Research on the Application of Whole-Process Engineering Cost Consultation in Construction Project Management

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Abstract: Construction projects often face challenges such as "creative overspending," "uncontrolled changes," and "settlement chaos" due to disjointed cost management across various stages, akin to a journey without guidance that easily deviates from the cost route. From the perspective of "whole-life cycle collaboration," this article focuses on the application of whole-process engineering cost consultation in construction projects. It encompasses investment estimation in the decision-making stage, quota control in the design stage, dynamic adjustments during the construction stage, and closed-loop review upon completion and settlement. The study reveals how consulting agencies adopt strategies of "precision, penetration, real-time monitoring, and rigor" to break down cost management barriers across all phases.

1. Introduction

A construction project is like a complex long-distance journey, from initial blueprint conception to mid-construction advancement and final settlement. Each step carries the risk of "cost misdirection." The siloed management approach, akin to an orchestra without a unified conductor, fails to produce harmony even with the finest instruments. Whole-process engineering cost consultation, however, delineates reasonable cost boundaries for creativity during the design phase, promptly addresses unexpected cost risks during construction, and clarifies every expense during settlement. It transforms cost management in construction projects from "remedial action" to "proactive planning," using coherent services to break down barriers between phases and find the optimal balance between quality and efficiency for construction projects.

2. Core Content of Whole-Process Engineering Cost Consultation

The core content of whole-process engineering cost consultation involves consulting agencies conducting professional cost management tasks at each critical stage of a construction project's lifecycle, from initiation to completion. This ensures project costs remain controllable and avoids issues such as phase disconnects or cost overruns[1].

During the project decision-making stage, the consulting agency communicates with the owner to clarify investment scale, expected returns, and functional positioning. It collects current market prices for building materials, labor costs, and equipment rental fees, combining these with cost experiences from similar projects to compile an accurate investment estimation report.

Upon entering the design stage, the consulting agency actively intervenes in the design process, promoting the concept of limit design to the design team. Based on the investment estimation determined during the decision-making stage, it breaks down cost control targets into specific design nodes, such as building structure, finishing standards, and equipment selection. The agency offers optimization suggestions for potential cost wastage in the design scheme, such as adjusting structural forms to reduce material usage while ensuring safety. During the bidding stage, the consulting agency prepares accurate tender control prices based on construction drawings and industry standards, setting reasonable upper limits for tender prices to prevent bidding units from disrupting the tender process through high-price bids or low-price malicious competition. It also assists the owner in reviewing cost-related clauses in tender documents, clarifying adjustment

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methods for contract prices, payment ratios, and timelines for progress payments, thereby reducing potential contract disputes during construction[2]. During the bid evaluation phase, the consulting agency analyzes the quotation composition of each bidding unit, assessing the reasonableness of quotes and identifying omissions or inflated items, providing professional advice to help the owner select cost-effective contractors.

During the construction stage, which is critical for cost control, the consulting agency regularly visits the site to verify progress, cross-check completed quantities against construction drawings, and review progress payment applications submitted by contractors. This ensures payment amounts align with actual progress, avoiding overpayment or underpayment. When engineering changes or site visa requests arise, the consulting agency promptly calculates the cost of changes, analyzes their impact on the total project cost, and offers cost control suggestions to the owner, preventing changes from becoming sources of cost overruns.

Finally, during the completion and settlement stage, the consulting agency comprehensively reviews settlement documents submitted by contractors, verifying the accuracy of quantity calculations, the appropriateness of unit prices as per contract agreements, and the compliance of various fees. For disputes between the owner and contractors, the consulting agency facilitates communication and negotiation based on project actual conditions and relevant regulations, helping both parties reach consensus. The agency then issues a complete settlement review report, providing clear and accurate cost basis for the owner to complete project cost accounting and asset handover.

3. Application of Whole-Process Engineering Cost Consultation in Various Stages of Construction Projects

3.1 "Precision in Investment Estimation" to Avoid Cost Mismatch Risks

During the decision-making stage of a construction project, whole-process engineering cost consultation agencies adopt "precision in investment estimation" as a core strategy to avoid cost mismatch risks from the outset. The agency confirms the owner's total investment limit, prioritizes core functional requirements (e.g., spatial needs for commercial projects, practicality rates for residential projects), and expected investment payback periods, ensuring alignment with the owner's needs[3]. The agency then conducts multi-dimensional data research, collecting current market prices for building materials, labor quotes, and equipment rental costs at the project location, while also analyzing cost fluctuation trends over the next 6–12 months using industry databases. It references cost cases from 3–5 similar projects in the same region, excluding special market factors. Based on this data, the agency prepares an investment estimation report by modules, such as decomposing a commercial complex project into civil engineering, mechanical and electrical installation, decoration, and landscaping modules. It calculates the cost proportion of each module, compares initial investments and long-term operation and maintenance costs of different technical solutions (e.g., steel vs. concrete structures), and clearly marks cost critical points for each plan. Finally, the agency assists the owner in completing feasibility analysis, determining whether the project can achieve expected returns at current cost levels. If a module's cost exceeds reasonable ranges (e.g., excessively high decoration costs), optimization directions are proposed early to ensure cost-effectiveness from the decision-making stage. Additionally, the agency includes potential hidden costs in the estimation, such as underground obstacle removal fees for old plots or winter construction anti-freezing measures in special climate zones, to avoid cost overruns due to omitted expenses. It also uses "scenario simulation" to stress-test the estimation results, assuming extreme conditions like sharp rises in material prices or sudden policy changes, analyzing their impact on total investment, and preparing contingency plans in advance.

3.2 "Penetration of Limit Design" to Eliminate Source Waste

During the design stage, whole-process engineering cost consultation agencies implement "penetration of limit design," integrating cost control requirements throughout the design process to eliminate source waste. The agency breaks down the total cost target from the decision-making

stage into specific limit indicators for various disciplines and phases. For example, in residential projects, it defines the cost per square meter for structural engineering and exterior wall decoration, conveying these indicators in writing to the design team to ensure clear cost constraints[4]. During the schematic design phase, the agency intervenes simultaneously, conducting cost pre-assessments of preliminary designs submitted by the design team. If cost wastage is identified in certain design details (e.g., excessively long corridors reducing space utilization, material selections exceeding limit standards), it immediately communicates with the design team to propose alternatives, such as replacing curved bay windows with right-angle ones to reduce construction difficulty and costs or recommending cost-effective material substitutes. During the construction drawing design phase, the agency conducts detailed reviews, cross-checking quantities, material specifications, and process requirements in the drawings against limit indicators. If a sub-project's design cost (e.g., roof waterproofing) exceeds the limit, it assists the design team in optimizing design parameters (e.g., adjusting waterproof layer thickness, selecting more economical waterproof membranes). Simultaneously, it prepares a construction drawing budget, comparing it with limit indicators to ensure the budget remains within limits, thereby locking in project costs at the design level.

3.3 "Real-Time Dynamic Control" to Stabilize Cost Fluctuations

Costs during the construction stage are susceptible to various influencing factors. Whole-process engineering cost consultation agencies adopt a "dynamic control, real-time management" strategy to promptly address cost fluctuations and stabilize the project cost curve[5]. First, the agency establishes a progress payment review mechanism. Upon receiving progress payment applications from contractors each month, it dispatches professionals to the site to compare construction drawings with progress plans, verify actual quantities of completed work, and confirm compliance with contract quality requirements. Second, for frequent engineering changes and visa requests during construction, the agency sets up a rapid response process: within 24 hours of receiving a change or visa request, it sends personnel to the site to verify the situation, determine the necessity of the change, and accurately calculate the cost of the change. If the change would cause total cost overruns, the owner is immediately notified. The agency also provides 2–3 alternative solutions for the owner to choose from, preventing loss of control over change costs. For visas, it strictly reviews the authenticity of content and completeness of procedures to prevent contractors from obtaining fees through false visas. Third, the agency updates market cost data weekly, tracking fluctuations in material prices and labor costs. If the price of a key material (e.g., steel, cement) rises by more than 5%, it promptly analyzes the impact on the total project cost and suggests countermeasures to the owner (e.g., bulk purchasing in advance to lock in prices, signing long-term supply agreements with suppliers). This ensures cost fluctuations remain controllable. The agency synchronizes site verification data, change visa records, and market cost fluctuation information into the project cost management ledger, forming a dynamic cost database. It submits a weekly cost analysis report to the owner, clearly indicating deviations between actual and target costs and their causes. If deviations approach warning thresholds, it immediately convenes cost coordination meetings with contractors and supervisors to develop targeted adjustment plans, achieving early prediction and timely resolution of cost risks and firmly stabilizing the project cost fluctuation curve.

3.4 "Rigorous Closed-Loop Review" to Safeguard the Final Cost Baseline

The completion and settlement stage, as the final phase of cost management, is handled by whole-process engineering cost consultation agencies following the principle of "rigorous closed-loop review." First, the agency strictly checks the completeness and compliance of settlement materials: upon receiving settlement documents from contractors (e.g., as-built drawings, quantity calculation books, visa forms, contracts, material invoices), it verifies whether all documents are complete. For example, it checks if as-built drawings are signed and sealed by the design unit, if visa forms have confirmation from the owner and supervisor, and if material invoices match the brand and specifications stipulated in the contract. If documents are missing (e.g., visa forms for a sub-project) or suspected of fraud (e.g., invoice amounts significantly deviate from market prices), the contractor is required to supplement or provide proof until the documents meet

review requirements[6-7]. Second, the agency conducts detailed cost reviews: referring to as-built drawings and contract agreements, it recalculates quantities for each sub-project (e.g., earthwork excavation for roadbeds, pavement area for road surfaces), verifies the accuracy of unit price applications (e.g., compliance with contract-rated standards), and checks various fees (e.g., regulatory fees, taxes). If the contractor is found to have overestimated quantities, inflated unit prices, or duplicated charges, the agency lists adjustment reasons and amounts item by item and communicates with the contractor for verification. Third, for dispute resolution, the agency facilitates negotiations between the owner and contractor based on contract terms and industry standards. For disputes over quality-related deductions, the agency conducts on-site verification of the actual impact of quality issues and provides objective mediation solutions based on contract-defined deduction standards, promoting consensus between both parties[8]. Finally, the agency issues a formal settlement review report, including review results, adjustment details, and calculation basis, forming a complete closed loop from document review to dispute resolution and result output. This ensures the authenticity and accuracy of settlement results, providing a reliable basis for the owner to complete project cost accounting.

4. Conclusion

As construction projects move away from the outdated cost management model of "each phase managing its own segment," whole-process engineering cost consultation acts as a " full-course navigation system." This shift from "fragmented control" to "full-chain collaboration" addresses the pain points of traditional cost management, such as "numerous loopholes, slow response, and significant disputes." It also enables construction projects to achieve scientific cost control while pursuing functionality and quality. In the future, with the deep integration of digital technology and cost consultation, the whole-process service model may further upgrade, providing stronger support for the construction industry to build a new management pattern integrating "quality-cost-efficiency." This will drive the industry toward more stable and far-reaching refined development.

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