Research on the Development of Real Estate Project Information Management System Based on Web

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Abstract—The real estate project information management system based on Web technology and Python language realizes the innovation and optimization of traditional project management mode in real estate enterprises. With the advantage of network information technology, the real estate project information management system emphasizes the sharing and effectiveness of information to change the current information exchange mode of real estate enterprises. In view of the complexity and variability of current real estate enterprise projects, the system has a direct impact on the quality, production cost, management efficiency, economic benefits and other aspects of engineering projects with system functions such as project management, bidding management, cost management and implementation management, thus promoting the scientific management and fine control of the whole project. The construction of the real estate project information management system, as the only way for the informatization construction of the real estate industry, has also made an innovative attempt for the deepening reform of China's real estate industry and fields

Keywords-Web technology; real estate enterprise; project information management system; information construction

1 Introduction

With the rapid development of China's social economy, urban construction and development are constantly on a new level, and the level of urbanization has been further improved. Behind these remarkable achievements, there is a close connection with the rapid development of the real estate industry and great economic contribution. With the expansion of the real estate market, real estate enterprises are also growing rapidly, and more and more real estate projects are managed by them. As far as the characteristics of real estate projects are concerned, they are characterized by many categories of projects, wide coverage, long process cycle and large cost investment, which brings great challenges to the project management of real estate enterprises. According to the survey, the current project management modes of real estate enterprises are mostly project manager management mode, project company management mode, project group management mode and mixed operation management mode. However, these modes are all traditional manual management modes, that is, statistics of project-related information by manual means. This mode is not only inefficient, but also prone to errors, which seriously affects the efficiency of project management and damages the economic benefits of enterprises. [1]

Facing the new stage of the current national development, the real estate industry has also entered a new era of development. Under the general tone of "Houses are for living in and not

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for speculative investment", the period of steady development has gradually become the internal consensus of the real estate industry. How to explore a new development model and how to further improve the project management and project operation ability, product and service ability of real estate enterprises has become an important issue related to the sound development of a large number of real estate enterprises in the new development stage. [2] In view of this, in the current economic and social development environment, real estate enterprises should actively embrace computing network technology and communication technology, keep up with the development trend of economic globalization and informatization, and organically integrate network information technology with daily production, operation and management, so as to quickly realize the update iteration of the development model of real estate enterprises. Therefore, this paper holds that building a real estate project information management system based on Web technology and Python language can effectively improve the comprehensive management level of real estate enterprises, and realize centralized information management, cooperative operation of various businesses and unified supervision and control in the whole life cycle of the project by relying on the advantages of network information technology. It is conducive to improving the quality of engineering projects, reducing production costs, achieving management objectives and improving management efficiency, thus gradually establishing a scientific and effective management concept of real estate projects and promoting real estate enterprises to complete the informatization construction of engineering project management. [3]

2 Key Technology Introduction

2.1 Web technology

Web is an application architecture based on Internet, and its core lies in providing users with various forms of information content and information services. As a typical distributed application architecture, Web involves both the client and the server in every information exchange in practical application. Therefore, Web technology can be roughly divided into two categories: client technology and server technology. [4]

The main task of the Web client is to display all kinds of information required by users with HTML as the carrier. In the initial design, the HTML language can only show single and static text or image information in the client browser, and the webpage with this function is called static webpage. However, the function of static Web pages can't meet people's strong demand for information richness and diversity, and then promote the transformation from static webpages to dynamic webpages. Such as GIF image format, CSS, JavaScript language, QuickTime plug-in, and Flash animation, the presentation effect of Web pages is gradually dynamic to obtain better presentation effect and higher execution efficiency.

In the development process of Web server, it also experienced the evolution process similar to that of Web client. In the initial design, the Web server can only respond to the HTTP request sent by the Web client, and return the HTML file stored on the server to the browser. Then, with the emergence of CGI technology, the application program of the Web server can dynamically generate HTML pages according to the request of the Web client, and realize the dynamic information exchange between them. Information services with chat rooms, online forums and information retrieval as their main functions promote the rapid development of Web applications.

Up to now, Web application has fully realized the large-scale application of Web development framework and application model, and cooperated with powerful object-oriented programming languages such as Java, PHP and C# to make the development process concise and efficient. At the same time, it strengthens the access of the Web server to the database, combines the Web technology with the database, and develops dynamic Web database applications to realize efficient access to the database. Figure 1 shows the overall structure of Web development technology.

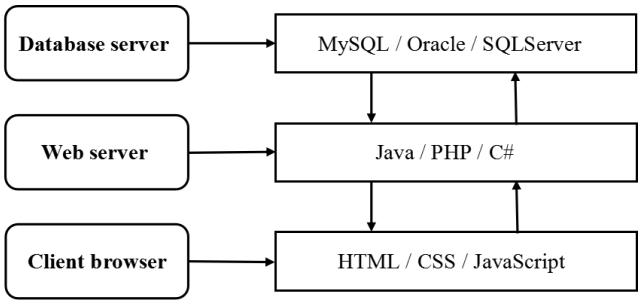

Figure 1 Web development technology structure diagram

2.2 Python

Python is a high-level scripting language that combines interpretability, compilation, interactivity and object-oriented. Python language was originally designed to solve problems rather than the syntax and structure of the programming language. Compared with other programming languages, Python has the advantages of simplicity, portability, readability, easy learning and maintenance. In addition, Python also has scalability, embeddability and uniqueness, and its own matching standard library. Among them, extensibility means that users can write some programs in C or C++, and then use them in Python programs, further improving the running efficiency of key codes of programs. Embedability means that users can directly embed Python into C or C++ programs, thus providing script editing functions for programs. Python's own standard library can widely support expression, document generation, unit test, thread, database, web browser, CGI, FTP, e-mail, XML, XML-RPC, HTML, WAV file, password system, GUI (Graphical User Interface), Tk and other system-related operations.[5] Python is an ideal scripting language in many fields on most platforms because of its powerful functionality, especially suitable for rapid application development.

2.3 Django

Django is a customized Web development framework based on Python. Its internal core components include object relation mapping for creating models, perfect management interface designed for end users, first-class URL design, designer-friendly template language and multi-use caching system. [6] Django's original design intention is to simply and quickly complete the design and development of database-driven Web applications. Django framework emphasizes the reusability of code, and supports multiple components to appear in the system of Web programs as plug-ins and serve the whole framework. The overall structure of Django framework is similar to MVC pattern, but it is not completely the same as MVC mode. In Django framework, it focuses on Model, Template and Views, also known as MTV mode. Table 1 shows

the levels and responsibilities of MTV mode.

Table 1 Levels and responsibilities of MTV mode under Django framework

Levels	Responsibilities
Model, Data storage layer	Handle all transactions related to data: how to access, how to verify validity, what behaviors are involved and the relationship between data, etc.
Template, Presentation layer	Handle performance-related decisions: how to display them in pages or other types of documents.
View, Business logic layer	Logic related to accessing models and retrieving appropriate templates, and the bridge between models and templates.

In the actual application process, Django further decomposes the view in MVC into two parts: Django view and Django template. Among them, Django view decides which data to display, Django template decides how to display it, and the template can be changed at any time according to the different needs of users, not just limited to the template built in the Django framework, as shown in Figure 2, which is the workflow diagram of Django. Compared with the controller in the traditional MVC mode, Django framework encapsulates it, directly calls various data operations in the database, reduces a large number of code writing in the control layer, and greatly improves the development efficiency of Web programs.

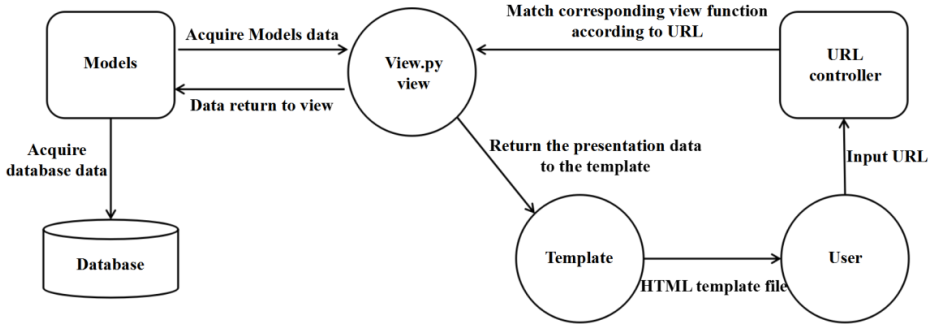

Figure 2 Django framework workflow flow chart

2.4 Development environment

Complete the configuration and deployment of the development environment according to the system development requirements and the use requirements of the above key technologies. The overall development of the system is based on Windows10.0 operating system. The Web server selects Nginx server, and the version selects Nginx/Windows -1.12.2. Because of its high stability, configuration flexibility and less system resource occupation, it can increase the number of concurrent processing of the system, and different processing of static pages and dynamic pages can provide the overall operating efficiency of the system. At the same time, it can also realize the functions of load balancing, buffering requests and responses. [7] Python2.7 is chosen as the development language of the project, and Python-MySQL module currently only supports Python 2.7 under Windows, so the database chooses MySQL5.5 to complete the

construction and support of the system database system. During the overall operation of the Web server, Nginx will unpack and analyze the http request from the client. If it is a static file, it will look up the resource in the configured static file and return it to the client. If it is a dynamic resource, Nginx will pass the request to uWSGI for processing through the configuration file, and call the files and functions of Django project according to the request. After processing, uWSGI will receive the data and forward it to Nginx, and finally return it to the client, as shown in Figure 3 for the overall operation diagram of the system. [8]

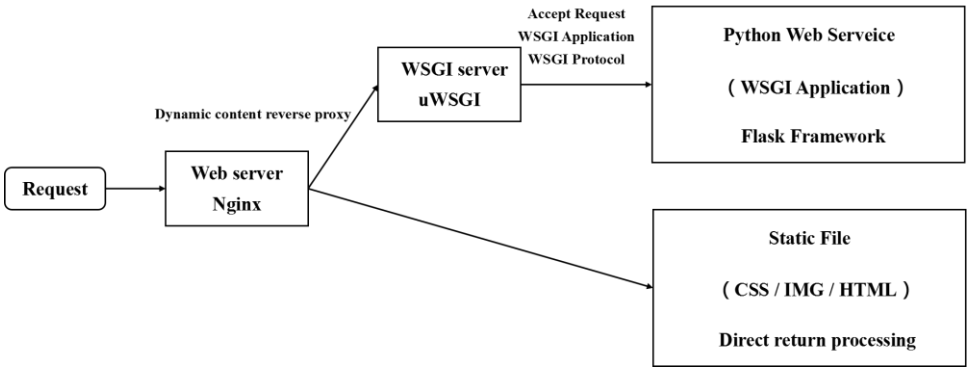

Figure 3 The overall operation process of the system

Through the brief introduction of the above key technology theories, we have determined the overall environment of system development, the configuration of related software and tools, and also made clear the technical feasibility of the whole project of real estate project information management system based on Web technology.

3 Requirements Analysis

3.1 Functional requirements analysis

The real estate project information management system based on Web technology realizes collaborative management of real estate projects by users at different levels, such as business level, management level and decision level, through system functions such as project management, bidding management, cost management, implementation management, so as to achieve management objectives such as project schedule, quality, cost control, and help enterprises realize unified management and information sharing, thereby further reducing the operating cost of real estate enterprises and improving the core competitiveness of real estate enterprises. [9]

Real estate project information management system can provide authority management for users with different roles according to each link of real estate projects. Under the project management function, user roles are divided into project leader and enterprise manager. Under the function of bidding management, the user roles are divided into the person in charge of bidding and bidding participants. Under the cost management function, user roles are divided into financial accounting and financial department managers. Under the implementation management function, user roles are divided into quality manager, data manager and project leader. The real

estate project information management system can be based on the management requirements of actual business, realize high degree of virtualization and simulation for every link and process in the whole life cycle of real estate projects, and ensure long-term efficient and fast operation to support the daily work of various departments.

At the same time, all users in the system can access the project information in the database through their own authority, and get the progress of the project in time, so as to improve the transparency of project management, and comprehensively improve the working efficiency and production capacity of construction enterprises in an equal, shared and cooperative working atmosphere. Thereby comprehensively promoting the development of China's construction industry and accelerating the pace of informatization construction in the construction field.

3.2 Global design

In view of the functional requirements of the real estate project information management system, we combined the application and configuration of the above related technologies to complete the overall design of the system. In the choice of the overall system architecture, the B/S architecture with brief introduction of functional design and low development difficulty is still adopted. The B/S architecture is used to carry the technology of Web, and the whole system is designed hierarchically according to the logical architecture, so as to clarify the functional division of each part and the dependence and call among different levels. The system architecture diagram is shown in Figure 4. Under B/S architecture, Python-based Web application development can further subdivide the Web server into application layer, forwarding layer, control layer, business layer, persistence layer and database layer according to Django framework. Among them, the application layer is the basic interface for users to complete interactive operation, while the database layer is supported by MySQL database for system operation and data storage. Other levels are the functional subdivision and enhancement of the Web server.

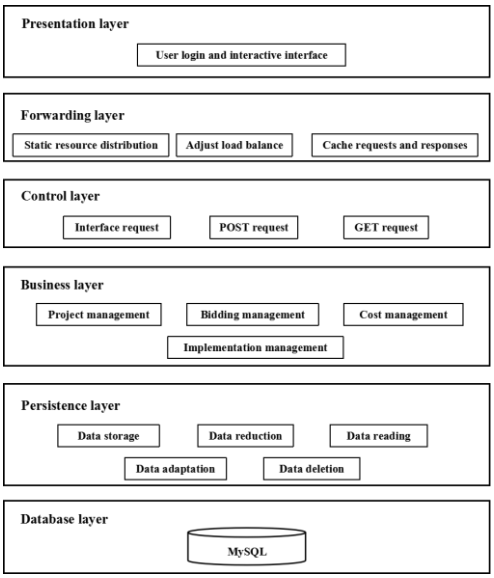

Figure 4 System architecture diagram

4 Function Realization

4.1 Project management

As the beginning of the whole real estate project, project management can realize the most basic functions of the whole system. Under the project management function module, as the first sequence user of this function module, the project leader can complete the operations of inputting, inquiring, modifying and deleting the basic information of real estate projects in the system, including all the information of projects that have not been built, under construction and completed in real estate enterprises, so as to realize the comprehensive management and digital transformation of real estate project information.

The project leader can also complete the setting, modification and improvement of the project plan through the project plan management sub-module under the project management function. The overall project plan involves actual business requirements, key project nodes, project cycle limitation, etc. After the project leader completes the project plan online, he can submit it to the system, and the data information will be automatically transmitted to the enterprise manager, waiting for the approval of the enterprise manager. In addition, the project leader can also add the project schedule, query and review the project schedule under the sub-module of project schedule management. Among them, the newly added project progress can ensure the timely update of the project progress, and the audit of the project progress also requires the system to call the approval method of the enterprise manager, send out the audit application, wait for the approval confirmation of the enterprise manager, and automatically update the project progress after completion.

4.2 Bidding management

Under the bidding management module, according to the actual operation requirements of real estate projects, three sub-functional modules of project bidding announcement management, project bidding management and project winning management are set up. Among them, in the public management of bidding, the person in charge of bidding of real estate enterprises can complete three operations: adding, reviewing and publishing the bidding announcement. Similarly, the application approval process of the tender announcement is that the system automatically calls the approval method of the enterprise manager, sends out the approval application, and waits for the approval confirmation of the enterprise manager to complete the publication of the tender announcement.

In the sub-module of project bidding management, users are bidding participants. After the tender announcement is released, the bidding participants can query and browse the contents of the announcement in the system, and complete the formulation of the bidding scheme and the submission of the bidding quotation according to the actual situation of the real estate project. After submitting the scheme and the final bid price, the person in charge of bidding can get different schemes and quotations of different bidders in time under the sub-module of project bid-winning management, and can carry out statistical analysis and processing of multiple schemes according to the data information collation and analysis tools of the system, and submit the corresponding results to enterprise managers for approval. The content of examination and approval includes quotation scheme, qualification of bidding enterprise, case of current project, etc. After passing the examination and approval, this module can be used to complete the

publicity of the bid-winning results, so as to ensure the fairness, impartiality and openness of real estate project bidding.

4.3 Cost management

Under the cost management module, the system manages the real estate project according to the budget formulation and expenses. Sub-functional modules are also set up as two parts: project budget formulation and analysis, and project cost audit and processing.

First of all, enterprise financial accounting can complete the expense processing and analysis under the formulation and analysis of project budget. That is to say, when expenses are incurred in the project, financial accounting needs to retrieve all available information to be paid, and after being verified and confirmed by the manager of the financial department, the expense information is added, uploaded and verified as the new content of the project budget after being analyzed and processed, so as to complete the formulation of the project budget. Secondly, enterprise financial accounting can complete the audit and treatment of expenses under the audit and treatment of project expenses, and guide, supervise, adjust and limit the expenses according to the project budget, correct the deviation in time, and control the total cost within the planned range while completing the predetermined project objectives. [10]

4.4 Implementation management

Under the implementation management module, the system has three sub-functional modules: project quality management, project completion acceptance management and project documents and materials management.

Under the project quality management, the quality manager users can manage the information of the project suppliers to realize the source control of the project quality. At the same time, the quality manager can also initiate the self-inspection of each section of the construction within the construction department through the quality control management function, and upload the test results to meet the needs of the real estate enterprise and the engineering supervision unit to check and call the engineering quality. Under the project completion acceptance management, the quality manager can input the actual acceptance results and the required rectification requirements into the system after organizing relevant experts to carry out the completion acceptance, and the project leader can check and accept the project by online acceptance. Under the project documents and materials management, the data manager users can organize, upload and archive all information materials, drawings, reports and other contents in the process of project implementation, so as to facilitate subsequent reference.

5 Conclusion

The real estate project information management system based on Web technology and Python language has solved many problems of real estate projects, such as many links in real estate projects, complex engineering system, multi-department coordination. The real estate project information management system based on Web technology and Python language has solved many problems of real estate projects, such as complicated engineering system and multi-department coordination. Relying on network information technology, it emphasizes the establishment of information flow in the process of real estate project operation and

implementation, and realizes the modernization, networking and informationization of real estate project management by combining the dimensions of bidding, budget control, cost indication, construction, completion and data file information archiving. With the deepening of real estate reform, it has become an inevitable trend for the development of real estate management in China to strengthen the information construction of real estate, innovate, optimize and improve real estate management.

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