

Application Strategy of Whole Process Engineering Cost Management in Modern Green Building Economy

Xilong Jin*, Qiuyun Zhu

Zhejiang Guli Construction Group Co., Ltd., Hangzhou 310000, Zhejiang, China

*Corresponding author: Xilong Jin (Email: 23089719@qq.com)

Abstract

This article focuses on the application of whole process engineering cost management in modern green building economy, and deeply analyzes the theory of green building and whole process engineering cost management. By reviewing the current research status, clarify the research direction and focus. This article systematically elaborates on the specific application strategies of project cost lifecycle management in the green building economy, focusing on the five key links of decision-making, planning and design, bidding and procurement, construction implementation, and completion acceptance of green building projects. At the same time, we will explore the problems faced in the application process, such as insufficient professional competence of personnel and poor information communication, and propose corresponding solutions, aiming to promote the widespread application of whole process engineering cost management in modern green building economy and achieve high-quality development of green building economy.

Keywords

Whole Process; Engineering Cost Management; Green Building; Economic Optimization Application Strategy.

1. Introduction

Green building is a new type of building model that is energy-saving, environmentally friendly, and sustainable. By applying new energy sources, energy-saving materials, and environmental protection technologies, it significantly reduces building energy consumption and pollution, and improves building comfort and living quality. It not only focuses on environmental protection and resource conservation, but also emphasizes the economic benefits of the entire life cycle of buildings. However, green buildings face challenges such as high costs and complex technology in the design and construction process. Therefore, controlling the cost of green building projects through whole process engineering cost management has become crucial. As the core of modern architectural economic management, whole process engineering cost management not only focuses on cost prediction and control in the early stage of construction, but also pays attention to cost monitoring and adjustment during the construction process, as well as cost settlement and analysis after completion. By implementing cost management throughout the entire project lifecycle, we aim to achieve comprehensive control and optimization of project costs. Based on the basic national conditions, apply the whole process engineering cost management to green building economic management, effectively address the problems of high resource consumption in the traditional construction industry, maintain ecological balance, and promote the green development of the construction industry.

2. Overview of Green Building and Whole Process Engineering Cost Management

2.1. Green Building Theory

Green building refers to maximizing resource conservation, environmental protection, and pollution reduction throughout the entire life cycle of a building, providing healthy and efficient highly applicable spaces, and achieving harmonious coexistence between humans and nature. Its concept has gradually developed from the initial ecological architectural concept to a comprehensive concept covering resource utilization, environmental protection, building functions, and other aspects.

The significant characteristics of green buildings are as follows: (1) meeting the fundamental functional requirements of buildings, based on safe construction, providing a healthy and comfortable living environment; (2) Pay attention to the conservation and utilization of natural resources such as land, emphasize the harmonious coexistence between humans and nature, use recyclable materials to improve energy efficiency, and achieve energy conservation and emission reduction; (3) Implement full lifecycle management of buildings, comprehensively managing multiple stages of the project from initial design to procurement of building materials, later construction, and operation and maintenance; (4) Pursuing the goal of harmonious coexistence between humans and nature, we are committed to integrating environmental protection throughout the entire lifecycle of buildings.

2.2. Theory of Whole Process Engineering Cost Management

Whole process engineering cost management is a comprehensive management method that covers the entire life cycle of a construction project from planning to final settlement. It adheres to the management principle of "comprehensive coverage and meticulous attention to detail", and uses specialized technical methods to accurately plan and control resources, costs, benefits, and risks. It runs through key links such as project decision-making, design, bidding, construction, and completion. The decision-making stage mainly focuses on project decision-making, investment estimation, and other aspects; The design phase includes tasks such as quota design; During the bidding stage, a detailed analysis of cost targets and contract strategy planning are required; After entering the construction phase, accurate measurement and pricing of the project quantity will be covered, strict management of project changes will be implemented, and claims will be effectively handled; During the completion phase, it is responsible for completing settlement and final accounting work.

2.3. Research Status of Application of Whole Process Engineering Cost Management in Green Buildings

Research on green buildings and whole process cost management started earlier abroad and has accumulated fruitful results. Scholars have systematically reviewed the development of the cost management industry and suggested constructing and implementing a cost management control system from three dimensions: national, regional, and unit. Regarding the research on green building engineering projects, different experts have analyzed the influencing factors of cost control throughout the entire process from the planning, design, and construction stages; Some scholars have also focused on the project decision-making stage, pointing out the significant impact of project complexity and site hardware conditions on cost management. In terms of evaluation indicators and model construction, a large number of studies have demonstrated the application value of entropy weight method in the construction of green building cost management evaluation models; Scholars have also developed and designed evaluation models such as TOPSIS, which are applied to cost control in green building management, exploring effective ways to apply Building Information Modeling (BIM) to cost

control throughout the entire process of green building projects. Empirical analysis shows that, taking a certain office building project as an example, optimizing management such as data collection, personnel collaboration, and scheme evaluation effectively improves the effectiveness of project cost management by about 50% [3].

With the promotion of the Chinese green building concept, research on the whole process cost management of green buildings in China is becoming increasingly rich. In terms of theoretical research, a large number of studies have analyzed the current status of green building engineering design and pointed out the key role of design optimization; There are also studies exploring the opportunities and challenges faced by green buildings, proposing methods for dynamically and effectively controlling project costs. Research on the analysis of influencing factors has shown that it is important to pay attention to the impact of decision-making, design, and other aspects on cost management, and to emphasize the important role of relevant design and cost personnel from an engineering economic perspective. In terms of evaluation index system and model construction, experts pointed out that it is necessary to pay attention to promoting the development of green buildings by improving the causal model; There are also studies that integrate domestic and foreign literature on engineering cost, explore the characteristics of current management mechanisms, identify key elements in construction cost management through regression analysis, and adopt entropy weight method to construct corresponding index calculation models. In terms of empirical analysis, scholars are committed to building a theoretical system for whole process engineering cost management applicable to green buildings based on their characteristics. They have proposed a BIM based framework for whole process cost management of green buildings and applied BIM technology to cost control at various stages. Numerous studies have shown the importance of whole process cost management and control processes for green buildings.

Although some achievements have been made in the overall cost management of green building projects, there are still many challenges that need to be addressed. Most existing research focuses on economic benefits considerations, with insufficient attention paid to the details of project cost management. Additionally, the evaluation index system lacks in-depth segmentation and close integration with practical applications. In addition, research is mostly phased and lacks a systematic perspective from the entire process, and there are shortcomings in practical applications. The applicability of existing evaluation index systems, evaluation models, and technical means needs to be improved.

3. Application Strategies of Whole Process Engineering Cost Management in Green Buildings

3.1. Decision Stage

Scientific and rational decision-making is the key to controlling costs. A comprehensive economic evaluation system for green buildings should be established, taking into account environmental, social, and economic benefits. By conducting a full lifecycle cost analysis, evaluate the economic feasibility of different solutions and provide scientific basis for project decision-making. Firstly, determine a reasonable construction scale and construction area. The size of the construction scale directly affects the investment scale of the project, and needs to be determined by considering factors such as market demand and resource supply; The selection of construction areas follows the principle of "land conservation", fully considering factors such as local economic development level, labor costs, transportation conditions, surrounding environment, and historical and cultural relics protection. For example, in economically developed areas, the construction of green buildings has higher labor costs, but it has advantages in technology, material supply, and other aspects, which need to be comprehensively balanced. Secondly, with the continuous development of green building

technology, selecting advanced, applicable, and economically reasonable technologies and equipment can not only meet the functional requirements of green buildings, but also effectively control costs. At the same time, it is necessary to carefully absorb various engineering schemes, extensively solicit opinions from experts, designers, construction personnel, etc., conduct comprehensive and in-depth analysis and comparison of the collected schemes, and select the optimal scheme. Furthermore, strengthening budget management and coordination is crucial. In the project decision-making stage, it is necessary to estimate the project investment reasonably, develop a scientific and detailed plan for the use of funds, and coordinate with multiple parties to ensure the smooth progress of the project. At the same time, coordinate work arrangements, develop a reasonable project schedule, clarify work tasks at each time node, strictly execute according to the plan, and avoid cost increases caused by project delays.

3.2. Design Phase

Although the design phase has a small proportion of cost, it cannot be ignored in the overall project cost management. Value engineering methods should be adopted to optimize green building design schemes. Through functional analysis and cost evaluation, seek the optimal cost-effectiveness ratio while meeting the performance requirements of green buildings. In addition, it is necessary to actively apply new materials and technologies, such as utilizing renewable energy technologies such as solar energy, to reduce dependence on traditional energy sources such as fossil fuels, fundamentally curb environmental damage, and improve resource utilization efficiency. At the same time, we attach great importance to the discharge and review of waste, adopt pollution-free treatment methods, review and screen waste, achieve the secondary utilization of some waste, and save costs.

Enhancing and improving the comprehensive abilities of designers is the core element of implementing cost management in the design phase. Designers need to deeply cultivate the concept of green building design, be familiar with the standards and requirements of green buildings, fully consider various factors such as building functionality, aesthetics, energy efficiency, and environmental protection during the design process, and make design plans based on green concepts. At the same time, designers and budget personnel should strengthen communication and cooperation. When designing specific architectural drawings, budget personnel should conduct an overall budget analysis based on the drawings, quickly identify and avoid potential waste factors, ensure that the budget is not exceeded, and achieve dual optimization of the economic benefits and environmental performance of the design scheme.

3.3. Bidding Stage

The bidding stage is a crucial step in selecting high-quality construction companies and accurately controlling project costs. It is necessary to prepare bidding documents with a green concept, clarify the construction requirements and standards of green buildings, and provide strong constraints for subsequent construction. At this stage, based on market research, current pricing standards, and the characteristics of green building projects, a scientific maximum price limit should be established to improve the accuracy of compilation and lay a solid foundation for cost control. At the same time, establish and improve the system for filing and reviewing base bids, implement standardized management, dynamically track and compare project costs, and ensure the accuracy and rationality of base bid preparation. In the bidding process, pay attention to the market supply and demand relationship, eliminate false quotations, and select strong construction companies. In addition, increasing the importance of the role of economic management personnel, strengthening attention to cost control of green building economy, ensuring that they can timely obtain data, analyze changes in engineering costs, and optimize the engineering cost management process accordingly. Finally, based on the actual situation of

the project, carefully choose between general contracting or specialized subcontracting to reduce the risk of delays and improve the quality of the project.

From a macro perspective, construction companies should attach importance to the overall investment environment, establish a green building concept, and integrate it into their corporate culture. Through vigorous promotion and training, they should strengthen the green building awareness of their employees. Encourage management personnel to fully consider green building standards in project decision-making and management processes, reducing unnecessary resource waste. At the same time, establish a reward and punishment system to commend and promote the concept of green building engineering in enterprises, and punish violations. To comprehensively enhance the understanding and practical level of green building among enterprises and employees.

3.4. Construction Phase

The construction phase is a key node in engineering cost management, implementing refined cost control and management. By establishing a sound cost management system, real-time monitoring of construction costs, and timely detection and correction of deviations. Firstly, it is necessary to strengthen the management of relevant personnel. Construction companies should establish rigorous job responsibilities and performance evaluation systems, constrain and regulate the behavior of workers, and improve work efficiency and quality. In the material procurement process, it is necessary to follow the material standards of green building projects, compare and analyze the quality and price of similar materials in the market, and select composite materials that combine high performance and environmental protection characteristics to ensure maximum economic benefits while meeting performance requirements. In terms of material usage, establish a strict and standardized requisition system, carry out corresponding registration work, strengthen the supervision of material usage process, and reduce material waste. Finally, dynamic engineering cost management should be implemented. Considering that construction is easily affected by factors such as personnel, weather, and environment, which may lead to construction problems or changes, it is necessary to enhance collaboration and communication between design, construction, and other departments, and quickly determine a plan that balances cost management with minimal impact and meets the requirements of green building quality. Ensure that the project cost is fully controllable and promote the smooth implementation of green building projects through specialized management measures.

3.5. Completion Stage

In the completion stage, the application of information technology should be strengthened, documents and data should be managed through electronic means, the information retrieval process should be simplified, and management efficiency should be improved. At the same time, fully utilizing computer and other technologies to conduct in-depth analysis and processing of construction data, providing solid data support for cost management. Build a high-quality network environment, achieve real-time sharing and transmission of information, and ensure orderly implementation of project management activities. Standardize project management processes to ensure accurate, timely, and orderly communication of information, and avoid management risks caused by poor information flow. In addition, strengthen the management of engineering claims, collect and organize relevant evidence in a timely manner, make reasonable claims, and safeguard the legitimate rights and interests of all parties involved in the project.

After completion, a long-term cost monitoring and optimization mechanism can be established, regular building performance evaluations and maintenance needs analysis can be conducted, scientific maintenance plans can be formulated, the building's service life can be extended, and maintenance costs can be reduced. At the same time, attention should be paid to data collection

and analysis to provide reference for decision-making and design of future green building projects.

4. Conclusion

The whole process engineering cost management faces challenges of complexity and management synergy in the implementation of modern green buildings. One is the lack of professional competence among personnel. Some cost management personnel have insufficient understanding of the characteristics and requirements of green buildings, lack relevant professional knowledge and skills, and find it difficult to fully consider the factors of green buildings in cost management. The uneven green concepts and comprehensive qualities of designers may lead to deficiencies in the economic and green aspects of design schemes. The second issue is poor communication of information. In the whole process cost management of green building projects, poor information communication among multiple parties (including construction units, design units, construction units, supervision units, etc.) may lead to delays and distortions in information transmission, directly affecting the accuracy and timeliness of cost management, and thereby weakening the overall management effectiveness. Thirdly, there are difficulties in applying technology. Green buildings involve various new technologies and materials, and their cost calculation and cost management are relatively complex. Some enterprises lack corresponding experience and technical support when applying these technologies and materials, which increases the difficulty of cost management.

To address the issue of insufficient professional competence among personnel, enterprises need to strengthen training on green building knowledge. Regularly organize cost management and design personnel to participate in green building training courses and seminars, encourage self-learning, update knowledge structure, and enhance the professional competence of cost management personnel. Secondly, in order to solve the problem of poor information communication, an effective information communication mechanism should be established, advanced management software should be actively introduced, real-time sharing of project information should be achieved through information platforms, cooperation among all parties should be strengthened, and coordination meetings should be held regularly to ensure close connection between each stage and timely resolution of problems. Finally, for technical application challenges, enterprises should strengthen cooperation with research institutions, universities, etc., to obtain technical support and experience reference. At the same time, actively carry out internal technology research and innovation, and improve one's ability to apply green building technology and materials. In addition, the government should strengthen the promotion and application of green building technology, formulate relevant technical standards and specifications, and provide guidance for enterprises. In the face of challenges and opportunities, we should actively respond and continuously innovate, promote the sustainable and healthy development of green building industry through scientific and efficient management, and achieve comprehensive optimization of green building economy.

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