Research on Project Management Computer System Based on BIM

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Abstract: In the engineering industry, its development is combined with information technology. The traditional method is to use CAD (Computer Aided Design) technology. With the economic growth and the development of information technology, engineering projects become more and more complex. The traditional technology has gradually been unable to adapt to the development of the project, and its disadvantages have gradually emerged, which cannot meet the requirements of project management. Therefore, BIM Technology should also be applied. It can greatly make up for the shortcomings of traditional technology in complex engineering and promote the development of engineering projects. According to the principle of BIM Technology, this paper applies BIM Technology to project management. According to the characteristics of BIM Technology and the difficulties of large-scale project management, the application of BIM Technology in engineering is studied and analyzed. Combined with computer technology, this paper studies the project management computer system based on BIM, which can improve the management level of large-scale engineering projects, improve the management level of large-scale projects, and save costs. It can provide certain reference for the follow-up research and promote the application of BIM Technology in project management.

Keywords: BIM Technology, Project Management, Computer System

1. Introduction

The content associated with construction engineering [1] is widely distributed, and it is a process that needs dynamic management. The three important contents of project management [2-4] are project cost, construction progress and quality management. Whether the three aspects can be balanced is directly related to the quality of management, that is, whether the project cost can be reduced, the
project progress can be accelerated and the quality of management can be improved. It is not easy to do well in these three aspects of management, involving a lot of management work. The application of BIM Technology [5-7] realizes the informatization of project management, which makes the tedious management of engineering project information operation, and realizes the control of various elements of engineering project.

BIM Technology, namely building information model, refers to the use of computer software technology to establish a specific construction project model [8], through the application of virtual design and construction system means to simulate the operation of the construction project, observe the feasibility of the implementation of specific plans, and carry out scientific, efficient and comprehensive management of the project according to the simulation effect. All kinds of functions and characteristics of the project can be presented in a digital way through the established model, and at the same time, the transmission and sharing of resources can be realized. In the process of applying the model, it can provide certain support for all kinds of tedious management work; for a certain project, when the management work needs to be adjusted due to the irresistible external factors, BIM Technology can be used to realize the operation of relevant processes, so as to realize better cooperation in all aspects and improve the construction efficiency and quality [9-10].

In this context, BIM is applied to project management according to its own characteristics. Through the establishment of the relevant computer system, calculate the allocation of various resources in the project, compare different management schemes, and determine the optimal allocation of resources, the management level of the project can also be improved. The management efficiency of the project can be greatly improved by using the characteristics of the computer, and it can also promote the exploration of more complex and difficult projects To solve various management problems.

2. Project Management Based on BIM Model and Its Research

2.1 Project Management

Project management is not a single operation, but a process of connecting a variety of people and things to complete an activity at a specified time and place. Therefore, the completion of this process must have timeliness, that is, the integration and deployment of relevant resources within a predetermined time to achieve the corresponding goals. At present, most of the project management work hopes to improve the management efficiency by increasing the input of various resources, but the effect is not ideal. Although the main reason for the mismatching of resources is that they cannot be coordinated with each other, the main reason is that they cannot coordinate with each other effectively. Therefore, the corresponding model can be established to calculate the matching degree of resources. The processing of the model is simply a calculation process, and we can use the entropy theory to calculate. Project management involves many factors. In recent years, there are more and more new projects and more difficulties. With the increasing difficulty of the project, the complexity of the project is gradually improving, and the difficulty of project management is also gradually increasing.

2.2 Research on Project Management Based on Entropy Coupling Algorithm

Entropy is a measure of system state uncertainty, which reflects the degree of chaos of the system. When the system is in $N$ States and the probability of each state is $p_i, i=1,2,\cdots,N$, the entropy of the system is:

$$E = -\sum_{i=1}^{N} p_i \log(2, p_i), 0 \leq p_i \leq 1$$  \hspace{1cm} (1)

The coupling degree of resources and project management of engineering project refers to the intensity of interaction between the two variables. According to entropy theory, the coupling degree (OH) of two variables can be calculated
\[ OH = -\lambda \sum_{i=1}^{n} p_i \log(2, p_i), 0 \leq p_i \leq 1 \]  
(2)

Assuming that the satisfaction rate of \( J, 1 \leq J \leq n \) resources to \( I, 1 \leq I \leq m \) sub strategy is \( p_j \) after \( s_j \) standardization, the coupling mode of enterprise resources and sub strategy is as follows:

\[ c'_j = \left( \sum_{i=1}^{n} p_i \ln p_i \right) \min(s_j) \]  
(3)

Then the overall coupling degree of enterprise strategy and resources is as follows:

\[ c^* = \sqrt{\frac{\sum_{i=1}^{n} (c'_j)^2}{m}} \]  
(4)

The coupling degree of resources in project management can provide managers with certain information, reallocate resources, improve the coupling degree of various resources and projects, and formulate the best project management scheme. The concept, characteristics, mode, model and calculation of coupling are fully integrated into the project management, and the corresponding coupling degree model is established to allocate the existing resources, so as to provide effective reference data for project management. In this paper, the research of this paper is different from the previous research, and the BIM model is established. According to the coupling degree, resources are allocated reasonably and the best management scheme is determined.

3. Experimental Background and Parameter Setting

3.1 Experimental Ideas

According to the coupling algorithm mentioned above, the coupling degree between the corresponding elements in the engineering project is calculated, and the coupling degree of the engineering project management is finally obtained. In this model, the coupling degree between the resources and the strategy and between the resources and the project are calculated. The main steps are as follows:

Firstly, determine the factors involved in project management and the number of factors;

The satisfaction rate between the relevant factors is calculated, and then the standardized satisfaction rate is obtained by standardized processing;

The coupling degree of the resources and management mode involved in the project is calculated according to the standard satisfaction rate of the project, and the coupling degree of the overall project is finally calculated;

3.2 Experimental Design

In this model, this paper determines the best scheme by selecting different parameter forms: adjusting the factors involved in the project management project and determining the impact of a certain factor on the project. For example, when studying the influence of factor A, keep other factors unchanged, only change the value of factor A, and study the impact of factor A on project management project, in the same way, other factors can be analyzed. Then we can compare the best factors and other factors to determine which kind of project has the greatest impact. The factors and parameter settings in this model are shown in Table 1.
Table 1. Matching degree of resources and schemes

| Resource type     | Option A | Option B | Option C |
|-------------------|----------|----------|----------|
| staff             | 0.92     | 0.80     | 0.72     |
| equipment         | 0.96     | 0.92     | 0.80     |
| material Science  | 0.82     | 0.80     | 0.85     |
| method            | 0.86     | 0.88     | 0.84     |
| environment       | 0.72     | 0.76     | 0.70     |

4. Discussion

4.1 Analysis of Influencing Factors

The management of a project is related to many factors, and the management efficiency and cost control are more difficult to control. This model studies the cost and duration of project management under three schemes, and the emphasis of each scheme is different. In scheme a, the relevant resources required by the project are highly coupled with the project, which can well meet the requirements of engineering construction. In scheme B, the matching degree of staff and engineering project is lower than that of scheme a, other resources are close to scheme a, while the matching degree of various resources in scheme C is lower than that in scheme a and scheme B, especially the coupling of staff and equipment. The degree is much lower than the other two options.

In the above three scenarios, the cost of each scheme is shown in Figure 1. It can be seen from the figure that the cost of scheme A is lower than that of the other two schemes. The cost of scheme C is much higher than that of scheme A and scheme B, which is about twice that of scheme A. Therefore, the coupling degree of various resources in project management is very important. Any mismatch of resources may increase the cost of project management and reduce the management efficiency. Compared with scheme B, the cost difference between scheme A and scheme B is not very large. This is because although the coupling degree of employees is a little different, there is almost no difference in other resources, so the increase in growth is not much. Every factor involved in project management may affect the quality of project management, and every link must be designed well.

![Figure 1. Cost of each scheme](image_url)
In addition, if the management efficiency is not high, the construction period will be greatly increased, the project efficiency will be reduced, and the time and energy will be consumed. Figure 2 shows the construction period required to complete the project under the three schemes. It can be seen from the figure that the construction period of scheme A is the shortest, which is 124 days. The construction period required by scheme C is the longest, which is more than 4 times that of scheme A, while that of scheme B is slightly more than that of scheme A. According to the coupling degree of various resources and schemes calculated above, scheme C has the lowest coupling degree, so it needs the longest construction period, and scheme A has the highest coupling degree and the least construction period. Any mismatch of resources will increase the construction period of the project, increase the input of human and material resources, and the efficiency is low. Therefore, in the engineering project management, especially for complex engineering projects, making appropriate scheme and ensuring the adaptation of various resources will greatly improve the management efficiency and reduce the management cost.

![Figure 2. Construction period of each scheme](image)

According to the above two charts, the coupling degree of resources and scheme is high, which can not only reduce the cost of project management, but also shorten the construction period of the project and improve the management efficiency. In the management of engineering projects, especially some large-scale projects, many factors are involved, and it is difficult to grasp the matching of various resources and engineering projects. BIM Technology can solve this problem well, increase the coupling degree of various resources and improve the management efficiency.

4.2 Measures to Improve Project Management

1. Strengthen Project Equality Supervision

Whether the project quality can be guaranteed largely depends on whether the supervision is in place. In the process of project management, there must be strict standards and systems. In any construction project, if there is no excellent quality supervision team, it is difficult to achieve efficient management. Good quality cannot be separated from good materials. It must be made clear to individuals. If any material has problems, it is necessary to find out the source and investigate the responsibility. When purchasing the materials required by the project, the quality of the materials shall meet the engineering requirements, and the materials entering the site shall be subject to strict inspection.
2. Improve the Management Level of Managers

In order to reasonably and effectively improve the quality of project management, it is necessary to improve the management level of managers, which determines the quality of project management. In the specific implementation, there are many measures to improve the comprehensive level of managers. For example, managers with professional experience and professional qualification can be recruited for project management; comprehensive management team can be established to transfer personnel from different professional fields to form a management group to implement targeted project management. The management of engineering construction project has a great relationship with human factors, and the quality of management directly depends on the level of management personnel. Therefore, it is necessary to do a good job in the training and education of employees, hold regular lectures, and those who are not qualified in management should not be allowed to participate in the management work, and can only participate after passing the training.

3. Joint Efforts of All Parties

Any project involves many aspects. Any party must seriously implement the relevant construction laws, regulations, standards and specifications, establish and improve the quality and safety management mechanism, earnestly perform its duties, and implement the guarantee of project quality and safety; strengthen supervision, all kinds of quality and safety hazards must be dealt with in time, eliminate the hidden dangers in the bud, and establish multiple departments The joint inspection mechanism, the linkage of all parties, forms a joint force, makes the market order more standardized, and ensures the quality of the project. At the same time, it is necessary to improve the quality and level of supervision personnel. In the process of supervision and management, we must be fair and just. According to the relevant national laws and regulations and project contracts, we should carry out our work impartially and independently. We should take full advantage of the role of supervision and management, and deal with the non-standard behaviors in the process of project construction in a timely manner. In order to improve the system of supervision personnel, the management justice of supervision unit must be strict, and the corresponding responsibilities should be seriously performed.

5. Conclusions

This paper studies a project management computer system based on BIM model, according to the system can effectively calculate the coupling degree of various resources and projects in the project, optimize the allocation of resources, and can compare the advantages and disadvantages of various management schemes. According to the calculation results, the best management scheme can be worked out. The computer system established by BIM for project management can effectively manage all kinds of resources and configuration of the project, improve management efficiency, reduce management cost and shorten the construction period of the project, which can provide certain reference for future project management.

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