

Research on Project Cost Management Based on Whole-Process Engineering Consulting

Xianfei Zhang

Anhui Nuojin Construction Cost Consulting Co., Ltd., Hefei, Anhui, 231500, China

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Abstract: For construction units to achieve good investment returns, the key lies in the efficient management and control of construction project costs. This paper, centered on the perspective of whole-process engineering consulting, explains its role in ensuring the quality and benefits throughout the entire project lifecycle. It points out existing problems in current cost management and proposes optimization measures: establishing a whole-cycle system, building a collaborative hub, and strengthening technical personnel support. The aim is to provide reference opinions for the practical work of relevant personnel.

1. Introduction

Some pre- and post-construction cost estimators in advance stages of development today have yet to present construction expenses or enforce upfront cost accountability. This has negatively affected the effectiveness of construction units economically. The whole-process engineering consulting service model, which provides professional support throughout the life cycle (decision-making, design, construction, etc.) can help construction units improve their upfront cost estimation mechanism. It allows for proactive cost management at all stages of construction, thus relieving the adverse effects caused by inaccurate pre- and post-construction cost estimation on economic profits. This ensures that the construction units can obtain investment return goals.

2. The Importance of Whole-Process Engineering Consulting

Whole-process engineering consulting means to cover the whole cycle of project, decision-making, design, construction and operation. This is essential for project quality, efficiency and benefits. First, it is critical to risk prevention and control in project decision-making process. Through feasibility studies, investment estimation analysis, and comprehensive research on policy direction and market demand, consulting institutions can help clients avoid blind investment risks. This will enable the accurate positioning of projects, controlled investment returns and reduced resource waste arising from client decision errors ^[1]. Second, in the design stage, whole-process consulting allows design optimization and upfront expenditure control. Consulting teams serve as links between design and construction requirements, advising designers on how to improve the design to meet functional requirements at a lower cost. They also manage design depth, minimizing the chances of changes, and unwanted rework from design omissions in construction, thereby helping their clients reduce costs at source. Thirdly, it participates as a coordination management and quality supervision in the construction phase. Effective consulting establishments maintain track of project progress through coordinating schedules amongst a wide variety of consultants and helping resolve on-site interfacing problems. They ensure stringent quality and safety parameters, by immediately identifying a construction hazard to avoid such quality accidents and delays that may actually work against the interests of the client. Then, when it comes to the operational phase, whole-process consulting offers operation and maintenance recommendations as well as asset revitalization ideas ^[2]. Using data from construction projects, consulting teams can create smart operation and maintenance plans for operators, extending the life of facilities. They additionally furnish professional recommendations to customers on asset disposal, increasing the challenge's long-term monetary gains.

3. Main Problems in Current Project Cost Management

3.1 Significant Gaps in Full Lifecycle Cost Management Coverage

Some engineering enterprises currently do not carry out cost management throughout the whole life cycle; only after construction final account stage and construction drawing budget stage. Even larger weaknesses exist in managing cost during the initial decision and construction period. Many of these enterprises initiate a project too hastily in the early stages of decision-making, and do not perform an accurate cost estimation according to market behaviour, material price trends and actual project requirements. Instead they base cost frameworks on historical project experience, ignoring that the external environments and construction requirements for these projects may be different from previous projects, laying foundational risk for future budget loss ^[3]. At the same time, with regard to construction drawing budgets which are prepared in this design phase, some enterprises still not take cost optimization as a core goal of designing. Design teams approach design within the highly technical realm, ignoring cost rationality, leading to a technology-heavy, cost-light design approach. Additionally, for the sake of obtaining certain technical characteristics or visual effects, some projects have designs with abilities that go beyond any real need. This results in construction sites that are much more expensive to set up than a traditional solution, which can also extend the time needed for construction due to labor and management costs. In short, during the construction process, designs may have to be arbitrarily modified because of excessive pressure on costs which leads to wastage of design investments and delays in progress.

3.2 Fragmentation of Cost Management Due to Ineffective Multi-Party Collaboration

The collaborative mechanism among clients (construction enterprises), contractors (construction units) and designers (design units) exists serious defects, resulting in a disjoint state of cost management. Fuzzy responsibility contours in the organizational structure and lack of unified system of cost management accountability (contractual or otherwise) contribute to a siloed way of managing. Clients (being the investor) primarily stick to project cost control and try to finish off within planned budget right so, it is their money & interest. Propose to conduct contracts over construction profits, increasing settlement amounts through change orders as executors. Designers, as technical providers stress meeting technical specs in designs but are not incentivized to optimize cost. These separate goals result in large absolute "information silos" and no regular, fixed-interval communication mechanism. Further, there is no synchronized briefing process of designers with our construction and cost teams for developing designs. Portfolio: Drawings are transferred on a plain file basis with limited explanations of cost considerations or opportunity for optimisations in design details ^[4]. If contractors identify discrepancies in their material costs compared to expectations, or if the design does not match existing conditions during construction, they need to speak with designers and make adjustments. This often leads to wasted procurement costs and schedule slippage.

3.3 Weak Technical and Tool Support Capabilities for Cost Management

As an example, engineering companies despite using advanced Engineering software are still working on manual calculations with simple office software when it comes to cost accounting. Since quantifying and pricing involves keying in drawing data & applying quota items, it is susceptible to human errors that cause deviations resulting in incorrect cost data. In addition, manual accounting is not efficient; It takes up a lot of manpower and time to finish a whole cost estimation for a small or medium-sized project which make the tool unable to be either scale with more larger and complicated projects or provide enough efficiency in terms of timeliness according to the progress of the projects ^[5]. However, IT-centric cost management tools have seen a meagre adoption. Many of the companies that do invest in them only use their potential for rudimentary data capture and numeration and by not actually leveraging their value with real time linkage between design, construction and cost. Despite the introduction of advanced BIM technology on some projects, in many cases because data interfaces between tools are still missing data must be re-entered manually post design change to obtain cost. This results in cost updates lagging behind

design changes, trivializes technology-enabled dynamic cost analysis and optimization, and devalues the management benefits of IT tools.

4. Optimization Measures for Project Cost Management Based on Whole-Process Engineering Consulting

4.1 Establish a Whole-Lifecycle Cost Control System to Fill Coverage Gaps

In this regard, you need than to promote the "phase focus" to "full lifecycle integration" cost management thinking change, basically can take the whole cycle control and based on innovative concept, comprehensive supervision needs new journey process engineering consulting units (WECU). WECUs should be responsible for detailed cost estimation at an early stage of the decision-making process and not rely on experience from historical projects. Dynamic cost calculation models should be built by researching market dynamics, material price trends, project needs, material supply-demand relations and policy directions. This ensures a better understanding of differences with respect to construction standards and environmental requirements in previous projects, yielding reliable initial cost estimates oriented at supporting client decision-making and avoiding deviance from the cost framework at its origin ^[6]. Second, WECUs should incorporate cost optimization as a design goal during the design phase. With change in designs, they need to do 2 dimensional (technical and cost) design reviews. National standards and project investment limits are input to analyze cost-effective construction methods and material selections within designs, preventing excessively expensive solutions driven purely by technical specs or aesthetics. A well-designed proposal comparison mechanism should be established, which compares the differences in cost and economic benefits of each scheme based on detailed data, strives to achieve cost optimization under the premise of meeting technical requirements, and reduces the stubbing design adjustment cost and waste caused by poor early-stage proposals or plan selection. Lastly, in the defining construction phase of WECUs at all levels, they need a dynamic cost monitoring mechanism. Onsite there should be dedicated cost personnel to monitor material use, labour inputs and change orders at the time they take place so that cost ledgers are contemporaneously updated. One must constantly compare actual to budget costs, analyze causes for deviation and take corrective actions quickly so that there are no surprises at the end of project life.

4.2 Build a Multi-Party Collaborative Hub to Overcome Fragmentation

WECUs should function as a central collaboration hub by welding together resources from clients, contractors and designers with uniformed management and process improvement. First, WECUs must take the lead in developing a standard cost management accountability system. They define the client cost control goals based on contracts & agreements, sensible profit margin of contractor and cost optimization obligations of designer eliminating any ambiguity in duties. Design some mechanism to share profits and dangers, making the effectiveness of cost-control coupled with interest obtained by the parties, thus promoting from "siloe operations" to "collaborative win-win," minimizing conflicts caused by different interests. Next, WECUs should formalize consistent mechanisms to facilitate communication and sharing of information. Third, they should identify opportunities for the parties to conduct periodic cost management coordination meetings to synchronize key information like project progress, cost consumption and design changes (to overcome "information silos"). The process of drawing briefing is led by WECUs. Post-design execution, they want designers to explain enough about cost implications, optimization opportunities and constructability in the designs. Immediate feedback prevents potential cost waste and delays of misinterpretations, as contractors and clients can raise questions on the spot ^[7]. Thirdly, WECUs need to create uniform standards for cost accounting and dispute resolution. They must identify the basis, methods, and data inputs for the final settlement ahead of time to gain alignment upfront in line with national pricing practices and project specifics. In case of disputes during settlement, the WECU takes on an impartial role, verifying and mediating disputes in line with criteria agreed upon ex ante to resolve disputes quickly whilst avoiding "buck-passing" that are

likely to slow down processes.

4.3 Strengthen Technical and Personnel Support to Address Capability Shortcomings

And technically, WECUs must lead their digital transformation around cost management tools. First, well-established IT tools such as cosmetic software and intelligent quantity require-off systems should replace manual/fundamental software program hybrid fashions switching regular in-decide advent errors and quota cast application aberrations. Second is the deep integration of BIM technology with cost management. You need real-time interfaces binding design and construction information to cost data, so if the design changes the cost data updates automatically. This helps with dynamic cost analysis and optimizing costs while avoiding delays from manual updates. Lastly, an enterprise historical cost database is needed. The prices of main materials, labor costs, use fees for the equipment etc. are collected systematically from previous projects and periodically updated to enable accurate references for estimating new project ^[8]. From a people standpoint, WECUs must develop cultivation and evaluation systems for cost professionals. They are expected to engage with engineering firms to provide customized training that addresses: whole-life cost management knowhow (early estimation, design optimization and construction monitoring); operation of IT tools (e.g., BIM, cost platforms) and interpretation of policy/regulation. This enhances the financial allocation skills of cost personnel, construction experience and technical application level. Simultaneously, supervision, reward and punishment systems must be adopted. Conduct performance assessment metrics incorporating the cost control outcome measures such as deviation rates and accounting efficiency. Outstanding performance should be rewarded, while personnel creating overruns from mistakes should be labelled. This reinforces accountability and requires personnel to enforce the specific control measures.

5. Conclusion

Cost management in construction terbaru should support the entire project lifecycle rather than just isolated phases. Based on its own "full-cycle, multi-dimensionality, and strong collaboration" features, whole-process engineering consulting is a unique channel to break through the current dilemma of cost management. It can fill the command holes in early decision-making and assembly and dismantling processes and break up information silos between undertaking contractors. Looking ahead, in the context of deeper integration of whole-process engineering consulting and digital technologies, cost management will continue to move toward "data-driven decision making", adding a more lasting driving force for the sustainable development of the construction industry.

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