

Refined Management of Traffic Engineering Cost Based on BIM Technology

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Abstract: The rapid development of technology and economy has brought the construction industry into a stage of vigorous development. The traditional mode of project cost management is no longer suitable for the development of the construction industry, and more refined management of cost is imperative. At this stage, BIM technology is widely used in the management of cost. It can establish corresponding models to carry out fine management of each stage of construction. Based on the above background, the purpose of this paper is to refine the management of traffic engineering cost based on BIM technology. This article first conducts a survey of the current status of traffic engineering cost management based on BIM technology. Through statistical analysis of the survey data, it is mainly aimed at the investigation of the current BIM understanding and application of the traffic engineering cost industry. Then put forward the basic principles of BIM technology application engineering cost management, and then put forward the optimization plan of traffic engineering cost management based on BIM technology, including investment decision, design, budget, bidding, construction stage, etc. Finally, the study found that in the process of project construction, the application of BIM technology greatly facilitated the construction of various specialties, and the project quality rate reached more than 98%, and significant results were achieved.

1. Introduction

Refined management is a management concept prevailing in the West [1]. Refined management emphasizes a continuous improvement and continuous improvement process, which is a process from empirical and extensive management to standardized and refined management [2]. The concept of refined management is accepted by more and more business managers, and they are improved and innovated in the practice of business management. Apply the concept of refined management to the cost management of traffic engineering, fully excavate the main factors and key links in the process of project cost management, and on the basis of ensuring quality and construction period, eliminate waste and reduce various expenditures, and achieve small costs and large benefits Economic purpose [3]. The refined management of project cost is of great significance for improving the management level of construction enterprises and improving the management of project cost. The era of enterprises from extensive to refined has arrived.

Fine management of the project cost can ensure that the project has reasonable and sufficient funds during the construction of the project, and the cost of each stage of the construction can be controlled within a reasonable range [4]. At present, in the relevant fields of engineering construction, the engineering quantity list is mainly used to calculate the price. This list is formed according to the actual project, which is conducive to the dynamic and fine management of the construction cost by all



parties. With the continuous expansion of the scale of the project, the data involved in the management of the cost of related units has increased rapidly, which greatly increases the difficulty of cost management. The application of BIM technology can effectively solve this problem. This technology can realize the application of computer and network in cost management, not only can improve management efficiency, but also provide conditions for further refinement of management.

This paper conducts theoretical research on BIM technology and engineering cost management by consulting related articles, and understands the characteristics of BIM technology. At the same time, it deeply analyzes and discusses the advantages of applying BIM model to engineering cost management. The application in this paper is analyzed, which provides the corresponding theoretical basis for the construction of building information model.

2. BIM Technology and Refined Management

2.1. Features of BIM Technology

The elements of BIM technology are independent objects and components. The geometric information, construction requirements, physical characteristics and cost information of objects and components can be expressed through parameters. At the same time, this information is summarized through the topological relationship collected by spatial information, and the Stored in the database, and finally produced a digital model. All component models in the BIM model involve a lot of components, such as geometric size information, so only need to apply calculation rules to the geometric size of the component model, the engineering quantity of the component can be quickly determined.

The BIM model has the following characteristics:

- (1) Visualization displays the two-dimensional line-type components through 3D renderings, and can also generate feedback and interactive visualization with the components.
- (2) The parameterization of the digital model is the basis of other functions. The parametric model of the main components can provide a variety of key information for the related work of the construction project. In addition, it can also receive information feedback. At the same time, it can optimize and improve the model with the help of information processing.
- (3) Coordination BIM model can simulate the specific conditions of the project, so as to solve the contradictions and all the problems between different professions, thereby reducing the frequency of changes during the construction period.
- (4) Exportability Various parameterized data together form a BIM database, which can be exported in different ways, such as different two-dimensional graphics information of buildings from multiple perspectives, electronic document information, etc.

2.2. Refined Management of Project Cost

The principle of refined management of project cost can be summarized in four words: "precise, accurate, meticulous, and strict". Refined: It means that both products and management work require excellence and the pursuit of the best. Accurate: Be able to follow accurate plans and instructions, accurate information and measurement, to ensure that all work links are accurately connected and working methods are correct. Refinement: Refinement of the content and terms of work, management, especially implementation, to achieve refinement. Strict: Strictly control budget deviations and implement budget standards and systems.

The establishment of a new concept of refined project cost management is mainly reflected in the following three aspects: 1) Adhere to the idea of "process control determines completion and settlement, and fine management determines the success or failure of the project". The traditional post-event accounting is gradually changed to pre-planned and detailed accounting during the event, forming a new idea of "full process control, refined management, and shifting focus". 2) Establish a new concept of whole-process, all-round, and full-staff management, and implement refined target cost management throughout the process. 3) Pay attention to the application of information technology

in project cost management, establish an information management platform, establish a basic data database for enterprises, and realize cost information data sharing.

3. Experimental Design of Refined Management of Traffic Engineering Cost

3.1. Construction of Experimental Evaluation Index System

Matter element is the basic element to describe things. It studies things, characteristics and corresponding values as a whole, represented by an ordered triplet $R=(N,c,v)$, called one-dimensional matter element. Among them, N represents things, c represents features, and v represents the magnitude of N on feature c . The matter element connects the attributes of things with the value, and dialectically reflects the relationship between the two and the dynamics of things. When something N has multiple characteristics, it is defined by analogy with one-dimensional matter element. The multidimensional matter element N has n features c_1, c_2, \dots, c_n and the corresponding magnitude $v_i(i=1,2, \dots, n)$ to form an array:

$$R = \begin{bmatrix} N & c_1 & v_1 \\ & c_2 & v_2 \\ & \vdots & \vdots \\ & c_n & v_n \end{bmatrix} = \begin{bmatrix} R_1 \\ R_2 \\ \vdots \\ R_n \end{bmatrix} \quad (1)$$

The value range of each evaluation object about the refined management level of traffic engineering cost is called the classic domain, where V_i is the value range specified by the evaluation object C set on the refined management level of traffic engineering cost V_i . The classic domain Q_i is recorded as:

$$Q_i = (U, C_i, V_{in}) = \begin{bmatrix} U_i & C_1 & V_{i1} \\ & C_2 & V_{i2} \\ & \vdots & \vdots \\ & C_n & V_{in} \end{bmatrix} = \begin{bmatrix} U_i & C_1 & (a_{i1}, b_{i1}) \\ & C_2 & (a_{i2}, b_{i2}) \\ & \vdots & \vdots \\ & C_n & (a_{in}, b_{in}) \end{bmatrix} \quad (2)$$

The value range of all levels of the evaluation index collection of traffic engineering cost refined management is recorded as the section domain, where V_u is the value range specified by the evaluation index collection C of the traffic engineering cost refined management level U . The section field Q_u is recorded as:

$$Q_u = (U, C, V_{un}) = \begin{bmatrix} U & C_1 & V_{u1} \\ & C_2 & V_{u2} \\ & \vdots & \vdots \\ & C_n & V_{un} \end{bmatrix} = \begin{bmatrix} U & C_1 & (a_{u1}, b_{u1}) \\ & C_2 & (a_{u2}, b_{u2}) \\ & \vdots & \vdots \\ & C_n & (a_{un}, b_{un}) \end{bmatrix} \quad (3)$$

3.2. Experimental Investigation Methods

The purpose of this experimental questionnaire survey is to understand the application of BIM Technology in China's transportation engineering cost industry by using the method of statistics and analysis of survey data, so as to understand the application of BIM Technology in transportation engineering cost industry in China at this stage, so as to lay a foundation for the formulation of BIM Technology Application Management Scheme. The questionnaire is mainly composed of two parts. The first part is mainly about the basic situation of the interviewed units and individuals; the second part is about the understanding and application of BIM Technology in the current transportation engineering cost industry.

The object of this experiment questionnaire survey is the relevant practitioners in the field of traffic engineering in China, including direct employees and indirect employees, such as project management, project evaluation, construction and other aspects of the staff. The questionnaire is mainly distributed to design units, owners, cost units and construction units of traffic engineering. The main way of distribution is on-site visit and investigation and sending e-mail to relevant units. A total of 500

questionnaires were distributed and 118 valid questionnaires were recovered, of which 95 were collected from the scene and 23 from e-mail. The recovery rate was 23.5%.

4. Analysis on Fine Management of Traffic Engineering Cost Based on BIM Technology

4.1. Investigation of Traffic Engineering Cost Management Based on BIM Technology

The questionnaire mainly includes the understanding of the concept of Bim and the application of BIM Technology in the unit. By means of statistical analysis, we can not only preliminarily understand the current practical application of BIM Technology in the transportation engineering industry, analyze the market environment, and master the industry's demand for BIM related cost software, but also find out the most widely used manufacturing software in the industry in the survey. By using the method of comparative analysis, we can analyze the differences between the BIM Technology software and the BIM Technology software, This paper discusses the advantages of BIM Technology software. In the basic understanding of BIM Technology, in the effective questionnaire, 34 people have heard of BIM Technology, accounting for 28.81% of the total number of samples; the reason why they know BIM Technology is because of the publicity of cost consulting units and media, as shown in Figure 1.

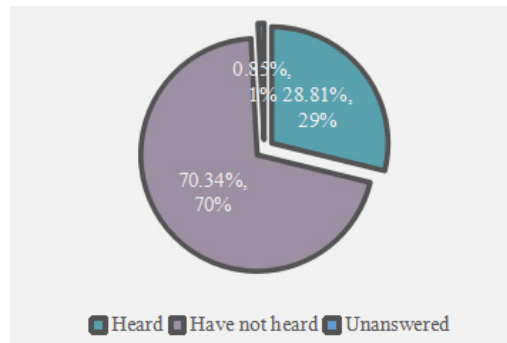


Figure 1. Understanding of BIM technology

The survey also involves the use of BIM Technology in the enterprises. The results show that 77.12% of enterprises do not use BIM Technology, and only 11.02% of enterprises are using BIM Technology, as shown in Table 1. The most commonly used BIM Technology software is Luban, which is the first-line cost software. Only some people in CATIA and other enterprises simply master some real BIM Technology software knowledge, but they can not deeply understand and apply it. Many respondents mistakenly believe that the cost software like sville belongs to BIM software, which is also caused by their lack of understanding of BIM Technology.

Table 1. Application of BIM Technology in sample units

	Getting started	Not in use	No answer
Proportion	11.02%	77.12%	11.86%

According to the proportion of BIM heard by the transportation engineering cost industry, 20 people have been exposed to BIM Technology for less than one year, accounting for 58.8%, accounting for 16.95% of the total sample, as shown in Figure 2. On the question of "ways to understand BIM", the most people who did not answer or choose the option of "other", accounting for 61.98% of the total sample. The reason for this phenomenon is that 54.22% of the 70.34% people who have not heard of BIM Technology chose the "other" option, and 30.12% did not answer.

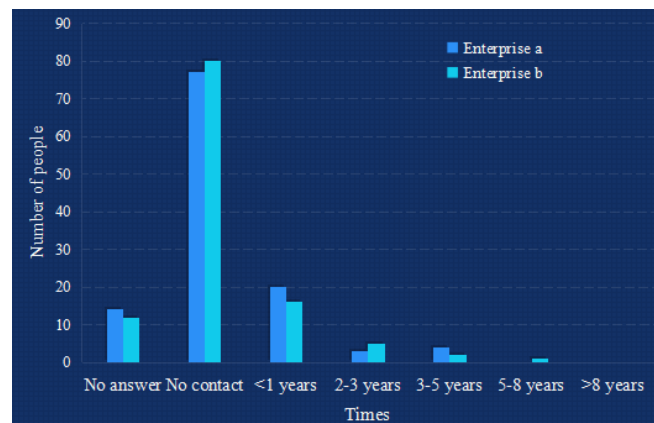


Figure 2. Time to contact BIM

4.2. Refined Management Analysis

According to the actual data of the completed SFW project with refined management and relevant expert consultation opinions, combined with the refined management evaluation system of transportation engineering cost, the matter-element to be evaluated for the fine management of the project cost is determined. The correlation degree of the evaluation index is used as the judgment matrix of weight, and the weight of the index is calculated according to formula (1) (2), as shown in Table 2.

Table 2. Sum of comprehensive correlation degree

Evaluation level	V1 difference	V2 qualified	V3 good	V4 excellent
Comprehensive correlation degree	-0.3959	-0.0647	-0.0717	-0.3397

Finally, it can be seen from the table that the comprehensive correlation between the refined management level of project cost of SFW project and V2 qualification is the largest, so the refined management level of project cost of SFW project is qualified.

To sum up, the enterprise also needs to strengthen the cost control of main materials such as steel bars and turnover materials, improve the construction progress control and processing of change visa, and improve the content of enterprise fine management system and enhance the employees' fine management consciousness. Finally, the fine management of project cost will be realized gradually, the cost expenditure will be reduced and the economic benefits of enterprises will be improved.

5. Conclusion

With the deepening of construction industry reform and the rapid growth of China's economy, the traditional cost management system has been unable to meet the needs of economic construction. In project management activities, cost management is a key link, which is of great significance to project management. Therefore, enterprises pay attention to project cost management, realize multi-dimensional and all-round control, and improve the overall management level. This is an effective measure for construction enterprises to change their operating system, turn losses and increase profits and expand profits, and it is also a necessary task for long-term development. BIM adopts three-dimensional digital technology and takes IFC as the reference standard to gather the information of construction projects into engineering data model. BIM is a more intelligent tool, which makes the information management of traffic engineering cost more convenient, which is undoubtedly a huge change compared with the traditional way of thinking.

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