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Research on the Application of Green Building Cost Control Technology Based on BIM Simulation

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Abstract: With the popularity of the concept of "green, energy saving, and environmental protection", green buildings have received unprecedented attention in the construction industry. In the construction of green building projects, cost control becomes a key issue. This paper analyzes the cost control problems existing in my country's green building construction. Based on the application of BIM technology, through the management of the whole life cycle of the project, it proposes some effective control measures for the construction cost of green building projects and strives to achieve While saving energy and reducing environmental pollution, the economic effect of saving money is realized. An office building project is used to demonstrate the feasibility and accuracy of the calculation technology, improve the level of refined management of the green building's operating costs, and provide research references for its subsequent dynamic cost forecasting and intelligent cost control.

Keywords: Green Building; Cost Control, BIM Simulation

1. INTRODUCTION

China's special historical environment has created a great incompatibility between China's economic promotion and environmental development. The rough production method has caused a secondary aggravation of the environmental crisis and hindered further economic growth. If we want to promote the second radiance of China's economy in the wave of globalization, we must start with the key points of China's economy, dissect its roots, and promote economic development and the tortuous progress of China's environmental protection cause. As the core of China's top ten industrial pillars, the construction industry has become the only way for China to step into the rise of a great power. The development of green buildings in my country is in its infancy, and there are few relevant literatures on the cost control of green buildings.

Chen Siqin analyzed the economic benefits of green buildings and pointed out that green buildings belong to the product of external economy, and non-green buildings have external diseconomy . Chang Haixia analyzed the factors affecting the cost of green buildings and pointed out that the whole life cycle cost control management method should be adopted . Zhang Wei and Liao Congping believe that the performance of green building life cycle cost management can be improved by improving the result performance and behavior performance of green building life cycle cost management performance. The building operation cost usually includes facility maintenance fee, facility update fee, building consumption and cleaning fees. However, the existing research on the composition of green building operating costs is not yet clear.

In the "Green Building Evaluation Standards" (GB/T50378-2019, hereinafter referred to as "Green Label"), although there is no description of the operating costs of green buildings, it is pointed out that: green buildings refer to the use of various green the technology saves resources, protects the environment, reduces pollution, and provides people with healthy, applicable, and efficient use of space. It just rightly solves the problem of low implementation in the process of green building construction. The Cloud-BIM cloud platform built by BIM technology, coupled with the strong cooperation of the whole life cycle theory, divides green building projects into five major stages, and uses different software to select the best construction methods, construction materials, and personnel transfer plans according to different stages. etc., to fully cooperate with the high-quality and high-efficiency promotion of green building projects in the whole stage of construction.

From the perspective of effectively and reasonably controlling the cost of green buildings, this paper analyzes the development of traditional green buildings and the problems existing in the project process. Based on using BIM technology, compare the technical advantages and effective control management provided by traditional 2DAUTOCAD technology for the project. Achieve economic benefits under the premise of environmental protection. The calculation of green building operating costs is based on a yearly cycle, which is classified according to the purpose of use, and the operating cost calculation is completed item by item before summarizing, which is convenient for checking the actual annual cost, to optimize and improve the annual cost plan. Research cost is the first cost expenditure in the whole life cycle of a construction project, and it is also the basis for the smooth progress of a construction project. Most of this cost is borne by the owner, who prepares the project proposal.

2. THE PROPOSED METHODOLOGY

2.1 Cost Analysis of Green Building Engineering Based on BIM Technology

The owner set up a project department to conduct market research, conduct a comprehensive investigation of the project's regional prospects, the geomorphic characteristics of the project location and surrounding conditions, project construction content, funding sources, investment channels, etc., to prevent the development of the construction project at the source, and eliminate the unfavorable points of the construction project. early. At present, in my country's construction industry, the means of design and drawing still rely on 2DAutoCAD and manual drawing. For some construction projects with high requirements, the detailed parameters of the precise parts are manually determined, and there are large things, and the accuracy of the horizontal and

vertical section drawings is not high. Lag work and other phenomena are not uncommon. Furthermore, on the project site, due to the mistakes of relevant personnel, errors in the construction schedule, and process errors, the construction period was extended, and the project could not be completed on time.

To realize the efficient input of cost parameter data in cost calculation, BIM digital twin building information and building intelligent operation and maintenance platform should be used. The input data sources can be obtained in three ways: static data can be directly read through the intelligent operation and maintenance platform system The existing model database of the twin buildings is collected; dynamic data can be connected to the BA system database through the intelligent operation and maintenance platform to realize regular and directional data dynamic collection; manual input can be used to improve some cost parameter data that cannot be obtained through the first two, such as, labor costs, other costs, etc. The green building project supported by BIM technology, after the five-stage division of the whole life cycle concept, not only provides advanced technology support, but also makes this proposition into parts, making it more organized and clearer, and clearing the fog to see the moon. It also provides a feasible method for the enterprise to control costs. After the construction of the cost control system in the previous chapter is completed,

This chapter uses the analytic hierarchy process to analyze the cost of each indicator in the five major stages, and obtains the cost impact indicators through rigorous calculation, and ranks them according to their importance. In this way, it provides a starting point for the actual construction work cost control operation. BIM has a wider scope in architectural design, including design scheme demonstration, design creation, collaborative design, building performance analysis, structural analysis, green building evaluation, specification verification, engineering quantity statistics, etc. Compared with AutoCAD, the design effect displayed by the 3D model is very convenient for reviewers, owners, and users to evaluate the scheme, and even directly discuss issues such as constructability, how to cut costs and shorten the construction period on the current design scheme. Through visual operation, the error rate of decision-making by both parties is greatly reduced, saving time.

BIM-based cost estimation can further realize BIM-based green building operation and maintenance cost prediction and control. By analyzing the deviation between the predicted cost and the actual cost, it is judged whether to take control measures to adjust the cost. Taking the adjustment of energy consumption costs as an example, by adding cost control function modules to the BIM-based smart operation and maintenance platform, after docking with the equipment control system, the construction tasks can be completed within the entire life cycle to ensure maximum profit while simultaneously saving resources. Sustainable concept is the core of green building concept. The concept of the whole life cycle divides green building projects into five stages: pre-planning stage, scheme design stage, construction stage, operation and maintenance stage, and demolition and blasting stage, which is more conducive to the deepening of the concept of sustainable development.

2.2 BIM-Based Cost Control Strategy

Therefore, starting from the five major stages, the key points of green construction such as the construction plan, BIM technology selection, and construction cost control of each stage are broken down one by one, and the cost composition and corresponding cost control points of each stage are proposed by comprehensively considering the respective cost targets of enterprises, society, and consumers. , is the winning point for the realization of green building projects. The application of BIM technology solves the biggest problem that plagues construction companies - various collision problems. Before the construction starts, use the 3D visualization of the BIM model to coordinate the design of various disciplines (architecture, structure, water supply and drainage, electromechanical, fire protection, stairs), and check the collision between various professional pipes and the beams and beams in the pipe and building structure. Column collision. Analyzing and simulating construction difficulties such as new forms, new structures, new processes, and complex joints provides a basis for improving design schemes, reducing work delays and improving economic benefits.

The application of BIM improves the communication between the construction party and other parties, and all parties can track the progress in time, reduce errors, and improve quality and economic benefits. BIM-based cost estimation can provide data support for green building operation cost planning. Efficient and comprehensive calculation work can significantly improve the formulation level and execution efficiency of cost planning. Regular cost data accumulation can be achieved by completing comprehensive cost calculations on a regular basis, and comprehensive and clearly divided cost items can better provide support for subsequent operating cost planning. At the same time, the cost plan provides guidance for cost calculation and control work, forming a virtuous cycle. The concept of green building is the soul of its architecture, which is different from traditional construction methods.

During the feasibility study, it is necessary to integrate the green building concept into the initial stage of the construction project and continue throughout. In this way, the concept of green building takes root in advance, which is conducive to making full use of the surrounding environment at the beginning of construction, improving the utilization rate of the environment, and achieving the concept of harmony between man and nature. Early feasibility study is beneficial for enterprises to control costs at the beginning of the whole life cycle. When preparing the feasibility study report, we consider practical issues such as site selection, economic effect, environmental impact, and return on investment from a long-term perspective, and timely control the investment limit to facilitate the design and control of cost control points in the later stage of program design. After the construction party completes the building, make necessary tests and adjustments to the building, and use BIM to generate the as-built model. On this basis, the as-built model is enriched and the operation and maintenance system are established.

Through 3D visualization simulation, the real information model of the building can be obtained, and the spatial information of the building, equipment information and other information can be organically integrated, combined with the operation and maintenance management system to take advantage of spatial positioning and data records, and reasonably formulate operation, management, and maintenance plans, minimize emergencies in the operation process as much as possible. Greatly improve the management efficiency after completion and enhance the economic benefits of the building. Through the empirical application in this project: practiced the BIM-based green building operation cost prediction technology path, and

verified that this technology can better improve the problem of insufficient accuracy of green building operation cost management; by using the smart operation management platform developed based on BIM, quickly obtain intelligent dynamic monitoring data of facilities and equipment and call model static data to achieve rapid calculation of operating costs; through comparison with the energy consumption costs of similar buildings in the park, it is verified that the application of BIM and green building technology can effectively control building energy consumption costs. The operation evaluation of green buildings provides data support.

3. CONCLUSION

After analyzing the current situation of the use of BIM technology and the current situation of green building costs, it points out the adaptability of BIM technology to the life cycle cost control of green buildings. The possibility of using BIM technology to improve the life cycle cost control of green building projects is proposed. Compared with the application of traditional 2D AUTOCAD in green buildings, the application of BIM in the above aspects brings more obvious work and economic benefits to construction projects. The use and promotion of BIM can effectively control the construction cost of green building projects and realize the economic effect of saving money while saving energy and reducing environmental pollution. During the rapid development of my country's construction industry, BIM plays an increasingly important role in the construction industry, and the cost of green buildings will be more effectively controlled.

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