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Research on Key Stages and Control Strategies of Whole-Process Cost Management in Agency-Built Projects

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Abstract: Against the backdrop of the increasingly complex construction market environment, the whole-process cost management of agency-built projects faces issues such as cost overruns and insufficient management efficiency due to the numerous stages and high technical requirements involved. This paper focuses on the key stages of whole-process cost management in agency-built projects, including project initiation, design, construction, and completion. It proposes strategies to optimize the cost management process and enhance management efficiency, providing theoretical support and practical guidance for the whole-process cost management under the agency-built model.

Keywords: Agency-built projects; Whole-process cost management; Cost control; Dynamic management; Completion settlement

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1. Introduction

Agency-built projects are widely applied in complex construction projects due to their high degree of specialization and strong management efficiency. However, with the changes in the construction market environment and the expansion of project scale, the whole-process cost management of agency-built projects is facing practical problems such as an imperfect management system and increased difficulty in cost control. Based on the practical needs of agency-built projects, this paper starts from the key stages of whole-process cost management, combines actual cases, and explores optimized management models and control strategies, providing a scientific basis for reference and practical guidance in relevant fields.

2. The basic concept and framework of whole-process cost management in agency-built projects

The whole-process cost management of agency-built projects refers to a management approach that systematically

manages and dynamically controls the cost of construction projects from project initiation to completion and delivery under the agency-built model [1]. Its purpose is to optimize resource allocation and enhance investment efficiency by employing scientific methods and effective technical means, thereby ensuring the achievement of project objectives. The basic framework of whole-process cost management consists of four core stages: First, during the project initiation stage, cost estimation and investment control are carried out through feasibility studies, economic analysis, and preliminary estimation to determine a reasonable scale of investment. Second, during the design stage, cost optimization is achieved through limited design, alternative scheme selection, and value engineering to coordinate the design outcomes with cost targets. Third, during the construction stage, dynamic cost management is implemented with contract management as the core, and real-time cost control is realized through quantity surveying, change review, and phased settlement. Fourth, during the completion stage, settlement and cost evaluation are conducted through completion account audit, cost indicator analysis, and post-evaluation to improve the management mechanism. This is specifically illustrated in **Figure 1**.

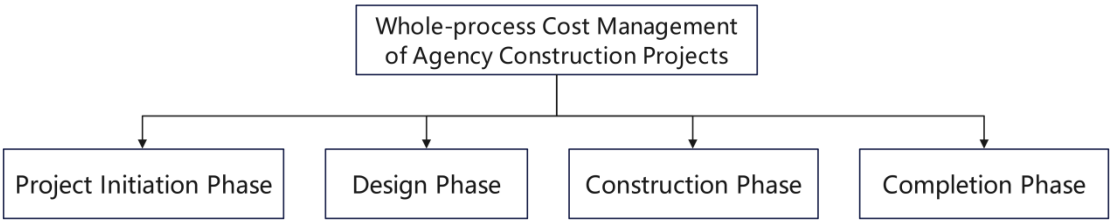

Figure 1. Technical roadmap for whole-process cost management of agency-built projects

3. Key stages

3.1. Cost management during project initiation and design stages

During the project initiation stage, cost management centers on a scientific and rational investment estimation, taking into account factors such as technical feasibility, market demand, policy environment, and funding sources to formulate an investment plan that meets the overall project objectives [2]. In the design stage, a combination of limited design, scheme optimization, and value engineering is employed to achieve a coordinated unity between cost targets and design depth. The management process emphasizes the full utilization of technical tools and data models, integrating project functional requirements and cost indicators for comprehensive evaluation, and adopting multi-scheme comparison to optimize design outcomes [3].

3.2. Cost control and dynamic management during construction stage

Cost control and dynamic management during the construction stage involve real-time supervision and dynamic adjustment of the project implementation process to achieve cost control objectives. The focus of management is on the basis of contract terms and construction organization design, employing methods such as quantity surveying, contract execution, and phased settlement to implement refined cost control. Dynamic management relies on real-time data analysis, integrating construction progress, resource allocation, and quality requirements organically [4]. It involves optimizing construction organization, adjusting resource allocation, and monitoring budget execution to ensure that costs are effectively controlled within the set limits.

3.3. Settlement review and cost evaluation during completion stage

The core of settlement review and cost evaluation during the completion stage is to ensure the authenticity and

reliability of project costs and to provide a comprehensive summary of management work. The settlement review is based on contract terms and actual completed work quantities, conducting a systematic review of completion documents, settlement files, and bill of quantities. During the review process, construction records, design changes, and actual on-site completion are comprehensively compared, with a focus on verifying the accuracy of work quantities and costs to avoid overestimation or omission. Cost evaluation focuses on analyzing the implementation effectiveness of whole-process cost management, assessing the deviation between actual and budgeted costs, and summarizing the strengths and weaknesses of management measures and their implementation effects to provide experience accumulation and improvement suggestions for subsequent projects [5].

4. Project overview

The Phase III Infrastructure Construction of the Airside Economic Industrial Park Surrounding the Phase III Expansion Project of Baiyun International Airport (Fangshi, Fenghe, Yahu, Heruilu, and Zhusan plots) is located in Renhe Town and Zhongluotan Town, Baiyun District, Guangzhou City [6]. The construction content of the project includes resettlement housing, supporting commercial and public buildings, as well as municipal road facilities within the land use red line, with a planned total construction area of approximately 851,638.55 square meters, including 624,020.8 square meters above ground and 227,617.75 square meters underground. The project is planned to resettle 1,906 residential units, with a resettlement housing area of 533,643 square meters, a public supporting facilities area of 70,326.8 square meters, and an underground area of 227,617.75 square meters. The engineering content includes excavation support, karst cavity treatment, soft foundation treatment, earth and stone work, architectural decoration, civil air defense, heating, ventilation, intelligent systems, landscape engineering, etc., and is guided by green building standards to promote sustainable development [7]. The project has a planned total duration of 1,080 days, and upon completion, it will enhance the level of infrastructure in the region and provide strong support for regional economic development [8].

5. Control strategies for whole-process cost management in agency-built projects

5.1. Improving the accuracy of cost forecasting in the project decision-making stage

In the project decision-making stage, this project has formulated a scientific preliminary planning and detailed cost forecasting strategy to ensure the rationality and feasibility of the budget plan. Specific measures include strictly implementing geological survey procedures, organizing a professional team to conduct thorough surveys and analyses based on the special geological conditions and climatic characteristics of the project area, and forming a complete set of basic data covering geological types, groundwater conditions, and construction risks. Meanwhile, following the relevant requirements of the "Code for Quantity-based Pricing of Construction Projects (GB50500-2013)," detailed calculations are conducted for each individual project, clarifying the cost composition of each sub-item in the bill of quantities, and a precise budget allocation plan is formulated by comprehensively analyzing factors such as material supply, construction techniques, and technical parameters [9]. In addition, the project employs a dynamic estimation model to track key cost elements such as material price fluctuations, labor cost adjustments, and machinery rental fees in real time, and sets aside a reasonable contingency of 10%–15% to ensure sufficient financial flexibility to cope with policy adjustments, market price fluctuations, and unexpected events. This is specifically illustrated in **Figure 2**.

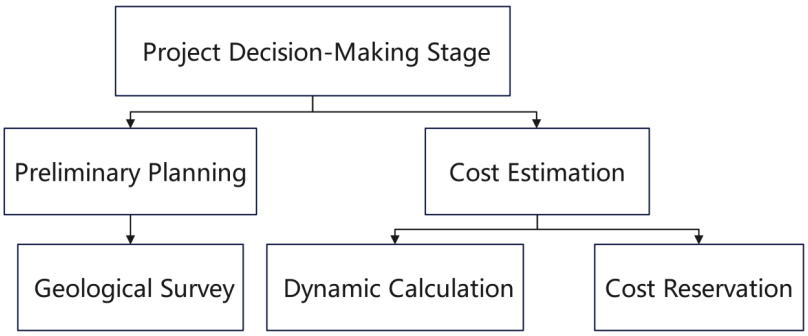

Figure 2. Cost management technical roadmap for the project decision-making stage

To enhance the precision of cost forecasting and the scientific basis for decision-making, the project established a regional construction cost database [10]. By employing big data technology to integrate historical cost data from similar projects and calibrating the cost baseline in accordance with current market dynamics, the project conducted a sensitivity analysis to assess potential cost fluctuations caused by different design schemes. To ensure the comprehensiveness and accuracy of cost estimation, the project implemented an expert review and an interdepartmental joint review mechanism. A joint evaluation team, composed of cost experts, design units, construction management teams, and third-party consulting firms, was organized to conduct multiple rounds of review and optimization of the preliminary budget plan. Consensus was reached on the rationality of key cost indicators and the feasibility of construction. Additionally, digital budget management tools were introduced to update estimation parameters in real-time and generate visual reports, ensuring transparency and traceability of budget data. Regular cross-departmental coordination meetings were held to review and revise the technical approach and cost model of budget preparation. Ultimately, a precise cost control system covering the entire project life cycle was constructed, laying a solid foundation for cost management in subsequent implementation stages [11].

5.2. Strengthening cost control in the design stage

In the design stage, the design unit fully implemented the requirements of the "Regulations on the Depth of Architectural Engineering Design Documents (2016 Edition)," clarifying the design depth and delivery standards for each specialty. Combining the technical demands of green building and prefabricated construction, BIM technology was employed throughout the entire design process. Specific measures included establishing a 3D model of the entire project using BIM technology to dynamically simulate the building volume, structural layout, and installation of equipment and pipelines [12]. Multiple design schemes were optimized and compared to achieve a balance between technical feasibility and economic viability. Comprehensive analysis was conducted on material usage, construction techniques, and technical parameters of building components, with real-time cost estimation of optimized schemes to ensure that the final design outcome met regulatory requirements and minimized cost risks during the construction phase.

Furthermore, the project strengthened the integrated management of design and cost control by establishing a linkage mechanism among the design unit, cost consulting unit, and construction unit. Before the submission of design results, a comprehensive review and optimization were conducted on errors in quantity calculation, unreasonable material selection, and structural redundancy in the construction drawings. To address potential cost fluctuations caused by design changes, a dynamic cost early warning system was adopted to track cost changes

in real-time and intervene promptly. In the design stage, the dynamic management capability of cost data was enhanced by introducing quantitative analysis tools and cost management software to dynamically update material market price fluctuations, supply chain conditions, and costs of design changes, ensuring timely and accurate cost control information. The project also strictly regulated the design briefing and drawing review process, adopting refined drawing review and briefing meetings to clarify construction technical requirements and cost control priorities [13]. This ensured that construction units accurately understood the design intent, minimizing construction changes and material waste caused by drawing issues, thereby achieving optimized cost management throughout the life cycle.

5.3. Strict cost monitoring and management in the construction stage

In the construction stage, the project established a comprehensive dynamic cost management system to precisely align the budget with actual expenditures, ensuring strict control over project costs throughout the process. Specific measures included establishing a dynamic monitoring system supported by a digital management platform to achieve real-time tracking and analysis of project progress, resource consumption, and fund flow. By comparing dynamic data with the construction schedule, potential cost deviations were quickly identified and corrected. For change requests submitted by construction units, a rigorous multi-party review mechanism was implemented. The supervising unit first verified the actual completed work volume on-site, followed by detailed estimation and re-calculation of the change content by the cost consulting unit. Finally, the contracting party decided whether to approve the change costs based on the review results, ensuring that the calculation basis for change costs was sufficient and that fund usage complied with contractual requirements [14].

In terms of material and equipment procurement management, the project strictly implemented a material supply management system for the contracting party. Clear regulations were set for procurement standards, supply channels, and quality acceptance procedures. Market dynamic monitoring was employed to analyze material price fluctuations in real-time, and procurement price limits and risk contingency plans were established for key materials to avoid cost overruns caused by abnormal market price fluctuations or material quality issues. Meanwhile, on-site construction implemented refined cost accounting management, with dedicated cost personnel calculating daily work volume completion, resource consumption, and material utilization. Detailed cost accounting reports were regularly submitted to the contracting party and supervising unit for review. Additionally, regular multi-party coordination meetings were held to compare budget and actual expenditure data, analyze cost risks in construction progress, and take corrective measures in a timely manner to ensure that fund usage during the entire construction stage was scientific, rational, and controllable. The specific management process is shown in **Figure 3**.

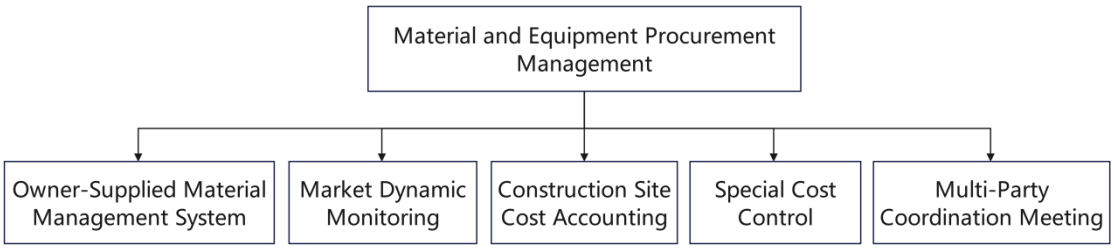

Figure 3. Technical roadmap for material and equipment procurement management

5.4. Rational settlement and audit during the completion and acceptance stage

Before completion and acceptance, the construction unit must submit a complete set of completion documents in accordance with the contract requirements. These documents include verified completion drawings, change records, on-site approval forms, and various types of acceptance documents. Based on these documents, the construction unit is required to prepare a detailed completion settlement file. The cost management department will conduct a thorough review of the settlement documents submitted by the construction unit, strictly checking the bill of quantities, change approval contents, and the actual completed work volume to ensure that the settlement data is consistent with the construction contract and the actual project situation. Any issues identified during the review will be immediately fed back to the construction unit for timely rectification. The review will focus on verifying the consistency between the bill of quantities items and the completion drawings, with particular attention to high-risk items and the compliance of costs outside the contract. In addition, a dynamic settlement progress management mechanism has been established, enabling the cost management department to control and accept the settlement process in stages. This mechanism effectively shortens the completion settlement review cycle and prevents delays in settlement from affecting the overall financial plan of the project [15].

During the audit phase, this project introduces an independent third-party auditing institution to conduct a comprehensive review of the completion settlement. Special emphasis is placed on auditing items that are prone to discrepancies or disputes, such as change orders, key material usage, and costs outside the contract. This ensures that all costs are supported by sufficient evidence and reasonable calculation standards. Regarding the payment and refund of the quality guarantee deposit, the project adopts a tiered review mechanism, with the supervising unit, cost consulting unit, and contracting party jointly reviewing and signing off on the payment approval opinions. This ensures that the payment of the guarantee deposit complies with the contract terms and acceptance standards. In addition, for matters involving settlement disputes, the project has established a detailed dispute resolution process. Expert reviews or arbitration procedures are organized to ensure fair handling of disputes and to avoid delays in project acceptance and fund management, thereby achieving standardized and closed-loop management of completion settlement.

6. Conclusion

Whole-process cost management in agency-built projects is a crucial component in achieving project economic benefits, efficient resource utilization, and quality control. The management process spans the entire life cycle of the project, from initiation to design, construction, and completion. Scientific and rational cost management can effectively improve resource utilization, reduce the risk of cost overruns, and promote dual enhancements in engineering quality and economic benefits. This paper has conducted a systematic review of key stages and in-depth research on control strategies, proposing specific measures to optimize whole-process cost management. These measures provide a comprehensive scientific basis and optimization path for cost management under the agency-built model.

Disclosure statement

The author declares no conflict of interest.

References

[1] Wu Q, Wang G, 2016, Cost Control by Design Institutes as the Agency in the Whole Process of Water Conservancy Engineering Agency Projects. Water Resources Development and Research, 16(07): 61–63.

[2] Tao L, 2012, Preliminary Exploration of Cost Management and Control in Agency Construction Projects. Science and Technology Information, 2012(21): 375.

[3] Zhai Z, Wang S, 2009, Discussion on Whole-Process Cost Management in Project Agency System. Urban Road & Bridge and Flood Control, 2009(11): 87–89, 10.

[4] Chen Y, 2025, Research on the Management of Government Investment Agency Project Based on SWOT Analysis. Investment and Entrepreneurship, 36(02): 164–166.

[5] Zhang S, Zeng L, Liu W, 2024, Application Analysis of Project Agency Management in the Construction of Pumped Storage Power Station Project. Electrotechnical Studies, 2024(S2): 323–326.

[6] Li Q, 2024, A Brief Analysis of the Problems and Improvement Strategies of Agent Construction Project Management. Juye, 2024(12): 167–169.

[7] Zhou Q, 2024, Research on the Construction of Financial Control System for Engineering Agency Construction Projects. Township Enterprise Herald, 2024(22): 138–140.

[8] Yin J, 2024, Research on the Optimization Path of Construction Cost Management in the New Era. Bulk Cement, 2024(01): 157–159.

[9] Chen J, 2024, Research on Project Cost Risk Assessment and Control Strategy. In: Proceedings of the 2024 Engineering Technology Application and Construction Management Exchange Conference of China Intelligent Engineering Research Association. Hangzhou Electric Power Equipment Manufacturing Co., Ltd.: 178–179.

[10] Zuo J, 2023, Research on Comprehensive Budget Management in Construction Cost Control. China Construction, 2023(5): 19–20.

[11] He H, 2024, Application of Dynamic Cost Control in Construction Project Cost Management. Building Materials Development Orientation, 22(22): 72–74.

[12] Lin L, 2021, Strategic Research on Cost Control of Government Investment Project Construction Units. Housing and Real Estate, 2021(22): 71–72.

[13] Peng Z, 2024, Research on the Role and Optimization Strategy of Project Budget in Construction Project Cost Control. Real Estate World, 2024(21): 122–124.

[14] Chen S, 2024, Analysis of Engineering Cost Control Strategy of BIM Technology in Construction Cost Management. Value Engineering, 43(31): 162–164.

[15] Wang S, 2022, Analysis of Risk Points in Cost Management of Housing Construction Projects. China Tendering, 2022(07): 112–113.