Research on Architectural Design Process and Design Quality Assurance System Based on Collaborative Work

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ABSTRACT. *The continuous improvement of the market economy has resulted in unprecedented development of the construction industry and the continuous expansion of the industry scale. Building a collaborative design model for architectural design is not only conducive to promoting communication between construction enterprises, but also helps enterprises to work at multiple levels at the same time. The significance of designing collaborative work models, this article will focus on the analysis of model design issues and practical applications.*

KEYWORDS: *Architectural design, Process design quality assurance system, Collaborative work*

1. Introduction

Facing the increasingly fierce market competition, the Ministry of Construction proposed "realizing computer-aided remote collaborative design". Therefore, the design and practical work of the collaborative design model of architectural design is particularly important and urgent. In the construction industry, the exchanges between the construction industry and the owners, the municipal planning and surveys are quite frequent, and this frequent multi-level communication requires the establishment of a "collaborative work system" to ensure the orderly exchange of communication . After many discussions and researches, a new computer collaborative work system has emerged, which has played the most effective and direct way to solve the problem of remote communication. The detailed researches are mainly carried out in the following aspects, which are three aspects of collaborative resource management, theoretical research, and collaborative management of personnel.

With the in-depth development of the construction industry, the collaborative work model has been widely used in various building design links. Its application in overall planning and design, residential design, and commercial space design has greatly improved the level and efficiency of architectural design, and has become an architectural design important content. Although the collaborative work model has been widely applied in architectural design, China has not yet formed a systematic

and perfect model design theory, which has limited the in-depth development of collaborative work models in the field of architectural design.

2. Collaborative Working Mechanism

A well-known problem is that in the design of architectural engineering, the entire process is composed of multiple types of work cooperating around a specific project. This is a process with a complex level and a large organization. During the construction process, it will be divided into several small construction sections. For a construction section, a certain type of work will be arranged for construction. Naturally, each type of work will be equipped with a corresponding designer. For the design of natural buildings, the general situation is to first analyze based on its own foundation, and then develop the design on this basis, usually in the design of plumbing and heating. During the design process, there may be some types of work that change their original design according to their own needs, affecting the design of other types of work. The state has therefore promulgated relevant regulations and provisions for the design of various types of work. It also requires that there must be synergy in the design process of construction projects. There are mainly three types of collaborative work modes, namely obedience, competition, and The three main stages of mixing are the three stages in which the design requirements can be fully met, the conflicts in design requirements are intensified, and the conflicts are resolved through negotiation. These three modes can actually be transformed into each other. Specifically, that is, in the early stage of the design cycle, when the specific design of each type of work has not been carried out, the contradictions have not been intensified, and they can be negotiated and resolved. However, with the deepening of engineering, the design has gradually deepened, and the contradictions between various types of work have gradually intensified. The mutual design will also have a certain impact, causing great conflicts between the various types of works. At this time, the collaboration has also turned into a scramble. In this scramble mode, a designer who wants to achieve his design goals must learn to use consultation to effectively adjust the contradictions of all parties. The conference aims to eliminate the contradictions between the parties to the conflict, and various types of work can continue to develop their designs. However, there is no guarantee that the contradiction will disappear forever, and the contradiction may reappear. The recurrence of contradictions has led to the cycle of this design process. However, the various types of work will always wait for coordination.

3. Research on the Collaborative Working Mechanism of Architectural Design

The content of the design collaborative working mechanism Due to the complexity and complexity of architectural design issues, and the need to repeatedly consider and discuss the design content of many key points, in the control process, it is necessary to effectively monitor each design link. Auditing, integrating innovative construction concepts, increasing the emphasis on the principles of comprehensive development and construction, so that matters such as preliminary design, detailed

design integration, audit supervision, etc. can be fully emphasized; its internal mechanism is based on this important link And the established one uses new management methods to sort out planning and design, field investigation, project review and other matters, and integrates with the network integrated construction system to enable the three modes of obedience, competition and mixing in collaborative work. Stability is established. In the process of integration, the comprehensive construction concept can be infiltrated and the healthy progress of internal control management can be promoted.

The design of the collaborative design mechanism of the flexible design system work process is the initial design, detailed design, contradiction coordination, cyclical rectification, and contradiction resolution. This complete work flow is effectively decomposed to capture the key work items in each link Carry out research to improve its own construction standards, and solve various problems in the process of division of labor and cooperation; in the new construction practice, conduct effective research on the perfect implementation of knowledge sharing and design concepts, and continuously strengthen The key requirements for its own design and planning enable the overall development efforts to be improved, and to strengthen the resolution of contradictions between design scope, positions, and parameters, and truly open up new design ideas for new ones. The development of construction standards has laid a good foundation.

4. Architectural Design Collaborative Work Resource Management

In collaborative resource management, "shared parts library" and version management, including the modification of the propagation and management of design history, are two different forms. The shared parts library is suitable for the characteristics of "small enterprises and large products" in the manufacturing industry, that is, products / parts are highly standardized in the industry and shared by the enterprises in the industry. The shared parts library strengthens communication, promotes sharing, and reduces repetitive design by unifying parts description methods and data sharing formats. The construction industry is characterized by "large enterprises and small products", and the design scheme (that is, the industry's production results, with documents and drawings as the main carrier) is inconvenient to reuse between projects, and it is frequently modified during the construction process. The design file and its version management have become the main problems in its collaborative resource management.

Document Resources Management Architectural design documents have strong industry characteristics. First of all, because of the multiple independent professional systems involved in architectural design, which are mutually dependent conditions and constraints, they attach great importance to matching with each other, and there are relatively few changes in the specialty. People involved in collaborative architectural design often occur between different professional designers. Therefore, it is very necessary to manage each design version of each specialty to provide other engineers with a data platform that is easier to understand and use. Third, the Chinese construction industry uses AutoCAD as its design platform. This software

records graphic design information in the form of DWG / DXT file database. Therefore, the collaborative system must consider the software database structure, and the data resource environment must be based on the file system. In view of the above, the control mode of collaborative resources adopts check-in-checkout according to the requirements of collaborative design of buildings. That is, version checking is performed when users obtain or submit files. When modifying, you must first obtain the latest version from the server, make the modification locally, and check for conflicts with the latest version maintained when submitting the modification. On this basis, the system also uses an object-oriented method to model design change data, and manages multiple files that describe the same design object, supports multiple files to express design intent, and realizes horizontal management of resources. .

Design modification history management management version, tracking design modification is another important issue in collaborative resource management, and has strong practical value. Barbosa proposed a design change object model to model the time information of design data and the relationship between design objects and version changes. The management level of design information includes "design object (part)", "geometry element" and "feature". Considering the industry characteristics and specifications and conventions of architectural design in the expression of drawing information: the geometric size and coverage of the drawing are very large, and often involve a floor or a flow section. Modifications to the design are often scattered throughout and are easy to miss. Identifying these changes quickly and accurately is the first step. For another example, architectural design uses floor plans as the final carrier, and lacks a consistent three-dimensional model. Therefore, the modeling levels of different majors vary greatly when drawing. Some directly use graphics elements as expression elements, while others use professional models as the basis. Most of the design information is obtained by the designer through manual reading. Therefore, the drawing information is mainly composed of intuitive element information. The data-assisted analysis system needs both high automation and flexibility. The system based on the "geometry primitives" design and modify the data analysis module also has professional-level presentation units with reasonable data granularity. The system automatically analyzes the database structure of AutoCAD graphics files of different versions and identifies the entities based on the entity handle and entity parameters. Since the handle is invariant in the two files formed by copying, the version file with a common initial file can use this method to track the change of the graphics data. When a design modification involves multiple primitives of multiple components (each component is often expressed by a combination of multiple primitives). The merging tool provided by this system enables the designer to merge many element modification annotations into one modification unit for annotation as a modification concept. Then, the derived change object class records other change information, including the entity handle, such as the entity handle that identifies the change, the user-defined name for the change, a brief attribute such as a note, and index information of the attached sound, document, and other files. And other additional information, and stored in the CAD database file, the CAD file and auxiliary data files are sent to the server together. These comparisons are performed when the designer submits a new version,

and the old version required for the comparison comes from the design history data warehouse maintained by the server. The data warehouse system of this system is based on the traditional data warehouse, introducing new mechanisms in data analysis and management, forming a themed, integrated, stable, and historical data collection, with data analysis capabilities, and is often used to support decision-making It is composed of heterogeneous data sources, and can be reorganized according to the theme when extracting. The data warehouse is responsible for receiving and storing the design version data composed of multiple different format files submitted by the designer each time; assisting the designer to determine the gap between the local data and the latest version maintained by the server, and according to the user's Under the guidance of the change object model, the design history is reorganized and distributed to the required users. After the designer obtains these data, he can quickly review each modification with the support of the local system, and obtain the information such as recordings and documents attached to it. This accords with the architectural design habits and needs, and promotes collaborative work.

5. Virtual Collaborative Working Environment

People are another element of collaborative work following resources. The collaborative work platform for personnel is another important part of the collaborative work system, including non-real-time and real-time levels. Non-real-time communication modes include messages, e-mail, and other methods for processing non-emergency information or calling people to a collaborative work platform. The real-time performance is a virtual collaborative working environment, emphasizing the use of voice, video, shared whiteboards, and shared programs to support designers' long-distance consultations that transcend regional boundaries. As a higher-level virtual collaborative work platform, it includes multiple aspects such as organizational relationship management, communication support, and real-time collaborative environment. It provides technical support for personnel from different levels of collaboration. Organizational relationship management refers to the delineation and classification of people who use collaboration; the real-time collaborative environment emphasizes the use of network collaboration to provide an alternative to face-to-face negotiation; communication support refers to the exchange, information transmission, and management of people outside of real-time collaboration. The virtual collaborative working environment proposed by this system supports the management of collaborative personnel; it provides daily messaging and other means to support daily communication; the concept of shared media space is proposed, and various transmission media such as audio, video, program sharing, and whiteboard are used for designers Synchronous discussion of drawings or data in different places, and collaborative design or calculation of the same drawing or structural unit. Form the "virtual design room" electronic consultation system; promote the realization of the concept of collaborative architecture.

6. Conclusion

At present, the most widely used models in China are solid models. Although computer models and three-dimensional models are new models, they have very high application value and application advantages. However, due to the differences in the level of designers and producers in China, they can be obtained through computers and three-dimensional The model has less staff and a certain level of gap, which makes the application effect of computer models and 3D models unsatisfactory and needs further strengthening.

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