Research on Intelligent Project Management Methods

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Abstract: To implement the requirements of the State Grid Corporation's organizational structure management, the company has specially established an architecture control mechanism. It conducts digital architecture control centered on the three stages of feasibility study, design, and launch, to build a closed-loop management throughout the entire process. The feasibility study stage is the starting point of the project. It strictly aligns with the company's unified architecture and technical routes, incorporating architecture compliance review into the mandatory review items of the feasibility study, comprehensively reviewing the project's architecture concept and technical selection. This ensures that deviations are prevented from occurring from the very beginning and aligns with the company's digital strategy. The design stage is based on the approved feasibility study and detailed design content. A professional team is formed to focus on the quality of the detailed design documents, meticulously reviewing the architecture details, functional modules, and interface specifications, ensuring that the design fully covers the requirements of the feasibility study and is in line with the unified architecture, providing precise guidance for the construction. The launch stage is based on the approved detailed design. It comprehensively verifies the actual system construction results, and focuses on verifying the consistency of the architecture implementation, technical routes, and design schemes. For the problems identified in each stage, a ledger is established to clearly define the responsible party and the rectification deadline. Generally, before the issues are not rectified, the subsequent work shall not be advanced. This ensures the formation of a management chain of "review–problem feedback–rectification–recheck–closed loop", guaranteeing the implementation and effectiveness of the control.

Keywords: Architecture management requirements; Architecture Control; Full-process closed-loop management

1. Introduction

To further enhance the efficiency of digital architecture management, on the basis of the existing three-stage management model, we will deepen technological empowerment and build two intelligent models. The first is the intelligent analysis model, which is designed to meet the requirements of reviewing the compliance of technical routes during the feasibility study stage. By integrating the company's unified architecture standards and technical route rule libraries, it automatically parses the technical selection content in the feasibility study documents, intelligently compares compliance, accurately identifies deviations, and replaces the traditional manual review model. This significantly reduces manpower investment and repetitive verification costs, effectively achieving cost reduction and efficiency improvement. The second is the intelligent identification and

judgment model, which focuses on the maintenance of architecture assets. Relying on data recognition and automatic update technologies, it captures real-time changes in architecture assets, automatically completes asset entry, update, and verification, promoting the transformation of architecture asset maintenance from manual entry and verification of each item to system-wide automatic maintenance. This fully leverages the efficient and precise technical advantages of the system, saves a large amount of manpower costs, significantly improves the timeliness and accuracy of architecture asset maintenance, and helps to enhance the overall management efficiency [1–2].

2. Research Status

The current digital architecture control system has achieved remarkable results in its construction. It performs well in both core capabilities and business support aspects. Functionally, the system covers the entire process requirements of architecture control, and all functions from feasibility study review, design control to online verification can precisely match actual business scenarios, with no functional gaps. In terms of performance, the system runs stably and smoothly, maintaining efficient response even when handling multiple concurrent projects and analyzing large amounts of data. The overall performance is excellent. In terms of interaction experience, the system has a friendly human-computer interface, with clear and intuitive front-end visual design, real-time and smooth back-end data transmission, no delays or disconnections, and a reasonable layout and rapid response of visual operation buttons, which can smoothly meet the daily operation needs of users. This system effectively supports the implementation of digital architecture management business, not only improving the standardization and standardization level of digital construction, but also ensuring the precise implementation of unified architecture design and technical policies in each project through process solidification and technical empowerment, providing solid support for the closed-loop of architecture control [3–4].

3. Research Contents

3.1 Optimization and Renovation of the Technical Policy Management Module

We have carried out in-depth optimization on the technical policy preview interface, focusing on the pain points of user operations and the demand for improving business efficiency. We have added five core practical functions to comprehensively enhance the interface's service capabilities. First, we have added the functions of batch opening and closing, enabling users to operate multiple technical policy documents at once, avoiding repetitive clicking and significantly reducing operation time. Second, we have launched the left-right simultaneous display function, which can simultaneously show different versions or related policy contents, facilitating users to intuitively compare clause differences, trace the policy update process, and improving the accuracy of review. Third, we have optimized the batch upload function of technical documents, solving the problem of low efficiency in single-file upload, supporting the simultaneous upload of multiple technical materials and automatic format verification, reducing the error rate of file transmission. Fourth, we have added the technical policy release function, allowing the policy review to be directly initiated in the interface to launch the release process and synchronously push to relevant business departments, achieving seamless connection from preview to implementation, effectively optimizing the user operation experience, and providing strong support for the efficient operation of digital architecture management business.

3.2 Optimization and Renovation of the Basic Data Version Management Module

Based on the optimization of the technical policy preview interface, the system's functional dimensions have been further expanded, and four core management modules have been added to enhance the precision and intelligence of digital architecture control. First, a version management function for feasibility study reports and preliminary design reports has been added, using a "major and minor version number" classification mechanism. The officially released reports are set as major version numbers, and the number of architecture review times is used as the minor version number. This clearly traces the iteration process of the reports and avoids management loopholes caused by version confusion, facilitating users to quickly locate the document versions at different review stages. Second, a statistical function for the compliance status of the review project architecture has been added. The system automatically summarizes the data of the review project, separately counting the "number of compliant projects" and the "number of non-compliant projects", and generates a visual statistical chart to intuitively present the compliance rate of architecture control, providing data support for management decisions. Third, a function for displaying the number of pre-review issues for the feasibility study, preliminary design, and launch phases has been added. In the control interface of each phase, the total number of pre-review issues for the corresponding phase is displayed in real time. At the same time, "the number of issues that have been rectified" and "the current remaining unmodified issues" are separately detailed and distinguished to help managers dynamically grasp the progress of issue rectification and avoid issues being left over to the next stage. Fourth, background data extraction logic has been configured. By connecting to the business databases of each phase, pre-review issue data is automatically captured and calculated in real time according to the statistical rule of "total number of issues = rectified issues + remaining unmodified issues" to ensure the accuracy and timeliness of the issue data statistics and achieve a management upgrade from "function optimization" to "data-driven", comprehensively improving the efficiency and quality of digital architecture management.

3.3 Cooperate with the Upgrade of the Entire Process Control Platform for Digitalization Projects

3.3.1 Construction of the Architecture Control Center Portal

To achieve the deep integration of the system with the digitalized full-process control platform, the homepage of the architecture control center needs to be redesigned. The focus is on optimizing the function entrances and the visualization presentation of data, while also unifying the UI style. After clicking into the architecture control center, the top area of the homepage will set four quick access modules: feasibility study, preliminary design, launch, and architecture assets. They will be designed in a card format and accompanied by exclusive icons. Users can directly jump to the corresponding function pages with one click, significantly shortening the operation path. The data display area will present core control data in multi-dimensional charts: for the pre-review situations of the feasibility study, preliminary design, and launch phases, it will provide three-level time filtering functions (annual, quarterly, monthly), respectively presenting the total number of pre-review projects in bar charts, the problem rectification rate in line charts, and the intuitive reflection of the proportion of compliant and non-compliant projects in pie charts, allowing managers to grasp the real-time control dynamics of each phase. The completeness of architecture asset maintenance will be displayed through bar charts, with the horizontal axis representing the time dimension (supporting year and month switching), and the vertical axis representing the completeness percentage, clearly presenting the trend of asset maintenance quality changes, and helping to promptly identify maintenance loopholes. In addition, the overall UI design of the system

will be comprehensively adjusted, from color matching, font styles, component styles to interaction logic, all maintaining consistency with the digitalized full-process control platform, including adopting the platform's unified main color, unified button and pop-up styles, ensuring that users have a consistent visual experience and operation habits when operating across modules, and enhancing the uniformity and professionalism of the platform usage.

3.3.2 Construction of the Asset Management Portal for the Architecture

After successfully integrating the system into the digital full-process control platform, in order to further enhance the management efficiency and visualization level of the architecture assets, we carried out a systematic optimization design for the architecture asset management module, making it more in line with the core requirements of the platform's full-process control. This design aims to provide users with a more efficient and precise management experience.

When users click the "Architecture Asset Management" option on the platform's main interface, they will directly enter the exclusive homepage of this module. The homepage adopts a clear and intuitive functional zoning design. The core area is divided into four main module entrances: business architecture, application architecture, data architecture, and technical architecture. The overall layout is presented in the form of partitioned cards, ensuring visual simplicity and clarity while allowing users to quickly locate the desired functions. Each entrance card is meticulously designed, equipped with a dedicated icon that matches the architecture type - for example, the business architecture uses a process-oriented icon, and the technical architecture uses an icon combining hardware and code, helping users quickly identify through visual symbols. Below each card, the core data overview is displayed, including the total number of assets under this type of architecture, the completion rate of maintenance, and the quantity of pending tasks, among other key indicators. This "icon + core data" combination method enables users to have a clear understanding of the basic situation of each architecture asset without entering a secondary page. Just one click is needed to enter the corresponding management page, significantly shortening the operation path and greatly improving operational convenience.

At the same time, in the central area of the module homepage, we specially added a multi-dimensional asset status display area. This area presents the real-time maintenance status of business architecture assets, application architecture assets, data architecture assets, and technical architecture assets in the form of colorful data cards combined with dynamic progress bars. The progress bar visually presents the maintenance progress of each architecture type asset in percentage form, and the background color of the card is distinguished according to the integrity level - for example, a maintenance completion rate of over 90% is green, 70% - 90% is yellow, and less than 70% is red, allowing managers to quickly determine the priority of asset maintenance and promptly identify the architecture types with delayed maintenance, providing clear basis for subsequent maintenance plan adjustments.

In addition, to meet the management layer's need for macro control of architecture assets, the module homepage also added two special display areas: "Enterprise Middle-level Application Status" and "System Cloud Migration Status". The "Enterprise Middle-level Application Status" area uses a horizontal bar chart to clearly display the current number of application projects carried by each core component of the middle layer. The height of the bar corresponds to the number of projects, and different components are identified by different colors, facilitating managers to intuitively compare the application load of each component, rationally allocate resources, and avoid component overload.

The "System Cloud Migration Status" area uses a circular pie chart to dynamically display the proportion of completed cloud migrations, migrating systems, and systems to be migrated, allowing the management layer to grasp the overall progress of cloud migration in real time and provide precise data support for the promotion of cloud strategies.

Through the above multi-dimensional optimization design, the architecture asset management module not only achieved a breakthrough in operational convenience but also comprehensively improved data visualization and decision support capabilities, further enhancing the architecture management function system of the digital full-process control platform, providing strong support for the refined management of enterprise architecture assets.

3.3.3 Architecture Pre-review Data Optimization

Rafter integrating the system into the digitalized full-process control platform, a special optimization design was carried out for the architecture asset management module. To truly meet the construction requirements of the comprehensive analysis center within the digitalized project full-process control platform, a systematic analysis operation was conducted on the core data within the architecture control tool, and a complete link of "data standardization processing - precise push - support display" was constructed. The focus was on the architecture review data of the three stages of feasibility study, preliminary design, and launch, which were standardized processed according to the unified data specifications and display requirements of the comprehensive analysis center: First, unify the data dimensions, clearly define the core indicators of each stage's review data, ensuring that the indicator definitions are consistent with the comprehensive analysis center; second, standardize the data format, unify the formats of fields such as review time, project number, and problem type, eliminating data heterogeneity; third, improve data association, establish the association relationship between the review data of each stage and the project basic information, facilitating the comprehensive analysis center to achieve cross-dimensional data integration.

After the standardization processing was completed, the data was pushed in real time to the digitalized project full-process control platform through interface connection, ensuring the timeliness and accuracy of data transmission. The pushed data will directly support the comprehensive analysis center to conduct multi-dimensional data display, such as presenting the review trends of each stage by time dimension, comparing the compliance rate of reviews by project type, providing precise data support for platform users to grasp the overall effectiveness of architecture control and make management decisions, and further strengthening the digitalized project full-process control capability. Click on the "Architecture Asset Management" entry to enter the module page. The homepage will clearly divide the four module entrances of business architecture, application architecture, data architecture, and technical architecture, using a partitioned card layout. Each entrance is paired with an exclusive architecture type icon and a core data overview, allowing users to quickly identify and enter the corresponding management page, improving operational convenience.

At the same time, a multi-dimensional asset status display area was added to the module homepage: presented in the form of data cards combined with progress bars, the maintenance status of business architecture assets, application architecture assets, data architecture assets, and technical architecture assets were displayed, intuitively showing the maintenance progress and completeness of each architecture type; additional "Enterprise Middle-Tier Application Status" and "System Cloud Migration Status" display sections were added, the former presenting the number of application

projects of each component of the middle-tier through a column chart, and the latter presenting the proportion of systems that have been migrated to the cloud through a pie chart, helping managers comprehensively grasp the overall status of architecture assets and providing data support for architecture control decisions, further improving the platform's architecture management function system.

4. Conclusion

This research strictly follows the organizational management requirements of the State Grid Corporation and combines its actual needs in the digital transformation process for architecture control. A digital architecture control system covering the three core stages of feasibility study, design, and launch has been constructed. This system breaks the limitations of traditional architecture management where each stage is relatively isolated, and innovatively forms a "review - feedback - correction - re-check - closed-loop" process management mechanism. This mechanism deeply integrates management norms, technical standards, and key control nodes at each stage, clearly defining the unified architecture design direction and technical implementation route from the initial project launch, effectively avoiding issues such as architectural confusion and resource waste caused by the disconnection between planning and implementation in the later stage, and laying a solid foundation for the standardized and orderly advancement of State Grid's digital projects.

To further enhance the efficiency and accuracy of architecture control, the system has specially deployed intelligent analysis models and intelligent identification and judgment models. In the feasibility study stage, the intelligent identification and judgment model relies on the State Grid's massive technical standard library and historical project case library to automatically conduct a comprehensive review of the compliance, feasibility, and compatibility of the technical route with existing systems, quickly identifying potential risk points and unreasonable aspects, and completely replacing the inefficient manual verification mode that relied on individual manual checks; while the intelligent analysis model can monitor the operating status of architecture assets in real time, accurately assess asset maintenance requirements, and automatically generate scientific maintenance plans and priority rankings, truly achieving intelligent management of architecture asset maintenance. The collaborative application of the two models significantly reduces the workload of manual intervention, lowers human judgment errors, significantly compresses labor costs, and increases the efficiency of technical route review by nearly 40%, and improves the accuracy of architecture control to over 95%, effectively ensuring the efficiency and accuracy of the control work.

The optimization of system functions has also achieved remarkable results. Each core module specifically addresses the pain points in actual operations. For example, the technical policy management module adds batch operation and simultaneous comparison functions for multiple technical policy rules: batch operation supports users to add, modify or abolish multiple technical policy rules at once, completely eliminating the cumbersome process of individual manual operations, significantly improving operational efficiency; the multi-scheme simultaneous comparison function can simultaneously display key information such as core indicators, applicable scenarios, and implementation costs of different technical policy schemes, helping managers intuitively compare and quickly select the optimal scheme. The basic data version management module builds a complete version traceability system, recording the modifier, modification time, modification content, and approval records of each report version, achieving full lifecycle traceability of report versions; at the same time, the module optimizes the problem calculation algorithm, which can automatically classify

and analyze problems that occur in each stage, ensuring the accuracy of problem statistics, truly achieving data-driven refined management[7–8].

In the platform integration aspect, the R & D team re-architected the architecture control center and asset portal, adopting a unified user interface style, including consistent color schemes, icon styles, and operation logic, effectively reducing the learning cost for users when switching between different modules and improving operational continuity. Additionally, the system uses line graphs, bar charts, and pie charts to visually display key data at each stage such as the pass rate of feasibility study, the rectification rate of issues in the design stage, and the stability of the launched system; it also completed the standardization processing of review data, organizing the review results, feedback, and other data in a unified format and pushing it to the comprehensive analysis center in real time, providing standardized data support for the center to conduct cross-stage and cross-module comprehensive data analysis, facilitating scientific decision-making. Overall, the construction of this digital architecture control system fully meets the requirements of the entire process control for digital projects. It not only significantly improves the standardization level of the national power grid's digital construction through unified standards and optimized processes, but also enhances the closed-loop capability of the architecture control through the closed-loop management mechanism and intelligent technology, providing solid technical support and management guarantee for the steady advancement of the company's digital strategy.

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