Discussion on Whole-Process Cost Control in Construction Project Management

Aiwen Liu

Anhui Zhongxin Engineering Consulting Co., Ltd., Hefei, Anhui, 230000, China

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Abstract: As a critical link in construction project management, whole-process cost control runs through all stages of a project, including decision-making, design, tendering and bidding, construction, and completion settlement. Effective whole-process cost control can reasonably determine and effectively control project costs, enhancing the economic and social benefits of construction projects. This paper deeply analyzes the characteristics of cost control at various stages of construction project management and proposes specific strategies for strengthening whole-process cost control, aiming to provide theoretical support and practical guidance for construction project cost management.

1.Introduction

Construction projects are characterized by large investments, long cycles, and numerous participants, making cost control challenging. Traditional cost management models often focus on cost control during the construction phase, neglecting cost management in the preliminary and design stages, which can lead to ineffective control of project costs. Whole-process cost control emphasizes comprehensive and systematic management and control of project costs starting from the decision-making phase. By rationally setting cost targets for each stage and implementing effective control measures, it ensures project costs remain within budget, maximizing the investment benefits of the project.

2. Analysis of Cost Control Characteristics in Various Stages of Construction Project Management

2.1 Decision-Making Stage

The core task of the decision-making stage is to conduct project feasibility studies, defining key elements such as project scale, construction standards, and site location. The key point of cost control at this stage lies in the scientific preparation of the investment estimation report. An investment estimation is not merely a list of numbers; it must fully consider various potential risk factors. Fluctuations in market prices, adjustments to policies and regulations, and changes in the natural environment can all impact project costs. Only by incorporating these risk factors can the accuracy and reasonableness of the investment estimation be guaranteed. An accurate and reasonable investment estimation acts as a "compass" for project decisions, providing a reliable basis. If the investment estimation is too low, it may lead to project disruption due to funding shortages during construction; conversely, an excessively high estimation may cause resource wastage and reduce investment efficiency. Therefore, a reasonable investment estimation helps avoid investment waste caused by faulty decisions and ensures the project's economic feasibility[1].

2.2 Design Stage

The design stage is crucial for translating project decisions into specific engineering solutions. An excellent design scheme can achieve reasonable cost reduction while meeting functional requirements; design flaws, however, may lead to increased project costs and hidden quality issues.

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A key aspect of cost control at this stage is implementing quota-based design (designing within prescribed cost limits). Quota-based design is an effective method where the preliminary design is controlled according to the approved investment estimation, and then the detailed construction drawing design is controlled according to the approved preliminary design budget estimate. It requires designers to strictly control costs at every step of the design process, keeping project costs within reasonable bounds. Designers should fully utilize their creativity and professional expertise to optimize the design scheme while meeting functional requirements. For instance, costs can be reduced by rationally planning building layouts, selecting appropriate building materials, and choosing suitable structural forms. It is important to note that design changes often lead to cost variations; therefore, unnecessary changes should be minimized. For essential changes, strict approval procedures must be established. During approval, the reasons and responsibilities for the change should be thoroughly analyzed (e.g., design flaws, changes in owner requirements, or other factors), and the impact on cost must be evaluated in detail to ensure the revised cost remains controllable.

2.3 Tendering and Bidding Stage

The tendering and bidding stage is vital for determining the project contract price through market competition. Cost control at this stage focuses on preparing accurate tender documents and Bills of Quantities (BoQ). Tender documents form the basis of the bidding process and should clearly specify key elements such as project scope, technical requirements, and pricing methods. The BoQ is the foundation for bid pricing, and its accuracy directly affects the reasonableness of project costs. Therefore, tender documents and BoQs must be prepared meticulously to avoid ambiguity or calculation errors that could lead to disputes and cost increases later. Reasonable bid evaluation methods and criteria must be established. Bid evaluation should not rely solely on the quoted price; it should comprehensively assess factors such as the bidder's reputation, track record, and construction plan. Selecting a competent contractor with a reasonable bid ensures smooth project implementation and facilitates effective cost control[2].

2.4 Construction Stage

The impact of the construction stage on project cost is generally less than that of the decision-making and design stages. However, due to the long construction period and numerous involved factors, cost overruns are common. Key aspects of cost control during construction include strengthening contract management. Contracts are vital legal documents governing the conduct of both parties; they must be strictly adhered to when controlling variations and claims. Variations should undergo rigorous approval, analyzing the cause and responsibility, and reasonably determining the variation cost. Changes caused by the contractor's own reasons should be borne by the contractor; changes due to design flaws or owner requirement changes should be adjusted according to the contract terms. Furthermore, progress payments should be based on the actual completed work, ensuring payment amounts are accurate. The review process must strictly follow contract clauses and project progress to avoid overpayment or underpayment. Effective management of material and equipment procurement is also critical. Since material and equipment costs constitute a significant portion of the project cost, selecting quality materials and equipment at competitive prices through tendering and optimized procurement strategies can effectively reduce procurement costs and thus control the overall project cost[3].

2.5 Completion Settlement Stage

The completion settlement stage is the final phase of project construction, where the final project cost is determined. Cost control at this stage centers on rigorously reviewing the completion settlement documents to ensure their authenticity, completeness, and accuracy. The review includes verifying the accuracy of quantity calculations, the reasonableness of unit price applications, and the compliance of fee calculations with regulations. Issues identified during the review should be promptly communicated and negotiated with the contractor for adjustment and correction. The settlement result should be objective and fair, accurately reflecting the actual project cost. Only by

effectively controlling costs at the completion settlement stage can the project cost be reasonably finalized, providing an accurate basis for assessing the project's ultimate economic benefits. Cost control across the various stages of construction project management is interconnected and interdependent. Only by accurately grasping the characteristics of each stage and implementing effective control measures can whole-process, comprehensive cost control be achieved, enhancing the overall benefits of the project[4].

3. Strategies for Strengthening Whole-Process Cost Control in Construction Projects

3.1 Establish and Improve Cost Management Systems

In the construction sector, construction entities must prioritize the establishment and refinement of internal cost management systems. Firstly, the specific responsibilities and authorities of various departments in cost management should be clearly defined, creating a rigorous management mechanism with interlocking, mutually restraining, and mutually supervising links. For example, the finance department oversees fund allocation and payment reviews, ensuring expenditures align with the cost budget; the engineering department manages project progress and quality while promptly reporting the impact of variations on costs; the cost management department focuses on cost accounting, analysis, and control, providing professional guidance and oversight to other departments. Secondly, specific workflows, operational methods, and quality standards should be established for every phase—from preparing the investment estimation report during the preliminary stage, reviewing budget estimates during design, determining tender bases and agreeing on contract prices during tendering, to reviewing progress payments and managing variation costs during construction, and finally, reviewing the settlement upon completion. Standardized and formalized management processes help prevent cost overruns due to human factors and ensure cost control work is rule-based and orderly. A robust assessment and evaluation mechanism for cost management is also essential. Regular evaluations of the performance of departments and individuals in cost management tasks can incentivize proactive fulfillment of responsibilities and collective commitment to cost control[5].

3.2 Enhance the Professional Competence of Cost Personnel

Construction entities should focus on improving the professional competence of cost personnel. On one hand, systematic training and education for cost personnel should be strengthened. This includes providing solid learning opportunities in core areas of construction cost (e.g., cost basis, pricing methods, quantity calculation rules) and familiarizing them with knowledge in related fields such as construction law, engineering technology, and project management. Since cost management is closely linked to these areas, only with a comprehensive knowledge base can cost personnel accurately judge and handle various cost issues in complex project environments. On the other hand, emphasis should be placed on cultivating strong communication, coordination, problem-solving, and analytical skills in cost personnel. During whole-process cost control, cost personnel need to frequently communicate and coordinate with internal departments as well as external parties like design institutes, contractors, and supervision companies. Effective communication ensures accurate and timely information flow, preventing misunderstandings and disputes. Additionally, cost personnel must possess strong professional ethics, maintaining honesty, integrity, objectivity, and fairness in their work. Adherence to professional conduct, rejection of irregularities and unethical practices, is crucial to ensuring the impartiality and authority of cost control work[6].

3.3 Strengthen IT Infrastructure

In the era of rapidly developing information technology, strengthening IT infrastructure has become essential for enhancing the level of whole-process cost control in construction projects. Construction entities should actively follow this trend and increase investment in IT. Firstly, advanced construction cost management software should be adopted. This software offers powerful functionalities enabling information-based management of project costs. It allows for rapid and

accurate calculation of quantities, compilation, and review of project costs, significantly improving work efficiency and accuracy. Secondly, a unified cost information management platform should be established, integrating cost information from all participants—construction entity, design institute, contractor, supervision company, etc.—enabling real-time information transfer and sharing. This allows all parties to stay informed about dynamic cost changes, identify and resolve issues promptly, and avoid cost overruns due to information delays. Furthermore, leveraging cutting-edge technologies like big data and artificial intelligence enables in-depth mining and analysis of vast amounts of cost data. Comparative analysis of historical and actual data helps identify patterns and trends in cost changes, providing a scientific basis for project decision-making[7].

3.4 Strengthen Communication and Collaboration Among Departments

Whole-process cost control involves multiple stakeholders such as the construction entity, design institute, contractor, and supervision company, requiring close coordination and collaborative work among various departments. As the project organizer and manager, the construction entity should play a leading role, enhancing communication and coordination with all parties. Firstly, an effective communication mechanism should be established, defining the methods, frequency, and content of communication. Secondly, during the design phase, the construction entity should engage in thorough and deep communication with the design institute. Clearly conveying the project's functional requirements, construction standards, and cost objectives enables the design institute to fully consider cost factors during design, optimizing the solution to reduce costs while meeting functional needs. Additionally, the construction entity should track and supervise the design process, promptly providing feedback on the cost impact of design changes to ensure the design meets cost control requirements. During the construction phase, the construction entity must work closely with the contractor and supervision company. Strengthen management of variations and claims: contractor-initiated change requests should be rigorously reviewed by relevant personnel to analyze necessity and cost impact; only approved changes should proceed. For claims, investigations and resolutions should be timely conducted according to the contract and relevant laws and regulations to ensure the reasonable protection of all parties' interests. Through the concerted efforts of all stakeholders, a powerful synergy can be formed to collectively control project costs and maximize investment benefits[8].

4. Conclusion

Whole-process cost control is crucial for controlling project costs and enhancing the economic and social benefits of construction projects. Construction entities should fully recognize its importance, strengthen cost management across all project phases (decision-making, design, tendering, construction, completion settlement), establish robust cost management systems, enhance the professional competence of cost personnel, strengthen IT infrastructure, improve communication and collaboration among departments, and implement effective control strategies. This enables whole-process, comprehensive cost control, ensuring project completion within budget. As the construction market evolves, whole-process cost control must continuously innovate to meet the demands of cost management under new circumstances.

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