Dynamic Management Control System of Engineering Cost

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Abstract: In construction engineering management, cost management is an important foundation and condition. The construction project has the characteristics of long construction cycle, high investment amount and large volume, which results in significant uncertainty in the final result of the construction cost. In the process of construction engineering construction, we must attach great importance to the dynamic management and control of construction cost to ensure that the development of construction cost meets the demand. Based on the above background, the purpose of this paper is to study the dynamic management control system of engineering cost. Based on the dynamic nature of engineering project cost management in different stages of the implementation process, this paper proposes specific control theories in the project decision-making phase, design phase, construction phase, dynamic management of project costs, and cost management in each phase of the project. Analyze and use advanced technologies and methods to manage project costs, decision-making stages, design stages, and construction stages of project cost management and management levels to maximize project investment returns. During the project decision-making phase, design phase, and construction phase, dynamic investigation of cost management ensures that project costs do not exceed approved investment limits, and that project investment is controlled hierarchically in accordance with construction procedures. Implement effective dynamic control of project costs. Save resources and control the effect of project investment.

1. Introduction

In recent years, the development speed of China's construction industry is getting faster and faster, which has accelerated the speed of China's social and economic development. At the same time, it has also made the market competition in China's construction industry more fierce [1]. Although many construction engineering companies have realized the importance of cost management control, these companies still have relatively weak awareness of dynamic control [2]. In order to ensure that all participants in the construction project obtain more economic benefits, it is necessary to effectively control the cost of the construction project, and at the same time have sufficient funds during the construction project construction [3]. In the dynamic management and control of construction project costs, the following principles should be questioned. First of all, the proverb that combines power and responsibility, the greater the ability, the greater the responsibility, which should also apply to construction projects [4]. Explaining responsibilities to people according to the division of work will save a lot of time in future work, but when unexpected things happen, responsibilities will also be attributed to the person in charge [5]. Second, the combination of experience and technology cannot use empiricism in construction or management. It is necessary to analyze specific problems and solve problems with scientific methods in order to ensure the safety of the project and protect the interests of the enterprise. Third, it must penetrate Various levels of project costs, including comprehensive control, construction project management, penetration of all links, raw materials to construction materials, construction personnel to management personnel, etc. to ensure efficiency; fourth, dynamic management, plans that may occur during actual construction do not exist, Then need to make appropriate adjustments according to the situation, then dynamic management is particularly important [6].

By implementing the dynamic control of construction project costs, investors, builders, supervisors, and designers can be responsible and cooperate with each other, and relevant departments can limit and interact with each other at all stages to improve the implementation process of construction projects [7]. Transparency, the strengthening of the management and supervision of the use of construction funds, and the avoidance of blind visas by leaders during the implementation of projects, reducing project costs, increasing the use of investment funds, and playing an important role in the supervision of the construction market [8-9]. The realization of dynamic cost management in each stage of the project construction is to constantly compare the actual value and the target value during the project implementation process, and check the deviation at any time [10]. The principle of dynamic management of engineering costs is to use technology to solve operational and management problems. Through the use of various methods and methods, the uncertain factors that are difficult to predict during project implementation are converted into specific determinants, and the unpredictable factors that are difficult to predict during project implementation are The identified factors are transformed into specific determinants to reduce investment risk [11]. Starting from the project cost survey, dynamic cost management improves existing models and methods, explores the needs of the development of market economy at this stage, formulates a complete theory and method of dynamic control of project costs in accordance with international conventions, and effectively controls engineering costs [12]. In order to maximize the control of investment profitability, invest and strengthen the dynamic management of project costs in the decision-making phase, design phase, and construction phase.

The main content of this article is to discuss the dynamic cost control of the project in the main implementation stage. From the decision-making stage, the design stage and the construction stage, the current status and main problems of project cost control management in China are analyzed in depth. In economics, technology, management, organization, and specific implementation, a theoretical system of dynamic management suitable for Chinese characteristics is constructed. This article expounds the determination and control ideas of the dynamic control of project cost, focuses on the analysis of the main factors that affect the dynamic control of project cost, and proposes the control points and corresponding countermeasures of dynamic management of cost in each stage.

2. Method

2.1 Dynamic Control Characteristics of Engineering Cost in The Decision-making Phase

In each stage of project investment, the investment in the decision-making stage is small, accounting for only about 0.5-1% of the total investment, and the degree of impact on the entire project cost is as high as 70% -80%. The decision-making stage is the key stage of cost control. The depth and accuracy of feasibility studies should be increased to ensure that cost errors are controlled within a reasonable range. The investment estimation of the project is mainly to formulate an investment plan at each stage of the project, collect and organize the actual cost information, carry out a comparative analysis of the planned cost and the actual cost, and realize the dynamic control of the project cost.

The correctness of the project investment decision is a prerequisite for the reasonable determination of the cost. If the project investment decision is correct, it means that the project investor has made a scientific decision on the project and selected the best investment plan from it to estimate the project's cost. Reasonable cost to effectively control engineering costs. You can hire a professional consulting company to estimate the investment of the project, so that the estimated investment amount is closer to the actual situation. To make the investment estimate of the project accurate and reasonable, you must ensure the correctness of the project decision and avoid mistakes in investment decisions;

Investment estimation in the decision-making stage plays a controlling role in project cost. Investment estimation is the basis for the project to raise construction funds and develop financing plans. It is also an important basis for the construction unit to prepare a capital plan and how to use

the funds. Project decision-making is to compare and select multiple schemes and choose the best investment scheme from them;

The content of investment decision determines the cost of the project.The scale of the project, the selection of the construction area and location, the construction standards, the selection of equipment, the financing scheme, the selection of the technology, and the construction period are important for the investment estimation of the construction project. The basis is directly related to the level of project cost. In order to ensure the scientificity and rationality of project decision-making content, the following methods are used for verification: 1) The method of empirical judgment, which gives full play to the role of consulting engineers, uses its consulting experience to analyze and judge project investment, and uses existing experience to solve new problems and new situations that occur in actual work, to ensure the correctness of project decisions; Use a combination of qualitative and quantitative analysis, mainly based on quantitative analysis, to quantitatively analyze project investment, and correctly reflect the project expenses may occur during the implementation process to determine the content of project investment decisions.

2.2 Status of Dynamic Control of Engineering Cost in The Decision-making Phase

At present, the work in the feasibility study phase in China is not comprehensive enough, so that project proposals and feasibility studies cannot accurately predict the problems encountered in the project implementation process:

The scientific and objective nature of the cost control in the early stage of the project is insufficient. The results of the project investment control are generally reflected in the feasibility study report. At this stage, investors do not pay much attention to the preliminary work of the project and do not consider taking investment risks. In order to obtain the construction permit of the project, the feasibility study becomes an approvability study, so that the work of the project at this stage loses its original meaning and does not achieve the effect of project investment control;

The feasibility study cycle of the project is short. There is no comparison of multiple investment schemes. The feasibility research work only revolves around an established scheme or just determines the project based on the subjective intention of the leader. There is no corresponding in-depth demonstration. There are only a few static investment indicators for judging whether the project's plan is feasible, and it is easy to make decision errors.

3. Experiment

Step1: First of all, we know that investment decisions in the decision-making stage play a key role in the success of the project, not only related to the entire project investment, but also determine the economic benefits after the project is completed. Realize the dynamic control of project investment estimation through linear regression analysis. The significant cost theory is applied to project investment estimation to simplify the investment estimation model, reduce the calculation workload, and improve the accuracy of project estimation.

Step2: Secondly, in the design stage, how to use the limit design to implement dynamic cost control, apply technical and economic analysis to evaluate the design plan and use value engineering to optimize the design plan, and use examples to demonstrate the use of value engineering and limit design to jointly achieve dynamic cost control. feasibility.

Step3: At the end of the construction phase, based on the principle of winning value, the joint monitoring of project costs and schedules is implemented. The relationship between the three is analyzed in time through the principle diagram of joint monitoring, and deviation control and cost and duration prediction are performed. The principle of naked value was extended.By introducing a quality index, the joint management of cost and schedule and quality was realized. A dynamic control management model of cost based on BP neural network was established to find the main factors that affect the project cost during the construction phase. Take proactive control measures in advance.

4. Discuss

4.1 Analysis of Experimental Results

According to relevant data and standards, this project is divided into the following functions, and scored by relevant experts of the program evaluation team, and the function scores and function evaluation coefficients of each item are shown in Table 1:

Table 1. Cost and operating cost of each sub-item of similar completed projects

Name	Building	Structure	Strong current	Weak current	Drainage	HVAC	Other	Total
Number of items	4	4	4	4	4	4	4	4
project costs	28350	80262	6385	4682	5026	3402	1235	142902
Operating cost	16643	8651	2126	1390	2457	7526	728	42810
Ratio of operating cost to project cost $S_j=C_B/C_A$	0.59	0.11	0.33	0.21	0.49	2.21	0.59	

The average cost of the four projects listed in the table above is 142902/4 = 35725.5 (ten thousand yuan), the average operating cost is 42180/4 = 10545 (ten thousand yuan), and the ratio of the average operating cost of the project to the average cost Si = 10545 / 35725.5 = 0.30.

In this paper, the first 30 sets of 35 construction engineering sample sets are used as training sets, and the last 5 sets are used as test sets. The normalized and organized engineering sample data is used as the input vector of the BP neural network.The training set of a three-layer BP neural network training sample set is used, and then an improved BP neural network calculation method is used to analyze the resulting data. The results are shown in Figure 1.

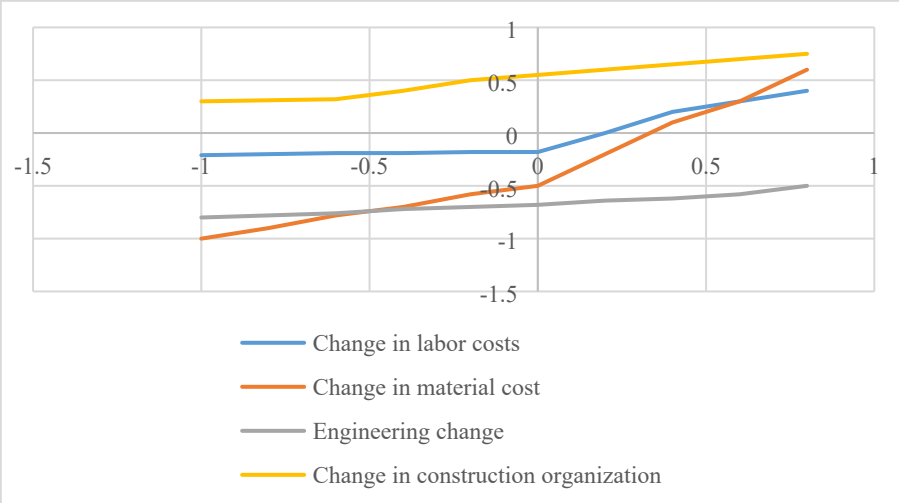

Figure 1. Variation of each data

As can be seen from the results in the above figure, the maximum relative error between the actual engineering sample value and the calculated engineering sample value is 3.53%, which is less than the target error of 5%. Within the scope of dynamic cost control during the construction phase,

this monitoring was successful. The cost dynamic control model is available, and the results obtained meet the requirements.

4.2 Strategies for Dynamic Management and Control of Project Cost

(1) Strengthen the awareness of engineering cost

In order to successfully carry out the dynamic management and control of construction project cost, it is necessary to deeply understand the dynamic management control of construction project cost and strengthen the awareness of construction cost. Relevant engineering cost staff must deeply understand and understand the importance of dynamic management and control of construction engineering cost, and also vigorously publicize and promote the role and advantages of dynamic management control. Construction enterprises should provide more professional training opportunities for construction cost personnel to effectively ensure the smooth progress of dynamic management and control of construction cost. In addition, in the process of deepening the understanding of the dynamic management and control of construction cost, it is necessary to effectively combine the relevant policies of our country, take it as an important foundation and condition, and carry out effective dynamic management and control. In addition, in the course of professional training of engineering cost personnel, relevant policies should be effectively incorporated to obtain better results.

(2) Reduce design changes during construction

Adopt effective engineering cost control strategies during construction. During the entire construction process, due to the many complicated contents involved, in the process of dynamic management and control of construction project cost, from the design point of view, it is necessary to clarify all construction links, and at the same time, it is necessary to accurately estimate and analyze the cost of each construction link. In the construction cost estimation, in order to avoid changes in construction costs due to adjustments and changes in the construction process, we must reserve a certain amount of capital space. In the dynamic management control of construction engineering cost, construction materials are a major influencing factor. Based on this, in the process of dynamic management and control of construction project cost, it is necessary to strictly control the construction materials, and it is necessary to deeply understand the changes in the market price of construction materials and effectively manage the construction cost. In addition, under the condition that the cost budget is not exceeded, the construction materials with better quality should be selected as far as possible to improve the effect of dynamic management and control of construction cost and effectively guarantee the construction quality.

Effective treatment of construction cost difference. In the construction process of construction projects, the problem of construction cost difference often occurs. The above problems are an important content of dynamic management and control of construction cost. Based on this, in the process of dynamic management and control of construction cost, we must attach great importance to the construction cost difference, and we must comprehensively and thoroughly evaluate the overall budget of the construction process according to the changes in the domestic construction market, and find out the differences in all construction links. In order to avoid the difference between the construction link and the construction budget, effective measures must be taken. In the process of dealing with construction price differences, it is necessary to collect some of the latest news appearing in the market, and at the same time formulate corresponding reasonable treatment measures, in order to facilitate the construction project to make more reasonable construction decisions, and help the construction project dynamic management and control Improved accuracy.

Improve the dynamic management and control system of construction cost. In order to do a good job of dynamic management and control of construction project cost, we must perfect the dynamic management control system of construction project cost, effectively implement the relevant system of construction project cost, and continuously improve the economic benefits and market competitiveness of construction enterprises. By improving the dynamic management and control system of construction cost, it can effectively supervise the work of relevant personnel and

effectively regulate the behavior of all departments, which will help the smooth realization of the dynamic management control target of construction cost and can effectively improve construction quality of building works.

5. Conclusion

The research purpose of dynamic control engineering cost is to use technology and economy to predict engineering cost, control, analyze and optimize engineering cost, to realize the best allocation of investment resources and the greatest economic benefits. The control of engineering costs, because each stage uses the dynamic nature of the project, in order to dynamically control engineering costs in real time, the corresponding means and methods of the decision-making phase, design phase, and construction phase are used. This article will study the problems existing in the dynamic cost control of current projects in China and the countermeasures to be taken, investigate and analyze specific problems in each phase in detail, and propose effective dynamic control methods for construction costs.

References

[1]. Gary W. Lemmon, Dan Neal, Randall R. DeMartino. Variation in hospital costs and reimbursement for endovascular aneurysm repair: A Vascular Quality Initiative pilot project[J]. Journal of Vascular Surgery, 2017, 66(4):880-880.

[2]. Guillaume Trotignon, Ellen Jones, Thomas Engels. The cost of mapping trachoma: Data from the Global Trachoma Mapping Project[J]. Plos Neglected Tropical Diseases, 2017, 11(10):e0006023.

[3]. Emily Callander, Stephanie M Topp, Sarah Larkins. Quantifying Queensland patients with cancer health service usage and costs: Study protocol[J]. Bmj Open, 2017, 7(1):e014030.

[4]. Mohammad Javad Taheri amiri, Farshidreza Haghighi, Ehsan Eshtehardian. Multi-project Time-cost Optimization in Critical Chain with Resource Constraints[J]. Ksce Journal of Civil Engineering, 2018, 22(10):3738-3752.

[5]. Mangesh Gharote, Rahul Patil, Sachin Lodha. Scatter search for trainees to software project requirements stable allocation[J]. Journal of Heuristics, 2017, 23(4):257-283.

[6]. Gergő Gógl, Beáta Biri-Kovács, Ádám Levente Póti. Dynamic control of RSK complexes by phosphoswitch-based regulation[J]. Febs Journal, 2017, 285(1):46.

[7]. Katjuša Brejc, Qian Bian, Satoru Uzawa. Dynamic Control of X Chromosome Conformation and Repression by a Histone H4K20 Demethylase[J]. Cell, 2017, 171(1):págs. 85-102.

[8]. Quanmin Zhu, Dongya Zhao, Shuzhan Zhang. U-model enhanced dynamic control of a heavy oil pyrolysis U+002F cracking furnace[J]. IEEE/CAA Journal of Automatica Sinica, 2018, 5(2):577-586.

[9]. Y. Zhang, Z. Wang, H. Shen. Dynamic Control of Extended Petlyuk Divided-Wall Columns for Alcohols Separation[J]. Acta Petrolei Sinica, 2017, 33(2):281-290.

[10]. R. Borrego-Varillas, J. Pérez-Vizcaíno, O. Mendoza-Yero. Dynamic Control of Interference Effects Between Optical Filaments through Programmable Optical Phase Modulation[J]. Journal of Display Technology, 2017, 12(6):589-593.

[11]. Cheng-hua Shi, Cheng-yong Cao, Ming-feng Lei. Optimal design and dynamic control of construction dewatering with the consideration of dewatering process[J]. Ksce Journal of Civil Engineering, 2017, 21(4):1161-1169.

[12]. R. Zhang, C. Zhang. Combined Control Allocation and Sliding Mode Control in the Dynamic Control of a Vehicle with Eight In-Wheel Motors[J]. Journal of Beijing Institute of Technology,

2017, 26(1):58-66.