Construction of Project Management Evaluation Index System for Scientific Research Institutions under the Background of Digital Transformation

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Abstract. In the era of the digital economy, competition among enterprises has transcended traditional boundaries, and digital transformation is imminent. Project management plays a crucial role in the complex and dynamic process of corporate digital transformation. How to better practice project management and how to select evaluation indicators and construct an index evaluation system to assess the effectiveness of project management have become important issues that enterprises urgently need to resolve. This paper aims to construct a project management evaluation index system suitable for scientific research institutions under the background of digital transformation.

Firstly, this paper introduces the background of digital transformation in scientific research institutions, and then analyzes the impact of digital transformation on project management through a literature review. Based on the construction goals of digital scientific research institutions and actual project management practices, it identifies key evaluation indicators suitable for unified project management in scientific research institutions against the backdrop of digital transformation. Subsequently, the entropy weight method is employed to determine the weight of each indicator, ensuring the scientificity and practicality of the indicator system. To eliminate the influence of dimensions among different indicators, this paper adopts a dimensionless processing method to standardize each indicator. Ultimately, a project management evaluation system with 20 indicators, including digital coverage of project management, digital support rate for collaborative research and development, and online coverage of service processes, is established in accordance with the "156 Overall Planning" of scientific research institutions. This system can effectively evaluate the effectiveness of project management during the digital transformation process of scientific research institutions and the achievement of their construction goals, thereby providing scientific decision support for the managers of scientific research institutions.

Y. K. Wong Eric et al. (eds.), *Proceedings of the 2024 4th International Conference on Business Administration and Data Science (BADS 2024)*, Advances in Computer Science Research 119,
https://doi.org/10.2991/978-94-6463-632-1_15

Keywords: Digital Transformation, Scientific Research Institutions, Project Management, Evaluation Indicators, Entropy Method.

1 Introduction

1.1 Research Background

Against the backdrop of rapid global economic development, digital transformation has become an important way for enterprises to enhance their competitiveness. Enterprises are facing rapid changes in the market environment, diverse customer demands, and technological iterations, and traditional management models are gradually unable to meet the needs of modern enterprises. Digital transformation is not only a technological change but also a comprehensive upgrade of management concepts, business processes, and organizational structures. Project management plays a crucial role in the process of digital transformation, and how to effectively evaluate and manage projects is key to the successful transformation of enterprises.

In the "Overall Layout Plan for the Construction of Digital China" released by the State Council in 2023, it is pointed out that the deep integration of the digital economy and the real economy should be promoted, and digitalization should drive changes in production, life, and governance methods; in the "Action Plan for Accelerating the Construction of a New Type of Power System (2024-2027)" jointly formulated by the National Development and Reform Commission, the National Energy Administration, and the National Data Bureau in 2024, clear requirements have been put forward for the digitalization and intelligence of the construction of a new type of power system. For Chinese scientific research institutions, as national scientific research institutions, they must respond to the national call, better adapt to the requirements of digital transformation, and complete the goal of building a digital scientific research institution. Therefore, it is necessary to construct a project management index evaluation system suitable for their own.

(1)Strategic demand for digital transformation. Scientific research institutions are actively responding to national policies on digital transformation, such as the "Overall Layout Plan for the Construction of Digital China," to promote the deep integration of the digital economy and the real economy. Therefore, establishing an effective project management evaluation index system is a key part of achieving the strategic goals of digital transformation.

(2)Identification of existing project management problems. Scientific research institutions have encountered problems such as information silos, process disconnections, and poor user experience in existing project management. These problems indicate that existing project management methods and tools can no longer meet the requirements of the digital age and need to construct a new evaluation index system to optimize and upgrade project management practices.

(3)The need for business collaboration and data sharing. With the increasing demand for cross-department and cross-level business collaboration and data sharing, scientific research institutions need a unified project management evaluation index system to measure and improve the collaborative efficiency and data utilization efficiency of project management.

(4)Enhancing project management efficiency and quality. Scientific research institutions recognize that improving the efficiency and quality of project management through digital means is key to achieving scientific innovation and business objectives. The construction of the evaluation index system will help monitor project management performance and ensure that projects are executed efficiently, compliantly, and according to plan.

(5)Responding to the strategic needs of the State Grid Corporation and its subordinate units. As a research institution under the State Grid Corporation, scientific research institutions need to support the strategic implementation of the State Grid Corporation through digital transformation. The construction of the project management evaluation index system will help scientific research institutions better support the digital and intelligent construction needs of the State Grid Corporation.

(6)Achieving scientific innovation and business objectives. The digital transformation of scientific research institutions aims to promote the digital and intelligent transformation and empowerment of business and equipment through digital and intelligent technology, enhancing the automation and intelligence level of business activities. The construction of the project management evaluation index system will help achieve this transformation goal and promote the realization of scientific innovation and business objectives.

(7)Enhancing the digital service capability of employees. Scientific research institutions are committed to enhancing the digital service capability of employees, including improving service efficiency through mobile office, online services, and other methods. The construction of the project management evaluation index system will help evaluate the application effects of these digital services in project management.

Traditional project management evaluation indicators often focus on cost, time, and quality, which cannot fully reflect the complexity and multidimensionality of projects in the context of digital transformation. The success of a project depends not only on these traditional indicators but also on considering the new challenges brought by digital transformation, such as intelligent application, innovation capability, data-driven decision-making, etc. Therefore, it is necessary to explore suitable project management evaluation indicators for enterprises in the context of digital transformation through systematic research, providing theoretical support for the project management practice of scientific research institutions.

1.2 Research Significance

The construction of a project management evaluation index system for scientific research institutions under the background of enterprise digital transformation has important theoretical and practical significance:

(1)From a theoretical perspective, this research can help enrich and improve existing project management theories, providing new theoretical support and research directions for project management in scientific research institutions; it can explore new methods and models of project management in the process of digital transformation, providing new theoretical perspectives for the development of the project management discipline; it can provide a set of quantitative research tools for scientific research institutions, helping researchers and practitioners more accurately measure and evaluate the effectiveness of project management.

(2)From a practical point of view, the evaluation index system can help scientific research institutions more effectively monitor and manage projects, improving project management efficiency and success rates; it can enable scientific research institutions to more reasonably allocate and manage resources, ensuring the optimal use of project resources; it helps promote business collaboration between different departments and levels, improving internal organizational collaboration efficiency; it can provide key data support, helping management make more scientific and reasonable decisions; it helps scientific research institutions identify project risks in advance and formulate response measures, enhancing project risk management capabilities.

(3)From a societal perspective, scientific research institutions, as scientific research institutions, the construction of a project management evaluation index system can help promote the development of the digital economy, providing more scientific and technological innovation results for society; it can help scientific research institutions achieve a balance of environmental, social, and economic goals in project management, promoting the implementation of sustainable development strategies; by improving project management levels, scientific research institutions can more effectively support major national scientific and technological projects and strategies, thereby enhancing the country's global competitiveness.

In summary, this study not only helps deepen related research theories but also provides important guidance for the project practice of scientific research institutions and related enterprises, promoting the continuous and healthy development of the market.

1.3 Research Methods

Constructing a project management evaluation index system under the background of enterprise digital transformation is a complex task involving the comprehensive application of various research methods. The main research methods used in this paper are two: literature review and entropy method.

Literature review is an important foundation of this study. First, related literature is retrieved through keywords in academic databases, and then the retrieved literature is screened, classified, analyzed, and summarized. The screened literature is divided into two categories: the impact of digital transformation on project management and project management index evaluation system. According to the results of literature analysis, the project management evaluation indicators under the background of digital transformation are preliminarily clarified.

The entropy method is an objective weighting method based on information entropy[9]. Its basic principle is to calculate the information entropy of each indicator, reflecting its importance in the evaluation system. The larger the information entropy, the more information the indicator has, and its weight should be relatively lower; on the contrary, the weight should be relatively higher. This paper uses the entropy method to weight the project management evaluation indicators determined by literature review and Delphi method to ensure the scientific and rational nature of the evaluation indicators.

2 Literature Review

2.1 The Impact of Digital Transformation on Project Management

Henriette, Feki, & Boughzala (2015) found through a systematic review of the literature that digital transformation is not only a technological shift but also has an impact on business models, operational processes, and the final user experience[3]. They proposed a research agenda on digital transformation from a management perspective; Marnewick & Marnewick (2022) provided insights into the digital state of project management through a bibliometric analysis of 478 articles[4]. The research results emphasized the necessity of continuous learning to adapt to the transformation brought by digitalization; Tarawneh, AbdAlwahed, & AlZyoud (2024) discussed the application of artificial intelligence in project management, especially in resource optimization and success prediction[5]. The study showed that AI technology can improve the accuracy of project planning, improve risk management methods, and develop new methods. In addition, the integration of AI in project management examined the success of the project and customer satisfaction; Zhong Yongxin, Zhang Liping,&Zhu Zhiyong (2022) realized the automation of decision-making and evaluation, real-time risk warning and intervention through digital management communication for major customer investment projects, providing successful practical experience and innovative models for internal risk management of communication enterprises in the context of digital reform[12]; Yordanova (2024) explored the impact of digital transformation on project management practices, revealing how digital tools and methods reshape the field of project management, improving efficiency, communication, and resource management, while also bringing new challenges[7].

2.2 Project Management Index Evaluation System

Wang et al (2024) analyzed the construction methods of digital project performance evaluation index systems under different application scenarios and constructed an index system that covers multiple dimensions such as project decision-making, process, output, and benefits, and can comprehensively qualify and quantify indicators[10]; Verhoef et al. (2021) identified three stages of digital transformation based on existing literature: digitalization, digitalization, and digital transformation, and proposed specific organizational structures and performance measurement indicators required for digital transformation[6]; Zheng et al. (2019) discussed how to use leading indicators to improve the measurement and prediction of project performance[11]. By introducing leading indicators from system engineering measurement, it can help predict the future performance of the project and provide more comprehensive project monitoring; Haass & Guzman (2020) proposed a meta-framework to help project practitioners better understand the subjectivity, dynamics, and complexity of project evaluation, choose evaluation criteria suitable for their projects, and improve the flexibility and adaptability of project evaluation[2]; Wu Wenchuan & Bai Sijun (2018) proposed the evaluation index system for the project management capability of national defense research institutes and used the principles and methods of fuzzy preference relationship group decision-making to screen the indicators, establishing the evaluation index system for the project management capability of national defense research institutes[8]; Chen Zejin . et al (2024) constructed a customs industry exhibition effectiveness evaluation index system, and used the entropy method and fuzzy comprehensive evaluation method to evaluate the importance and comprehensive level of the corresponding indicators[1].

3 Construction of Project Management Evaluation Index System

3.1 Core Elements of Enterprise Project Management

Summarized from the literature review, the core elements of enterprise project management under the background of digital transformation include:

(1)Strategic alignment. In the process of digital transformation, the strategic objectives of enterprises usually change, and project management must ensure that the direction and objectives of the project are consistent with the new strategy.

(2)Team building. Team building is particularly important under the background of digital transformation because digital transformation requires the participation of multiple departments. Yordanova (2024) found that good team building can promote collaboration and information sharing between departments to cope with rapidly changing market demands and technical environments.

(3)Application of intelligent technology. Tarawneh et al. (2024) found that Intelligent technology plays a key role in project management: using artificial intelligence and automated tools to improve project management efficiency can reduce manual errors; through big data and analytical tools, project progress, cost, and quality can be monitored in real-time, providing data-driven decision support.

(4)Customer satisfaction. Tarawneh et al. (2024) found that under the background of digital transformation, changes in customer needs are more frequent, and it is necessary to establish effective customer communication and feedback mechanisms to continuously improve project management and delivery quality.

(5)Risk management. Zhong et al. (2022) found that digital transformation means that enterprises face a more complex and rapidly changing environment. Therefore, it is more important to timely identify various risks that may be encountered in the project process and formulate effective response strategies.

(6)Digital infrastructure. Under the background of digital transformation, it is necessary to build a unified computing operation platform, unified infrastructure, and unified data resource management to provide technical support and data foundation for enterprise project management.

3.2 Background and Current Status of Digital Scientific Research Institution Construction

To thoroughly implement the national and corporate work requirements on digital transformation, China's scientific research institutions issued the "Digital Scientific Research Institution" construction plan in October 2021, which clarified the "156" overall framework: one goal is to build the scientific research institution into a "converging, open, collaborative, and intelligent" digital scientific research institution; five digital constructions are scientific research innovation digitalization, testing and certification digitalization, professional support digitalization, business management digitalization, and employee service digitalization; six capability constructions are unified computing operation platform construction, unified infrastructure construction, unified data resource management, unified common support technology, unified network security protection, and unified operation and maintenance support services.

Since the issuance of this construction plan, twelve actions and fifty key work tasks have been formulated around the "five digitalizations" and "six unified capabilities," among which twenty-two tasks have been basically completed, twenty-four tasks are being promoted, and four tasks have not yet started. An initial digital system architecture for scientific research, testing, support, business, and service operations has been formed, and all core business systems have been migrated to the cloud, achieving a transformation from dispersed to centralized and independent to collaborative business and data, as well as a shift from offline to online business management models. At the same time, an enterprise-level hub platform and a multi-cloud management platform have been built, achieving full-domain resource allocation, promoting the construction of a data lifecycle management platform, initially achieving data convergence and sharing, and building a unified network security protection system to enhance the level of automated management of IT operations and network security.

However, there are still many problems in project management during the digital construction process of scientific research institutions:

(1)The practicality of the project management system is insufficient: the daily active user count of some systems is low, even close to 0, indicating that existing project management systems may have deficiencies in user experience, functional practicality, or user demand satisfaction.

(2)The penetration and collaboration of project management are insufficient: in the multi-system management of different types of projects, information such as project funds, contracts, progress, personnel, and results are not effectively associated, leading to low project management efficiency.

(3)Insufficient scientific research knowledge sharing: there is insufficient sharing of knowledge and professional data such as projects, patents, papers, and technical reports between units, affecting the efficiency and quality of project management.

(4)System repetition reporting issues: business management and processes have not achieved full penetration, and there are issues with repeated reporting, which increases the workload of project management and reduces efficiency.

(5)System function optimization requirements: there are deficiencies in product design, service processes, and system quality in core systems, leading to frequent user help requests, indicating that the functions of project management-related systems need further optimization and upgrading.

(6)Institute collaboration is insufficient: the current business management system is mainly for departmental business applications, with insufficient support for personnel, project, procurement, and assessment management at the institute level, affecting project management collaboration.

(7)Lack of unified business processes and data standards: the business processes and data standards for project management are not unified, making it difficult to effectively collaborate on cross-departmental or cross-level project management work.

(8)Mobile office business coverage is not comprehensive: high-frequency mobile office businesses such as business application approval, mobile reimbursement, and meeting room booking are not comprehensively covered, affecting the convenience and timeliness of project management.

Therefore, under the background of digital transformation, it is necessary to construct a project management index evaluation system that conforms to the current situation of scientific research institutions. In addition to general indicators, the above situation should also be considered.

3.3 Determination of Evaluation Indicators

Based on the core elements of enterprise project management in the context of digital transformation, and considering the current development of the Digital Electric Power Research Institute, 20 evaluation indicators fitting the "156" framework of the Digital Electric Power Research Institute were ultimately established, as shown in Table 1. These indicators encompass various aspects, including platform stability, independent controllability, asset management, data management, network security, and user satisfaction, allowing for a comprehensive quantitative assessment of the Institute's development outcomes.

Table 1. Evaluation Indicators for Project Management in Scientific Research Institutions

Serial Number	Domain	Evaluation Indicator	Indicator Description
1	Research and Innovation Digitalization	Project management digital coverage rate	The extent of digital coverage of scientific research project management
2		Collaborative R&D digital support rate	The proportion of collaborative R&D activities supported by digital means
3	Digitalization of Testing and Certification	Service process online coverage rate	The proportion of online detection and certification service processes
4		Detection process automation coverage rate	The coverage rate of automation technology application in the detection process
5	Professional Support Digitalization	Technical supervision business control digital coverage rate	The coverage rate of technical supervision business control on the digital platform
6		Professional support digital capability contribution rate	The contribution rate of professional support digitalization to the overall business capability improvement

7	Digitalization of Business Management	Business management digital coverage rate	The extent of digital coverage of business management activities
8		Core business indicator monitoring rate	The monitoring coverage rate of core business management indicators
9	Digitalization of Employee Services	Mobile office user coverage rate	The proportion of mobile office system users
10		Employee service satisfaction	The satisfaction of employees with digital services
11	Unified Computing and Operations Platform	Platform reliable operation rate	Measures the stability and reliability of the unified computing operation platform
12		Platform autonomous control rate	Evaluates the degree of domestic substitution of servers, databases, components, operating systems, etc.
13	Unified Infrastructure Development	New asset management rate	Measures the proportion of new IT assets incorporated into the management system
14		Infrastructure operation rate	The operational efficiency and stability of infrastructure
15	Unified Data Resource Management	Data access standard rate	The standardization of self-built business system data included in unified management
16		Self-built business system data management rate	The proportion of self-built business system data managed uniformly.
17	Unified Common Support Technologies	"Common +" professional application quantity	Measures the quantity of common technical services for cross-professional applications
18	Unified Network Security Protection	Number of major network security incidents	The number of occurrences of network security incidents
19	Unified Operation and Maintenance Support Services	Information system operation rate	The proportion of stable operation time of information systems
20		2786 call satisfaction rate	The user satisfaction of the customer service system

3.4 Determination of Indicator Weights

This paper selects a total of 20 indicators to evaluate the effectiveness of project management in scientific research institutions. After determining the evaluation indicators, determining the weights of each indicator is a key step in constructing the evaluation system. There are many methods to determine the weights of indicators, such as the Analytic Hierarchy Process (AHP), subjective weighting method, entropy method, Principal Component Analysis (PCA), etc. This paper adopts the entropy method (Xin wang, Weiyan M et al) to weight each evaluation indicator. Compared with the traditional expert scoring method, this method eliminates subjective factors to a certain extent and is more objective and comprehensive. The specific steps are as follows:

1.Record the scores of selected samples as x_{ij}, where i represents the sample number and j represents the indicator number. In actual research, different sample data are selected. Record the project scores on the indicator as x_{ij}.

2.Data standardization. Indicators may have different dimensions, which will affect the comparison and analysis of data. To compare data on the same scale, it is necessary to standardize the indicators. There are many methods for unifying dimensions, such as standardization and normalization. Among them, normalization scales the data to a

[0,1] interval range. Here, we use the min-max standardization method to normalize different indicators.

When processing, it is also necessary to consider whether the selected indicators are positive or negative. Positive indicators are better when the values are larger, while negative indicators are better when the values are smaller. Therefore, different algorithms are needed for standardizing indicators. Among the 20 indicators we selected, except for the number of major network security incidents as a negative indicator, the others are all positive indicators.

The max-min standardization calculations for positive and negative indicators are shown in Equations (1) and (2), respectively:

$$x_{ij}' = \frac{x_{ij} - \min\limits_{1\le i\le I}\{x_{ij}\}}{\max\limits_{1\le i\le I}\{x_{ij}\} - \min\limits_{1\le i\le I}\{x_{ij}\}} \tag{1}$$

$$x_{ij}' = \frac{\max\limits_{1\le i\le I}\{x_{ij}\} - x_{ij}}{\max\limits_{1\le i\le I}\{x_{ij}\} - \min\limits_{1\le i\le I}\{x_{ij}\}} \tag{2}$$

where x_{ij}' is the standardized indicator value, and x_{ij} is the original indicator value.

3.Calculate the indicator weight. The weight of the j-th indicator in the i-th sample is calculated as shown in Equation (3):

$$p_{ij} = \frac{x_{ij}}{\sum\limits_{i=1}^{I} x_{ij}}, \quad i = 1,2,...,I; j = 1,2,...,J \tag{3}$$

4.Calculate the entropy value of the indicator. The entropy value of the j-th indicator is calculated as shown in Equation (4):

$$e_j = -k / \sum_{i=1}^{I} p_{ij} \ln(p_{ij}), j = 1,2,...,J \tag{4}$$

Where $k = 1/\ln(I)$, $k > 0$, $e_j > 0$.

5.Calculate the information entropy redundancy. The information entropy redundancy of the j-th indicator is calculated as shown in Equation (5):

$$d_j = 1 - e_j, j = 1,2,...,J \tag{5}$$

6.Calculate the weight of each indicator. The weight of the j-th indicator is calculated as shown in Equation (6):

$$w_j = \frac{d_j}{\sum_{j=1}^{J} d_j}, j = 1,2,...,J \tag{6}$$

7.Calculate the final score of each project. The final score of the project is calculated as shown in Equation (7):

$$s_i = \sum_{j=1}^{J} w_j x_{ij}, i = 1,2,...,I \tag{7}$$

Case Analysis

In this study, we selected 10 actual research projects from within the scientific research institutions as samples and obtained the initial scores for each indicator of these samples according to pre-established rules, as shown in Table 2:

Table 2. Initial Scores of Each Sample

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
Indicator 1	0.74	0.62	0.81	0.91	0.70	0.59	0.79	0.55	0.74	0.84
Indicator 2	0.71	0.92	0.58	0.88	0.86	0.79	0.53	0.85	0.68	0.78
Indicator 3	0.54	0.89	0.94	0.51	0.76	0.82	0.69	0.72	0.74	0.60
Indicator 4	0.93	0.94	0.53	0.70	0.59	0.75	0.81	0.62	0.93	0.61
Indicator 5	0.58	0.93	0.51	0.75	0.73	0.94	0.82	0.82	0.95	0.93
Indicator 6	0.81	0.66	0.77	0.73	0.78	0.77	0.86	0.87	0.75	0.63
Indicator 7	0.56	0.91	0.62	0.76	0.63	0.80	0.56	0.69	0.95	0.74
Indicator 8	0.64	0.54	0.57	0.84	0.60	0.51	0.72	0.63	0.61	0.63
Indicator 9	0.77	0.89	0.64	0.92	0.55	0.89	0.64	0.80	0.57	0.67
Indicator 10	0.81	0.67	0.55	0.93	0.76	0.85	0.79	0.61	0.75	0.71
Indicator 11	0.75	0.58	0.52	0.64	0.62	0.60	0.90	0.93	0.92	0.66
Indicator 12	0.59	0.82	0.89	0.88	0.91	0.50	0.78	0.91	0.94	0.79
Indicator 13	0.82	0.84	0.68	0.55	0.92	0.58	0.57	0.87	0.76	0.74
Indicator 14	0.90	0.86	0.83	0.51	0.55	0.74	0.53	0.92	0.59	0.84
Indicator 15	0.54	0.76	0.76	0.76	0.54	0.58	0.69	0.53	0.65	0.84
Indicator 16	0.53	0.87	0.60	0.50	0.83	0.72	0.82	0.87	0.95	0.81
Indicator 17	9	8	9	5	7	9	3	3	3	7
Indicator 18	0	2	1	0	2	0	1	1	2	1
Indicator 19	0.86	0.90	0.93	0.60	0.50	0.79	0.54	0.75	0.93	0.84
Indicator 20	0.92	0.52	0.89	0.94	0.82	0.56	0.79	0.88	0.53	0.73

Except for Indicator 18 (number of major network security incidents), all other indicators are positive indicators. The weights of each indicator, calculated according to Equations (1) to (6), are shown in Table 3:

Table 3. Weights of Each Indicator

Serial Number	Domain	Evaluation Indicator	Indicator Weight
1	Research and Innovation Digitalization	Project management digital coverage rate	0.09
2		Collaborative R&D digital support rate	0.05
3	Digitalization of Testing and Certification	Service process online coverage rate	0.03
4		Detection process automation coverage rate	0.05
5	Professional Support Digitalization	Technical supervision business control digital coverage rate	0.02
6		Professional support digital capability contribution rate	0.01
7	Digitalization of Business Management	Business management digital coverage rate	0.03
8		Core business indicator monitoring rate	0.08
9	Digitalization of Employee Services	Mobile office user coverage rate	0.03
10		Employee service satisfaction	0.08
11	Unified Computing and Operations Platform	Platform reliable operation rate	0.02
12		Platform autonomous control rate	0.02
13	Unified Infrastructure Development	New asset management rate	0.01
14		Infrastructure operation rate	0.09
15	Unified Data Resource Management	Data access standard rate	0.04
16		Self-built business system data management rate	0.05
17	Unified Common Support Technologies	"Common +" professional application quantity	0.06
18	Unified Network Security Protection	Number of major network security incidents	0.10
19	Unified Operation and Maintenance Support Services	Information system operation rate	0.06
20		2786 call satisfaction rate	0.08

The final scores of each project, calculated according to Equation (7), are shown in Table 4:

Table 4. Final Scores of Each Sample

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
Final Scores	0.62	0.53	0.46	0.64	0.44	0.47	0.45	0.50	0.49	0.54

The above results indicate that the "number of major network security incidents" carries the highest weight, followed by "digital coverage rate of project management" and "infrastructure operation rate." This suggests that in the process of digital project management, the fundamental requirement is to ensure the proper functioning of various facilities. On this foundation, efforts should be made to utilize intelligent and digital means to cover the entire project management process as much as possible, while enhancing risk management to minimize the occurrence of major network security incidents. Moreover, in the development of the Digital Electric Power Research Institute, it is crucial to strengthen monitoring of core indicators and pay greater attention to both employee and customer satisfaction.

Based on the indicator weights and final project scores, it can be concluded that the evaluation indicator system established in this study can be applied to evaluate the project management capabilities of the Electric Power Research Institute. It also helps identify weaknesses in project management, providing a reference for formulating targeted improvement measures for the development of the Digital Electric Power Research Institute.

4 Summary

4.1 Research Achievements Summary

Constructing a project management evaluation index system under the background of digital transformation for scientific research institutions aims to fully quantify the construction effectiveness of digital scientific research institutions and provide corresponding decision-making basis for future construction of scientific research institutions and similar corporate digital construction. The main research achievements of this paper are:

1.Based on the core elements of enterprise project management summarized from the literature review, combined with the current situation of digital scientific research institution construction, 20 specific evaluation indicators suitable for digital project management of scientific research institutions are determined, providing a set of quantified standards for project management of scientific research institutions, making the effectiveness of project management can be objectively measured and evaluated. Through these indicators, scientific research institutions can clearly identify the strengths and weaknesses in the project management process, thus making targeted improvements and optimizations.

2.After determining the quantified evaluation indicators, the entropy method is used to more objectively determine the weights of each indicator, constructing a complete project management index evaluation system. This system not only covers traditional project management key areas such as project progress, cost control, and quality assurance but also integrates modern management concepts such as innovation, collaboration, and digitalization.

3.The evaluation system constructed in this paper can provide theoretical and data support for the standardization, automation, and intelligence of project management in scientific research institutions, help improve the transparency and efficiency of project management, ensure the rational allocation and utilization of project resources, enhance the sense of responsibility and urgency of the project team, promote communication and collaboration across departments and levels, ensure that project objectives are consistent with organizational strategies, and thus promote the overall development and innovation of scientific research institutions, providing a solid support for scientific research institutions to maintain a leading position in fierce market competition.

4.2 Research Limitations

Although this study has achieved certain results in constructing a project management evaluation index system under the background of enterprise digital transformation, there are still some limitations.

1.This study is primarily based on literature analysis and includes a case analysis using a small set of data. However, it still lacks comprehensive data collection and empirical analysis, which means that the research results are not well-supported by actual project data and, to some extent, may not accurately reflect the realities of project management practices.

2.Although this study has proposed 20 evaluation indicators, whether these indicators fully cover all key aspects of digital project management of scientific research institutions, and whether they need to be adjusted according to the specific needs of project management, are issues that require further research. In addition, this study mainly focuses on the internal project management evaluation of enterprises and less on the impact of the external environment. Digital transformation is a complex systematic project, involving not only internal enterprise management but also influenced by various external factors.

3.Digital transformation is a continuous evolution process, and the evaluation index system for project management also needs to be continuously adjusted and optimized. This study may not fully consider this dynamic change, leading to the evaluation system may not be flexible enough in the face of new situations.

4.The evaluation index system constructed in this study is mainly based on the current situation of digital scientific research institutions and is suitable for scientific research institutions and similar scientific research institutions, but different types of enterprises face different challenges and needs in the process of digital transformation. The universality of the index evaluation system constructed in this paper is low.

4.3 Future Research Directions

Based on the above research achievements and limitations, this study proposes the following future research directions:

1.Future research can conduct a large number of empirical studies, collect actual project management data, conduct empirical analysis, verify and adjust the existing evaluation index system to ensure the accuracy and practicality of the evaluation results.

2.In future research, the impact of the external environment should be further considered to construct a more comprehensive evaluation system. It can comprehensively consider various external factors such as policies and regulations, market environment, and technological development to construct a more scientific and comprehensive project management evaluation index system.

3.Future research should further study how to construct a project management evaluation system that can adapt to the dynamic environment of digital transformation, making it flexible to cope with technological, market, and organizational changes.

4.Future research can carry out in-depth research on different types of enterprises, especially emerging industries. The application and performance of digital transformation in different types of enterprises have significant differences. Therefore, it is necessary to construct targeted evaluation index systems based on the characteristics of different industries.

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