
Original Research Article

Research on Cost Management of Engineering Projects in State-Owned Construction Enterprises: Taking the Red Line Cost Budget Management Practice of a Project of China Railway Group Co., Ltd. as an Example

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Abstract: Based on a systematic consideration of the development dilemmas and outlets faced by state-owned construction enterprises, this paper demonstrates the need for state-owned construction enterprises to carry out cost management during the transition from “incremental expansion” to “intensive development”, and systematically summarizes the main factors of impact of costs management. Combined with the practice of carrying out project red line cost budget management by a China Railway Bureau Group Co., Ltd., it gives suggestions for the implementation of key points and safeguard measures for cost control of construction projects carried out by state-owned construction enterprises.

Keywords: Construction Enterprise; Red Line Cost; Cost Management.

1. Development Difficulties and Solutions Faced By State-Owned Construction Enterprises

1.1 Development Dilemma

In General Secretary Xi Jinping’s 2019 New Year message, he mentioned that “made in China, created in China and built in China, the three aspects work together to continue to change the image of China”^[1]. “Built in China” is juxtaposed with “made in China” and “created in China” for the first time. This is not only a high affirmation of built in China, but also an ardent expectation of built in China. China is not only a “manufacturing power”, but also a “building power”. Since the reform and opening up, China has made huge progress in construction, bridge, railway, tunnel and other fields, making difference in the initiative of “One belt, one road”. “Great construction” drives the high-quality development of China’s economy, and construction has become an important carrier of economic and social development. China affordable housing and shantytowns one belt, one road to the west, and the other is the construction of a large scale railway, road and waterway investment in 2020.

But an unavoidable fact is that although China is a large construction country, it is not a strong construction country. Ding Lieyun, academician of the Chinese Academy of engineering and professor of Huazhong University of science and technology, once said frankly that the extensive and fragmented production mode of the construction industry has brought many problems, such as poor capacity performance, large waste of resources, serious environmental pollution and low production efficiency^[2]. All these urgently need to be in accordance with the requirements of ecological priority and green development, and the spiritual requirements of the central city work conference, transferred to type upgrading to achieve high-quality development. In the face of affirmation and expectation, how to promote the further development of China’s construction? State owned construction enterprises are duty bound.

1.2 Development Outlet

With the establishment and improvement of China’s socialist market economy, the process of industry standardization is accelerating, the competition mechanism of the construction market is becoming more and

more mature, showing the market characteristics of complete competition, and the market information is sufficient. Any price increase or price reduction of any enterprise will lead to a sharp reduction in the service demand of the enterprise or an unnecessary loss of profits, the price of construction services can only be determined by supply and demand. Shou Xieren pointed out that although the demand (bidding curve) and supply (auction curve) of China's construction industry are growing, the increase of demand is less than that of supply, the development driven by rapid expansion of scale is becoming a thing of the past, the price of general engineering construction services is bound to decline, and it will be inevitable to win the bid at a low price^[3].

In the process of transformation from "incremental expansion" to "intensive development", solving the problem of project cost control, blocking management loopholes, how to spend every penny properly and use every resource of the enterprise where it is most needed have become the basic premise and fundamental guarantee for construction enterprises to improve the quality of development. The survey shows that at present, the extensive management mode of China's construction enterprises has not been fundamentally improved, the enterprise structure, operation process and basic management are relatively weak, the project management level is low, and the existing project cost management system needs to be improved in terms of management concept, objectives and means^[4].

It is urgent to improve the ability of resource allocation, i.e., the level of low-cost management.

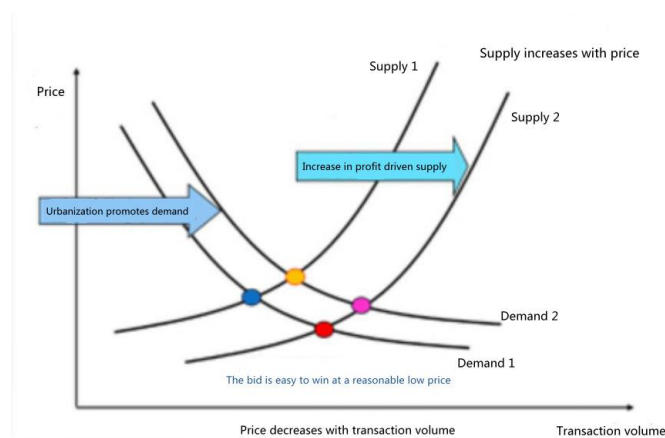


Figure 1 Demand curve and transaction curve of construction industry.

2. Project Cost Management

There are two categories of cost management in state-owned construction enterprises. One is enterprise cost management, and the other is project cost management. There are significant differences between the two in management object, management scope, management content, management purpose and management procedure^[5]. This paper focuses on the project cost management of state-owned construction enterprises. Project cost is the main composition of enterprise cost. Only by managing the project cost well, the cost of construction enterprises can be managed well.

2.1 Project Cost Management

Project cost management refers to the management activities such as effective organization, implementation, control, tracking, analysis and assessment of project cost in the process of project implementation according to the overall objectives of the enterprise and the specific requirements of the project, so as to strengthen operation management, improve cost management and improve the level of cost accounting, Reducing the project cost is the process of realizing the target profit and creating good economic benefits. The implementation of project cost management in engineering construction by construction enterprises is the foundation and core of enterprise survival and development^[6].

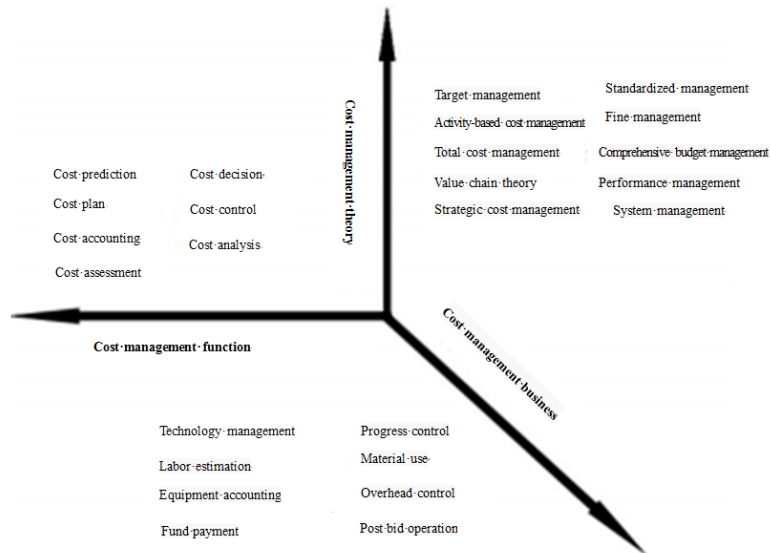


Figure 2 The three-dimensional system of engineering project cost management.

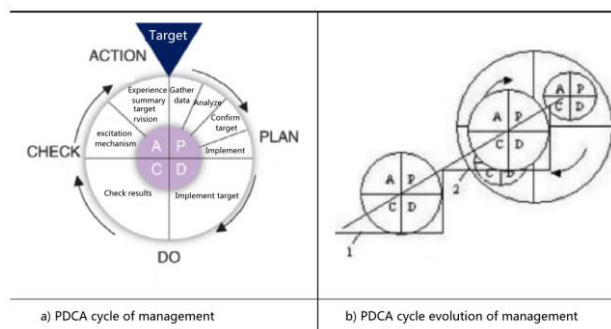
2.2 Project Cost Management Theory

After a century of development, the project cost management theory has developed into a huge system. Using a three-dimensional space model (see Figure 2) to describe the knowledge system of project cost management can be composed of cost management theory dimension, cost management function dimension and cost management business dimension. In the past 30 years of development, the cost management theory has further developed from the negative cost accounting and cost control in the event to the current prior cost prediction and cost decision-making. The evolution of theory shows the changing trend of the focus of cost management activities with the progress of epistemology and methodology, and warns us of the importance of front-end cost management and responsibility cost management at this stage^[7,8]. At the same time, based on the above analysis and judgment on the development trend of China’s construction industry market, this view is also supported. Responsibility cost management refers to the management method of implementing the direct cost responsibility to each production unit and business department, implementing internal cost contracting and linking the cost with responsibility.

2.3 Process of Project Cost Management

Project cost management mainly includes seven links: cost prediction, cost decision-making, cost planning, cost control, cost accounting, cost analysis and cost assessment. It operates round and round according to the PDCA cycle. From the process of cost management, to do a good job in cost management and improve the level of cost management, we must first seriously carry out cost prediction. As the beginning of the cost management process, cost prediction is the precondition of the whole management effect, especially under the framework of responsible cost management.

Table 1 Process of project cost control.



3. Analysis of Factors Affecting Project Cost Management

Peter Drucker et al. proposed that “management” is a working process of integrating personnel and resources inside and outside the organization to achieve common goals, and people have been running through the whole management process^[9]. Therefore, in the basic concept of management, the core element is people^[10]. In order to restrain and motivate “people”, we should establish a system. A good system can make all participants have a sense of honor and centripetal force of “being proud” and work together to achieve organizational goals. Therefore, the factors affecting project cost management can be analyzed from two aspects of “people” and “system”. Combined with the management practice of a China Railway Bureau Group Co., Ltd., the factors affecting cost management are summarized as follows.

3.1 Personnel Quality Cannot Fully Meet the Needs of Project Cost Management

First, the understanding of project management focusing on benefits is not in place. Some subsidiaries and project departments also continued the traditional idea of emphasizing progress, neglecting management, emphasizing construction and neglecting cost, and failed to effectively carry out the preliminary planning of the project, resulting in certain mistakes and loopholes in project startup, resource allocation, temporary construction planning, construction organization design, selection of project manager, selection of subcontracting team and determination of subcontracting mode. The project is not managed and controlled according to the established principles and ideas of the company’s cost management, which is an important factor causing low management efficiency.

Second, the implementation of internal standardized management is not in place. In the process of specific operation and implementation, some units often rely too much on personal role, and the system management function of cost control is greatly weakened. They do not conduct in-depth and comprehensive analysis on the real situation of the project economic operation, and have countless concerns about the profit and loss results. They neither trace the source of the project loss, nor take targeted corrective measures.

Third, the implementation of project management responsibility is not in place. Managers seriously lack a sense of responsibility, and some managers do not fear the system, think they are right and act arbitrarily. Some units neglect to monitor the project department, fail to fulfill the responsibility of monitoring and examination and approval, resulting in out of control of project cost. Some project department managers have weak subjective initiative, weak sense of responsibility, fail to effectively perform their duties, cost accounting and analysis become a mere formality, and corrective measures are not operational and difficult to implement.

Fourth, the implementation of the assessment and evaluation system is not in place. Whether the internal control system is strictly implemented depends to a large extent on whether the reverse incentive measures such as inspection, supervision and punishment are in place. The lack of principles in cost management of the unit will often contribute to the breeding and spread of unhealthy tendencies, confuse right and wrong, lead to the disappointment of more people who want to do something, and even the adverse phenomenon of “comparing losses” between projects, It will do great harm to the enterprise atmosphere and morale.

3.2 The Company’s Management Mechanism Cannot Meet the Needs of Project Cost Control

First, the company’s management system needs to be further improved. According to the mutual construction theory of technology and organization, the change of technology should be supported by the adjustment of organizational structure^[11]. Cost management involves the main business work of two-level and five-level management and relevant departments of the Group Company, subsidiaries, headquarters, and project department and shelf team. When the red line cost management is deepened to a certain extent, Obviously, the management mechanism of the company, including the setting of organizational structure, the definition of department posts and the level of office automation, lags behind the overall development speed, the internal form is not unified, the pace is inconsistent, the communication cost is high, and there is wrangling among different

units and departments.

Second, the company's risk prediction of project cost control is insufficient. Most of them attach great importance to project cost control within the enterprise, but the risk factors of project cost control from outside the enterprise are not predicted enough, and there is no corresponding plan to deal with it, resulting in the failure of project cost control. The project performance appraisal was not carried out in time, the incentive mechanism failed, and a good cost control atmosphere could not be formed.

Third, the operation of the company's internal mechanism is lack of sufficient coordination. The purpose of the mechanism is to restrict and influence personnel to form a joint force to jointly complete the organizational objectives. Then, in practice, it is found that most companies are still limited to individual departments in project process cost control and economic activity analysis, and have not formed a working mechanism for effective linkage of cost elements. On the surface, everyone has clear responsibilities, but lack of in-depth analysis of cost problems, the measures are not effective and the cost control effect is not ideal.

Fourth, the company's assessment of project management incentives and constraints is invalid. Although some subsidiaries have signed the operation contract responsibility letter with the project department, they lack process monitoring of the project cost data, and the assessment of the project operation performance results lags behind. To a certain extent, there is still a situation of "eating from the same pot", which makes the project benefits as good as bad, and seriously frustrates the work enthusiasm of excellent project managers.

4. Red Line Cost Budget Management and Its Implementation Points and Safeguard Measures

In order to further standardize the two levels and four levels of the group company and its subsidiaries to jointly participate in the cost control of engineering projects, solve the difficulties of cost management and reduce the risk of enterprise cost overrun, a China Railway Bureau formulated the project red line cost budget management plan in 2012. After seven years of hard practice, it has formed a characteristic project cost management mode.

4.1 Red Line Cost Budget Management

Red line cost refers to calculating the cost budget of the project under the condition of zero profit according to the calculation principle of static construction cost and zero profit, and taking the budget as the cost control red line in the actual operation stage of the project. In the actual operation process, the project shall carry out cost management with the red line as the highest limit of cost management, and control the project expenses within the red line cost range. Red line cost budget includes red line cost, safety production fee, general contracting risk fee, and incentive and restraint assessment fee and project profit. The red line cost includes direct cost, indirect cost, period cost and tax. The project profit is the amount after deducting the red line cost, safety production fee, general contracting risk fee and incentive and restraint assessment fee from the value in the contract and the income outside the contract.

Red line cost budget management is a project cost management mode based on the basic principles of responsible cost management and comprehensive budget management, with red line cost and capital flow control as the core. During the implementation of red line cost budget management, we should adhere to the main measures of red line cost budget management (see Figure 3 for details), focus on the application of engineering project network measurement and settlement platform, focus on project cost planning and improving secondary operation effect, and support informatization (network-based process management) and centralized payment.

4.2 Implementation points and safeguard measures of red line cost budget management

The basic process of red line cost budget management is shown in Figure 4. The implementation points and guarantee measures mainly include the following seven aspects:

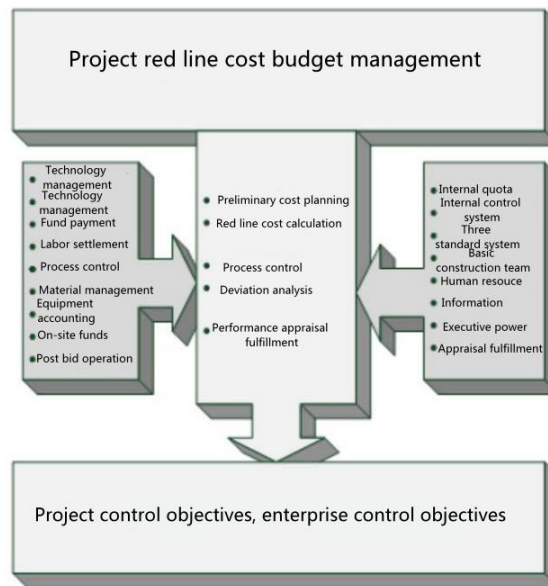


Figure 3 Overall framework of project red line cost budget management.

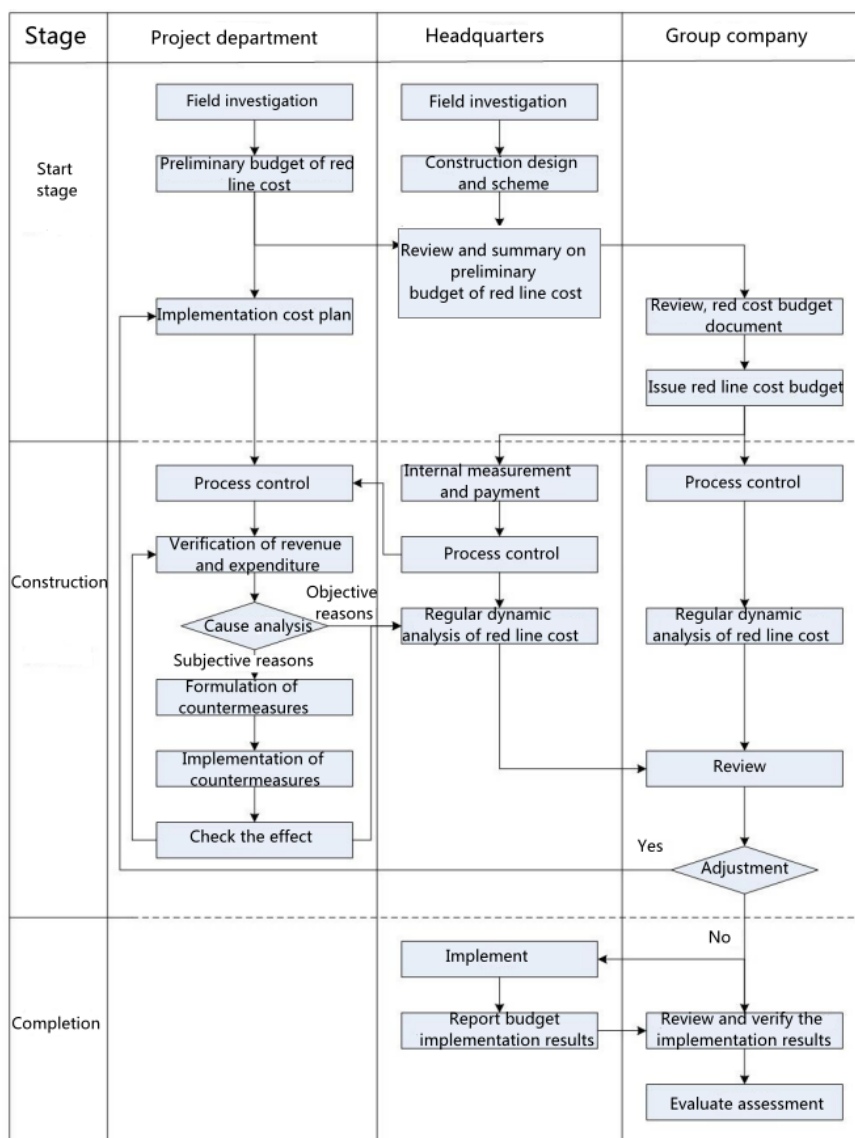


Figure 4 Flow chart of project red line cost budget management.

4.2.1 Based on Authorization Management

First, ensure the effectiveness of systems, processes and standards. Specifically, it means that the management process, division of labor, posts, standards and responsibilities are clear and operable, clarify the functional positioning of the management and project management in project management, strengthen the management's intervention in the economic behavior of the project and the management and control of the project, and weaken the role of the project department in system design project start-up planning, resource allocation, team selection, subcontracting pricing, material procurement, expense settlement, price payment, salary decision-making and personnel use, so as to improve the implementation ability of the project management.

The second is to ensure the implementation rate of systems, processes and standards, which reflects the implementation ability and performance of the responsible subject. Through authorization, the project settlement and payment are subject to procedural control and substantive review, so as to realize the whole process and all-round dynamic monitoring of the project cash flow and cost.

4.2.2 Take the Project Red Line Cost Budget Management as the Main Measure

First, it must be clear that the project red line cost budget management is the red line of two levels and four levels to jointly hold the cost. From the dynamic equation of profit: revenue \uparrow -expense \downarrow = profit ∞ , cost management represents the internal of the enterprise and aims to reduce expenses.

Second, project management takes cost management as the center to form a cost management system with full project coverage, whole process control, full participation and respective responsibilities.

Third, perform well in project startup and source control. Based on the principle of the lowest total cost of key lines, prepare the preliminary planning and economic construction team, and determine the cost elements and cost budget based on the principles of meeting the site, price limit and elastic constraints.

Fourth, strengthen process control. Take the control of quantity and price as the starting point, perform well in process control through construction management, process inspection, accounting analysis and correction, assessment and evaluation, as well as promoting income with expenditure and changing claims, highlight pre control, pay attention to in-process control, and improve post evaluation and evaluation, so as to ensure that all cost management systems are implemented, the whole process of project cost is controlled, and strive to maximize project benefits.

4.2.3 Focus on Project Cost Planning and Improving Secondary Operation Effect

First, take the project cost management planning as the basis of the red line cost budget, which includes but is not limited to: resource allocation, construction scheme and temporary project planning, risk identification and control, change of claim points, labor subcontracting mode and subcontracting guidance unit price, material bidding and equipment configuration scheme, etc.

Second, we should improve the effect of secondary operation. Secondary operation is also called post bid operation. After entering the site, the project department shall perform well in design optimization through drawing joint review and profit and loss analysis in combination with contract disclosure and preliminary planning results, and formulate a detailed post bid operation plan according to the specific situation of the project. In the project implementation stage, the objectives shall be decomposed and quantified according to the post bid business plan, the responsible person shall be determined, the relevant data shall be collected closely around the construction and production process, the signing procedures shall be improved, and the measurement and payment shall be handled. At the closing stage of the project, it is necessary to ensure the relative stability of the main post bid operation personnel, do a good job in project liquidation, improve various basic data, and ensure that the post bid operation results pass the audit. Five fixed management shall be implemented for closed projects, namely, fixed posts, responsibilities, personnel, indicators and rewards.

4.2.4 Support of Informatization (Network-Based Process Management) and Centralized Payment

First, informatization can effectively solidify the existing systems, processes and standards, fully reflect the rigid constraints, relevance, visualization, traceability and irreversibility, and “under the sun” improve the execution, work efficiency and capital use efficiency, especially for contract risk prevention, project settlement quantity control, subcontracting price limit control, material procurement and settlement, deduction capital payment plays a significant role.

Second, centralized payment is an effective verification of the implementation of authorization management. According to the provisions of authorization management, centralization and payment are the verification and quantification of the rationality, compliance and effectiveness of the results of the responsible subjects performing their powers and responsibilities, so as to support and assess the work performance of each responsible subject. Concentration is a means, including three processes: bidding, procurement, settlement and payment. The key is to maintain the bidding results and supervise the payment of funds. The centralized content includes “four centralizations” of capital, labor subcontracting, materials and equipment procurement.

The third is to solve the cancer in project management through information system. For the cost loopholes such as advance payment, day work, temporary project settlement, settlement expenses outside the contract and deduction, set corresponding modules in the engineering project network measurement and settlement platform and centralized payment platform to standardize process control by standardizing procedures, blocking timeliness and increasing transparency.

4.2.5 Profit Oriented Culture

Create a cultural scene of “simplicity is beauty, efficiency is truth”, “glorious profit, shameful loss and clean air”. First, it is emphasized that the enterprise is a profit-making organization, and the goal of the project is to create cash and profits. Any post and any personnel should closely focus on the realization of benefits, thrift, living within their means, reducing costs and increasing efficiency, increasing revenue and reducing expenditure, and embody the concept of “profit first and then sharing” everywhere.

Second, clear workflow and standards, strengthen process monitoring, and do not allow the contingency of project operation results to replace the inevitability of the company’s management results. Management gives executors a limited degree of freedom within a strict principle framework, and execution is the premise. Further emphasize the responsibility system of system manager and process manager. The company formulates and maintains rules, the project respects and implements rules, and improves the consistency of rule formulation and implementation.

Third, emphasize the ability of pioneering work at all levels, increase revenue and reduce expenditure, realize 2%–3% excess profit on the basis of red line cost budget, and include this index into the scope of performance appraisal.

Fourth, attach importance to performance appraisal and cash, and effectively motivate. The management shall take seriously the implementation of the phased business performance assessment and evaluation during the project implementation process and the performance evaluation after completion, take the compliance of the project business results as the prerequisite for cadre selection, implement the one vote veto system, and further create a good profit culture.

4.2.6 Taking Cash Flow as the Main Line

First, emphasize the concept of efficiency first and cash is king. Cash flow is the blood of enterprises and projects. It stresses profit and cash, and attaches importance to cash generating ability, especially operating net cash.

Second, the ownership and control of cash (money) belongs to the company (legal person), and the project management department cannot control it at will.

Third, cash flow should be used to restrict cash and cost expenditure. Cash outflow is the cost of precipitation. Before outflow, it is the debt to be determined (contingent debt). The former is that the cost follows the cash, and the latter is that the cost limits the cash flow. The former is “accounting after autumn”, and the latter is “accounting before payment”. Only by restricting the occurrence of cost with cash flow can we achieve real cost active control.

Fourth, fund allocation and investment should match the project completion progress to reduce the time cost of funds. The internal work inspection of directly managed and jointly managed projects shall be reported to the group company for approval.

4.2.7 Focus on the Application of Network Measurement and Settlement Platform for Engineering Projects

The goal of establishing a network measurement and settlement platform for engineering projects is to implement the management policy with cash flow control as the core, authorization management as the basis and centralized fund payment and settlement platform as the support, further solidify the economic process standards, force the cost control elements and rigidly restrict the cost control. Focus on the application of network measurement and settlement platform for engineering projects:

First, with the help of software approval process, solidify authorization authority, subcontract management and internal settlement process, and unify the red line cost budgeting method of the whole group.

Second, the settlement platform is seamlessly connected with the fund management, and the fund outflow is strictly controlled through the substantive audit of each system and the review of financial procedures, so as to prevent the settlement without contract, over quantity and over unit price.

Third, the software function should be used to automatically carry out cost accounting, improve the accuracy of cost deviation analysis, strengthen the traceability of technology, construction, engineering economy, materials, equipment and financial management, and improve the responsibility implementation of various cost management elements and links.

5. Conclusion and Enlightenment

Benefit is the key to measure the success or failure of the project. In the practice of red line cost budget management, China Railway certain Bureau Group Co., Ltd. has made certain experience and achievements. The cost management activities of the pilot project are basically controlled within the red line cost range, and the project cost profit margin is relatively stable and rising. Practice has proved that the project red line cost budget management is very effective in improving the effectiveness of project management, and is suitable for the application of state-owned construction enterprises. This paper systematically summarizes them in writing to provide experience for capital and cost control of state-owned construction projects.

Conflict of Interest

No conflict of interest was reported by the author.

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