Design and Implementation of “multi survey integration” Management Service Platform

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Abstract. Many cities have carried out the construction of “multi survey integration” management service platform, which implement the requirements of the state council on the sharing and utilization of surveying and mapping results involved in the approval of engineering construction projects, and promote the implementation of the reform of "multi survey integration". The platform realize the standardization, flow and informatization of "multi survey integration" management, reduce the burden of enterprises and improve the approval efficiency. This paper expounds the construction idea, system architecture, function design and key technology of the "multi survey integration" management service platform in detail, and realizes the design idea discussed in this paper through the construction of the "multi survey integration" management information system platform in Jiangxi Province. The establishment of the system realizes the online entrustment and management of the "multi survey integration" project in Jiangxi Province, the management and sharing of surveying and mapping results. The functions of supervision of surveying and mapping units and projects, quality inspection and audit of surveying and mapping results provide information support for the steady progress of the "multi survey integration" reform.

1. Introduction

In order to deepen the reform of "deregulation, management and service" and optimize the business environment, promote the transformation of government functions to reducing examination and approval, strengthening supervision, optimizing services, and promoting fair competition in the market, the State Council puts forward that "for the surveying work involved in the acceptance, it is necessary to implement one-time commission, unified surveying and mapping, and achievement sharing ". By using information technology and internet technology, we should build a multi-functional and efficient comprehensive service platform for "multi survey integration" surveying and mapping results sharing service, unified market supervision, online collaborative approval, etc., and form a service system for "multi survey integration" public service, government affairs handling and unified supervision of engineering construction projects, covering all aspects of engineering construction project surveying and mapping intermediary service, examination and approval departments. It will make the "multi survey integration" reform more efficient, convenient, fair and traceable.

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2. Current situation and demand analysis

2.1. Existing problems
For a long time, there are the following problems in the surveying and mapping work in the field of engineering construction:

- The results are not shared and repeated surveying and mapping. In the field of engineering construction, the special surveying and mapping results needed by various departments in the approval process are led by different departments and repeated surveying in multiple stages, which leads to the fact that the surveying and mapping results cannot be shared.
- There are many contradictions between results gave by different companies. The results of Surveying and mapping, which involve planning, land, real estate, civil air defense, fire protection and other different contents, are lack of mutual check and contradiction.
- At present, most regions have not established a unified "multi surveying integration" management service platform. The "multi measurement integration" business process, product quality and product form are all manually transferred, which makes data sharing difficult and management inefficient.

2.2. Requirement analysis
Based on the above problems, many areas are carrying out the reform work of "multiple survey integration". This work realizes the unified standard, one-time commission and achievement sharing of Surveying involved in the examination and approval of engineering construction projects. The construction of "multi surveying integration" is an important construction content to implement the reform. It is not only a data sharing service platform for realizing the sharing of Surveying achievements in all departments of project approval, but also a department joint audit service platform that can make the approval links and realize the circulation of approval business, and also the dynamic management, credit evaluation of surveying intermediary service institutions The platform of supervision after the event plays a important role in the reform of "multi surveying integration". The following functions are required:

- Business management function, including intermediary service agency management, project entrustment, contract signing, progress control, etc.
- Results management function, includes the functions of results quality inspection, audit and exchange management, achievement sharing and application management, etc.
- Achievement circulation function: provide the upload and download functions of professional data according to the authority, realize the real-time call of all kinds of data and the data exchange of various surveying data.
- Multi system docking function: seamless docking with "Jiangxi investment project online approval supervision platform", "Jiangxi enterprise registration network service platform", "unified online intermediary service supermarket" and other systems, to connect data flow, business flow and approval process.

3. Platform overall design and system architecture

3.1. Overall design of the platform
The platform adopts centralized and distributed operation mode, integrates the functions of government affairs publicity, approval process processing and information exchange. It connects the administrative examination and approval departments of natural resources, urban construction, housing management, emergency, civil air defense and fire protection horizontally, and connects city and county nodes. It realizes a series of interactive and visual online approval and unified supervision, such as data sharing, mutual recognition of achievements, online circulation, collaborative approval, credit evaluation and quality control.
3.2. System architecture

3.2.1. Logical architecture
The logical architecture of management service platform is divided into five layers from bottom to top, namely infrastructure layer, data layer, basic service layer, business application layer and user layer. The standard system and security system constitute the two security systems. The logical architecture is shown in Figure 2.

Fig.1. Business flow chart
Fig. 2. Logical architecture of the platform

3.2.1.1. Infrastructure layer
Infrastructure layer is the infrastructure supporting the "management service platform" operation, including server, virtualization equipment, security device, storage device and various network equipment.

3.2.1.2. Infrastructure layer
The data layer provides data resources for the "management service platform", and the database of the "management service platform" stores structured data, mainly including organization directory database data, surveying project data, audit information data, organization and credit data. Unstructured data is saved by file management server, mainly including surveying and mapping results files and other information attachments. Other shared databases do not directly connect with the "management service platform", and the "management service platform" realizes the data access of other shared databases by accessing the sharing exchange platform.

3.2.1.3. Basic service layer
Based on the data resources of the data layer, it provides basic services for project construction, including:
- Data access, data access to database;
- File access, access to surveying and mapping results files, system user authentication and authorization services;
- External interface service, maintain the interface service of external data exchange and sharing, which is an important guarantee for horizontally connecting other system platforms and getting
through data flow, business flow and audit flow. It is mainly interconnected with “online intermediary service supermarket”, “engineering construction project approval system”, “surveying and mapping qualification management system” and other business systems.

• Business application layer, the business application layer directly interacts with users and provides users with various operation functions. Users operate the corresponding functions provided by the application layer. The application layer calls the basic service layer, and the basic service layer accesses the corresponding data resource database, and finally realizes the access of data resources.

3.2.1.4. User layer
The users of service platform mainly include the following parts: the first part is the users of the government departments, data exchange and approval department, natural resources management department, which provide data sharing services for government agencies through the "provincial integrated online service platform"; The second part is enterprises, mainly including construction units, intermediary service agencies, etc; The third part is the quality inspection organization, which is mainly responsible for the quality inspection of Surveying and mapping results; The fourth part is the public.

3.2.2. Physical architecture.
According to the work needs, the platform is deployed in three major network areas, namely, provincial e-government external network, municipal county-level e-government external network and Internet. Provincial e-government external network deploys provincial documents, databases and application servers, and is interconnected with provincial government service platform and project approval system. The city county-level e-government external network provides management services for the competent departments and the examination and approval departments at the city and county level. Enterprise users (construction units, surveying and mapping intermediary service institutions) access the "management service platform" through the Internet. The physical architecture of the platform is shown in Figure 3.

4. Key technologies
The construction of "multi survey integration" management service platform needs to consider the convenience, performance stability, data security and other requirements, focusing on the following
three key technologies:

- **System security.** “The management and service platform of "multi survey integration" involves enterprise information, personal information, project information, surveying and mapping data and other kinds of information, so ensuring data security is the top priority. In the aspect of network security, because the system needs to be set up in the Internet and the government extranet, the E-government extranet and the Internet are interconnected through the security access strategy to ensure the network connectivity. The external clients can only access other servers through the nginx reverse proxy server to protect other servers from being exposed to the Internet. At the same time, the system security, framework security, database security and database security are guaranteed through firewall, user authentication and authorization, log recording, data backup and other ways.

- **Multi platform docking interface design.** In order to achieve the goal of "let the masses run less and let information run more", the management and service platform of "multi survey integration" needs to realize the docking with the provincial engineering construction project approval management system and other platforms. At present, most provinces have established provincial government data sharing and exchange platforms. Therefore, the external interface needs to be designed according to the docking system platform. If the docking system platform has been connected to the government data sharing and exchange platform, the "management service platform" can share and exchange data through the unified data interface of the exchange platform. If not, the point-to-point interface needs to be developed for data sharing and exchange, and the customized interface can be developed according to the actual situation.

- **Database management strategy and implementation.** "The "multi survey integration" management service platform mainly manages three types of data, including achievement catalog data, vector data and file archives. It realizes unified management of data through two ways: file based form and spatial database based form. The file based form mainly manages project information, surveying and mapping data (including drawings, forms, reports, picture, etc.) through file form, such as warehousing, storage, classification, etc. Based on the form of spatial database, we need to manage the vector data and realize the functions of browsing, querying, locating, retrieving and dynamic updating of the basic geospatial data.

5. **Construction of the “multi survey integration” management service platform in Jiangxi province**

The "multi survey integration" Management Service Platform is developed in Java language according to the notice of the “Interim Measures for the implementation of "integration of multiple measurements" in engineering construction projects of Jiangxi Province” and “the technical specification for "multi survey and integration" of Jiangxi project”, and other documents. It unified distribution and reception of Surveying and mapping services such as verification and measurement of planning conditions, civil air defense survey and real estate surveying and mapping of engineering construction projects, through optimizing the surveying process and unifying the business standard, integrating business platform, which namely, one-time receipt, parallel promotion, time sharing and achievement sharing, and minimize the mapping links and time limit. It mainly includes results review, organization directory database, credit evaluation, project entrustment and contract management, data management, shared services and exchange, platform portal, operation and maintenance 8 sections and 43 functions. The platform is deployed at the provincial, municipal and county levels to achieve vertical and unified business management; The platform connects with Jiangxi project approval management system, Jiangxi online intermediary service supermarket, surveying and mapping project filing, surveying and mapping qualification management system, and mapping operation certificate management system to realize horizontal circulation of management data.

The portal website of the platform is deployed on the Internet and government affairs extranet to provide the functions of policy information release, directory query, project query, etc. After logging
in, the user enters the workbench interface and performs relevant operations according to the user's permissions.

5.1. Directory management module
The module realizes the maintenance, change, submission, inquiry and display of the basic information (name, legal person, qualification scope, technical personnel, instrument and equipment) of intermediary service institutions and construction units. Meanwhile, it provides the information audit and credit management functions of the competent departments to intermediary service institutions and construction units.

5.2. Project management
It provides the functions of project information release, query, commission, project termination, progress query, etc.

![Project progress view interface](image)

**Fig. 4. Project progress view interface**

5.3. Project implementation module
All the project management functions after signing the contract are realized, including the preparation and provision of data before entering the site, the issuance of operation notice by the construction unit, the operation response by the surveying and mapping unit, the progress monitoring and risk warning of the project, complaints and feedback, project statistical analysis, project evaluation and other functions.

![Number of intermediary service institutions and Surveying projects](image)

**Fig. 5. Statistical analysis interface**
5.4. Results management module
To achieve the upload, quality inspection, review and submission of Surveying and mapping results, the process is as follows: the intermediary service organization uploads the surveying and mapping results and submits them to the construction unit. After the construction unit confirms, the results will be submitted automatically. The entrusted quality inspection items are submitted to the third party quality inspection agency for quality inspection and the quality inspection report is uploaded. After the quality inspection is completed, it is confirmed by the construction unit and submitted to the competent department. After the competent department reviews and passes, it is submitted to the approval department for use.

5.5. System operation and maintenance module
It provides various information release functions such as public announcement, user management, menu management, role management, unit management, dictionary management, log management, achievement directory structure setting, etc.

6. Conclusions
With the nationwide promotion of the reform of "integration of multiple tests", the construction of “multi survey integration” management service platform has been carried out in many cities, and its role in project standardized management, improving approval efficiency and reducing the burden of enterprises has been highlighted. In the follow-up, efforts should be made to promote the use of domestic passwords and electronic anti-counterfeiting signatures, further improve data confidentiality and security, establish electronic management of data in the whole life cycle, realize "paperless office" and traceable modification of data management, so as to make the system more comprehensive and convenient.

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