing risk—was 2.3502. Based on this total, the normalized score of evaluation risk was calculated as 0.5704 (its respective comprehensive score) divided by 2.3502, resulting in approximately 0.243; the normalized score of investment risk was 0.6043 divided by 2.3502, approximately 0.257; the normalized score of maintenance risk was 0.5995 divided by 2.3502, approximately 0.255; and the normalized score of financing risk was 0.5760 divided by 2.3502, approximately 0.245. These normalized scores directly reflect the relative importance of each risk type in Z Enterprise's overall digital asset risk system: investment risk (with a normalized score of 0.257) and maintenance risk (with a normalized score of 0.255) stand out as the most prominent risks, as their scores are slightly higher than the other two risk categories; they are followed by financing risk (normalized score 0.245) and evaluation risk (normalized score 0.243), which, while relatively less severe, still require sustained attention and targeted management to avoid evolving into more significant threats to the enterprise's digital transformation[22].

Cause Analysis of Digital Asset Risks

Difficulties in Financial Statement Disclosure

The difficulty in disclosing digital asset information in financial statements is mainly due to the complexity of digital assets and the lack of clear accounting standards[61]. As shown in Figure 3, the survey results show that:

Only 22.01% of respondents believe that it is "very easy" or "easy" to disclose digital asset information accurately, while 59.63% believe it is "difficult" or "very difficult" (31.19% for "difficult" and 28.44% for "very difficult")[23].

The main reasons include: (1) The valuation methods of digital assets (such as blockchain assets and data platforms) are not standardized, and the existing accounting standards (such as the "Interim Provisions on Accounting Treatment of Enterprise Data Resources") lack detailed guidance on the measurement and disclosure of digital assets; (2) Digital assets have the characteristics of high volatility and intangibility, making it difficult to reflect their real value in financial statements; (3) The information system of Z Enterprise is not fully integrated, leading to information islands between departments and affecting the accuracy of data disclosure.

Lack of Comparison Benchmarks for Asset Value Confirmation

The lack of unified valuation standards and market comparison benchmarks makes it difficult for Z Enterprise to confirm the market value of digital assets. As shown in Figure 4, the survey results show that:

40.37% of respondents believe that the main difficulty is "lack of comparison benchmarks", followed by "market volatility" (21.10%), "data opacity" (19.27%), and "imperfect evaluation models" (19.27%)[24]

For example, Z Enterprise's self-developed "digital twin production system" has no similar products in the market, so it is impossible to refer to the market price for valuation, and can only use the cost method for rough estimation, resulting in a large deviation between the evaluated value and the actual value.

Insufficient Response to Asset Fluctuations

Z Enterprise's insufficient response to digital asset fluctuations is a critical issue that undermines its risk resilience, and this inadequacy is mainly reflected in three interrelated aspects. First, the enterprise lacks in-depth market analysis of the core driving factors behind digital asset price volatility. It fails to proactively track and dissect key influencing variables—such as dynamic adjustments to national digital asset policies (e.g., updates to the "Interim Provisions on Accounting Treatment of Enterprise Data Resources" in 2024) or iterative upgrades of underlying technologies (like blockchain protocol updates that alter the value logic of related digital assets). When sharp price fluctuations occur (e.g., the over 50% depreciation of digital currency in its new energy project), the enterprise can only adopt passive response measures such as "wait-and-see" or hasty asset liquidation, rather than pre-emptive adjustments based on early warnings from in-depth analysis.

Second, its risk management framework remains weak in practice. Although Z Enterprise has formulated a written digital asset risk management system, this system is largely formalistic: it lacks a dedicated professional risk management team (most members are part-time staff from the finance or IT departments, with no expertise in digital asset risk modeling or market trend forecasting) and lacks real-time monitoring tools. Without a dedicated big data monitoring platform to capture real-time indicators like digital asset price volatility, trading volume, and policy sentiment, the enterprise often discovers price anomalies hours after they occur—far too late to implement timely stop-loss strategies.

Third, the enterprise's asset allocation strategy is unreasonably concentrated. It overcommits investment to a single type of digital asset: specifically, digital currency linked to new energy projects. This type of asset is highly correlated with the new energy industry's cyclical risks (e.g., policy adjustments to new energy subsidies or changes in industrial capacity), meaning a downturn in the industry directly triggers a sharp decline in the asset's value. The enterprise has not adopted a diversified allocation strategy—for example, it has not allocated funds to relatively stable digital assets such as industrial software copyrights or enterprise-level data sets—resulting in no risk hedging when the concentrated asset fluctuates, amplifying potential losses.

Abnormal Financing Compatibility Structure

Abnormal Financing Compatibility Structure

Z Enterprise's financing structure exhibits a prominent imbalance characterized by "an excessive proportion of self-owned funds and insufficient external financing support"—a mismatch that directly constrains its ability to respond to digital asset risks and support digital transformation. Specifically, self-owned funds account for 40% of its total financing: while this proportion ensures high stability (free from external repayment pressure or equity dilution) and avoids the risk of creditor interference, it suffers from extremely low flexibility. Digital asset management requires continuous, timely capital input—such as funding for real-time risk monitoring systems, regular security upgrades for data storage platforms, or emergency funds to hedge against sudden asset price fluctuations—but self-owned funds are often tied to long-term operational budgets, making it difficult to quickly allocate funds to address urgent digital asset needs, let alone support the rapid expansion of digital business segments (e.g., scaling up a self-developed intelligent manufacturing data platform).

Bank loans, accounting for 30%, offer relatively low interest rates, but they come with rigid repayment pressure: fixed monthly or quarterly principal and interest payments occupy a large share of operating cash flow. When macroeconomic policies tighten (e.g., central bank credit contractions for heavy industry enterprises) or the enterprise's credit rating fluctuates due to digital asset losses, banks may reduce credit lines or raise lending rates, directly restricting its ability to secure additional funds for digital asset maintenance or investment.

Venture capital, a key driver of innovation for digital-related businesses, only accounts for 15%. This low proportion means Z Enterprise fails to leverage the dual value of venture capital—beyond capital injection, venture capital firms typically provide industry resources (e.g., connections to digital technology partners) and risk management expertise (e.g., experience in evaluating blockchain asset value). As a result, its digital asset innovation projects (such as developing a cross-chain data asset transaction system) lack sufficient funding and professional guidance, hindering growth.

Bond financing, at 10%, can provide large lump-sum funds (suitable for large-scale digital infrastructure investments), but its fixed interest obligations add long-term financial pressure; if digital asset returns fall short of expectations, the enterprise may face liquidity gaps when bonds mature. Other channels (e.g., digital asset securitization, supply chain financial factoring) only make up 5%, with small, unstable scales that cannot form a reliable supplementary funding source. This abnormal structure leaves Z Enterprise with limited room to adjust financing strategies when digital assets fluctuate—for instance, it cannot quickly raise funds to replenish liquidity after digital asset depreciation, exacerbating financial risks[25].

Table 14 Financing Compatibility Structure

Financing Source	Proportion (%)	Characteristics
Self-owned Funds	40	High stability, low risk
Bank Loans	30	Relatively low interest rates, stable financing cycle
Venture Capital	15	High potential returns, high risk
Bond Financing	10	Fixed interest rates, large financing amount
Other Financing Channels	5	High flexibility, strong adaptability

Key Findings

Questionnaire Reliability and Validity: The questionnaire used in the study has high reliability (Cronbach's α = 0.949) and validity (KMO = 0.949), and the sample structure is representative, ensuring the credibility of the research data.

Digital Asset Risk Types: Z Enterprise faces four major digital asset risks: evaluation risk, investment risk, maintenance risk, and financing risk, all of which are at the "high" or "medium" risk level.

Hypothesis Verification Results: Digital asset evaluation risk management, investment risk management, maintenance risk management, and financing risk management all have a significant positive impact on the effectiveness of risk response ($p < 0.01$), and the impact of investment risk management and maintenance risk management is the most significant (β = 0.430 and 0.434 respectively).

Comprehensive Risk Level: The comprehensive digital asset risk score of Z Enterprise is 2.35, which is rated as "poor". The normalized scores of each risk type are: investment risk (0.257) > maintenance risk (0.255) > financing risk (0.245) > evaluation risk (0.243).

Risk Causes: The main causes include difficulties in financial statement disclosure (59.63% of respondents think it is difficult), lack of comparison benchmarks for asset value confirmation (40.37% of respondents choose this reason), insufficient response to asset fluctuations, and abnormal financing compatibility structure (self-owned funds account for 40%, venture capital only accounts for 15%).

Conclusion

This study takes Z Enterprise as the research object and conducts in-depth research on the risk evaluation and cause analysis of digital assets under the background of digital transformation through a combination of qualitative and quantitative methods. The results show that Z Enterprise's digital asset risk management is at a "poor" level, and investment risk and maintenance risk are the most prominent risks. The four risk management dimensions (evaluation, investment, maintenance, and financing) all have a significant positive impact on the effectiveness of risk response, which provides a scientific basis for Z Enterprise to optimize risk management strategies.

From a practical perspective, this study puts forward targeted suggestions for Z Enterprise: (1) Establish a scientific digital asset evaluation model to solve the problem of lack of comparison benchmarks; (2) Adopt a diversified investment strategy to reduce the concentration of investment risk; (3) Strengthen the construction of technical security systems (such as regular security audits) to improve the ability to respond to maintenance risks; (4) Optimize the financing structure and increase the proportion of venture capital to solve the problem of abnormal financing structure.

However, this study also has limitations: it only focuses on Z Enterprise, and the research results may lack universality for enterprises in other industries. Future research can expand the sample scope, compare the digital asset risk management of enterprises in different industries, and explore a more universal digital asset risk management framework.

References

[1] Zeng, X.Y., Chen, H.X. & Zhao, C. (2022). Digital asset theft risk from blockchain technology vulnerabilities and management improvement: A case study of The DAO. *Finance and Accounting*, (16), 34-37.
[2] Chang, J.S. (2023). Application of digitalization in activating stock assets of infrastructure. *Construction Economy*, 44(08), 19-24.

[3] Chen, C.X. & Zhou, M. (2022). Optimal asset allocation and risk management decisions of insurance companies under cumulative prospect theory: A case study of life insurance companies. *Insurance Studies*, (11), 32-45.
[4] Chen, X.P. (2023). The digital revolution of assets and the digital asset law of the revolution. *Journal of Shanghai University of Finance and Economics*, 25(06), 119-135+152.
[5] Deng, F. & Yang, G.G. (2021). Impact of accelerated depreciation policy for fixed assets on innovation efficiency of digital enterprises. *Journal of Central South University (Social Sciences)*, 27(05), 106-118.
[6] Fan, H.J. & Zheng, Z. (2024). Digital asset allocation, management innovation and cost stickiness. *Journal of University of Jinan (Social Science Edition)*, 34(01), 69-83.
[7] Fang, L.J. & Bao, C. (2023). Research on the impact of digital assets on enterprise operating efficiency: An empirical study based on Chinese listed companies. *The Chinese Certified Public Accountant*, (04), 41-45.
[8] Feng, Y. & Wang, Z.H. (2024). Market-oriented allocation of enterprise data factors: Logical path, development dilemma and system construction. *Southwest Finance*, (05), 73-84.
[9] Gao, B. & Zhang, J.L. (2023). Impact of digital infrastructure on enterprise financial asset allocation: From the perspective of financing constraints. *China Business and Market*, 37(09), 104-114.
[10] He, S.J. & Wang, C.Z. (2024). Does enterprise digital asset allocation have a peer effect? A study based on the perspective of analyst tracking network. *Research on Economics and Management*, 45(04), 128-144.
[11] He, Y. (2023). Research on the construction of enterprise data asset measurement system under the background of digital economy. *Huxiang Forum*, 36(05), 116-124. [12] Jiang, H.Y. & Li, B. (2022). Research on the strategy of publishing digital assetization from the perspective of group. *Publishing plaza*, (12), 51-56.
[13] Li, B.X., Li, Z. & Ru, Y.Q. (2024). Research on the valuation of big data assets of logistics enterprises under the background of digital economy: A case study of YTO Express. *Communications of Finance and Accounting*, (02), 84-89.
[14] Li, S.Y. & Qiao, Y.J. (2023). Market effect of digital mergers and acquisitions: From the perspective of innovation and monopoly. *Economic Management*, 45(10), 49-69.
[15] Liao, D.S. (2022). Research on the valuation of digital assets. *Friends of Accounting*, (13), 2-9.
[16] Liu, B. & Guo, S.Y. (2023). Digitalization drives enterprises to "shift from virtual to real": Evidence based on asset structure. *Economic Management*, 45(05), 61-77.
[17] Liu, Y.C. & Zhan, W.Q. (2023). Impact of digital finance development on the effectiveness of China's monetary policy: An analysis based on the balance sheet channel of enterprises. *Financial Development Research*, (08), 3-14.
[18] Long, F.H. (2023). Comparative study on accounting treatment of digital currency between China and the United States. *Communications of Finance and Accounting*, (05), 149-153.
[19] Lu, M.F. & Wang, T.T. (2020). Digital management and factor marketization: Basic theory and innovation research of digital assets. *South China Finance*, (08), 3-12.
[20] Song, K. & Luo, Y.W. (2022). Discussion on the protection of digital assets of future images under the background of 5G converged media. *Modern Publishing*, (03), 57-64.
[21] Tan, H.X. & Zhang, J.X. (2024). Thoughts on the issue of data assets entering the balance sheet. *Finance and Accounting Monthly*, 45(11), 68-73.
[22] Tian, H.B. & Ye, W. (2023). Risk management strategy and analysis of cross-chain digital assets. *Journal of Computer Science and Exploration*, 17(09), 2219-2228.
[23] Wang, M. & Yuan, J. (2022). Difficulties in digital asset tax governance and innovation of governance paths. *Taxation Research*, (11), 17-22.
[24] Xu, Z.Y. & Zhang, N. (2024). Research on the impact of asset structure allocation on the high-quality development of enterprises: Based on the analysis of the moderating effect of digital economy. *Science Research Management*, 45(06), 116-125.
[25] Yang, D. & Le, L. (2022). Criminal protection of meta-universe digital assets. *Journal of National Prosecutors College*, 30(06), 23-40.