Research on the Regulation Mechanism of Project Cost under the Changing Environment of Construction Market

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Abstract: By analyzing the characteristics of environmental changes in the construction market, this paper points out that there are some problems in the current market, such as fierce competition, profit compression, talent shortage and difficulty in withdrawing funds, and at the same time, it shows the trend of digital transformation and green building development. On this basis, the current engineering cost control mechanism is analyzed, and it is found that there are typical problems such as multi-department management conflict, lack of life cycle management and control, insufficient risk response, and deep technology integration. In order to cope with the above challenges, this paper constructs a dynamic regulation mechanism with the core goal of "adapting to market changes, safeguarding the rights and interests of all parties, and improving the efficiency of management and control". This mechanism follows the principles of combining real-time and foresight, paying equal attention to systematicness and collaboration, balancing flexibility and rigidity, and giving priority to fairness and transparency, and realizes dynamic intervention through the cooperative operation of three modules: market dynamic monitoring and early warning, full-cycle cost flexibility adjustment and multi-agent collaborative response. At the same time, the guarantee system is put forward from the aspects of system, technology and resources, aiming at improving the adaptability and effectiveness of project cost control and providing support for the healthy development of the construction industry in the complex market environment.

1. Introduction

As an important pillar of the national economy, the market scale of the construction industry continues to grow. However, the decline in industry profit rate shows that enterprises are under great pressure in cost control. The profound changes in policy, economy, technology and market are reshaping the operation mode of the construction industry: from pricing methods to green building standards, from the fluctuation of raw material prices to the popularization of new contracting modes, to the application of BIM technology and the development of prefabricated buildings. These factors work together to make the cost structure more complicated [1].

The current engineering cost control mechanism shows obvious lag. The quota standard issued by the government is updated slowly, which can not reflect the market changes in time, which makes it difficult for enterprises to cope with the rapidly changing cost environment. In addition, the risk sharing mechanism is unbalanced, and the contractor bears most of the risks of material price fluctuation and engineering quantity change, which not only increases the business risk of the enterprise, but also affects the project quality. Low information transparency and insufficient technology integration further aggravate these problems, which hinder the transformation of enterprises to data-driven decision-making and intelligent management and control tools.

2. Analysis of environmental change characteristics of construction market

2.1 Current situation of market development

There are a large number of enterprises in the construction industry, and the industry competition is extremely fierce. With the volume growth of the construction market, the competitive mode of

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the construction industry has also shown diversified development. Market concentration continues to rise, resources are increasingly concentrated in the head, and at the same time, general contracting enterprises are clustered together, and homogenization competition is fierce [2]. In order to win the bid, the construction enterprises had to reduce the price, which led to a sharp decline in profits after the price reduction. The verification of engineering qualifications and personnel has intensified, and the recruitment cost of enterprises has become higher and higher, further reducing the profit space. Affected by the downward trend of real estate and local government debt pressure, the pace of project promotion is blocked, and it is difficult to charge fees as a common problem in the industry. Many engineering construction enterprises are caught in the dilemma of managing and controlling the two funds, and it is difficult to withdraw funds, and the operating pressure is huge [3]. The aging problem of construction workers has become increasingly prominent, the attraction of talents in the industry has plummeted, and the enrollment of architecture and civil engineering majors in colleges and universities has been cold, which has led to the emergence of hidden concerns about talent shortage.

2.2 Market prospect

With the acceleration of urbanization and the continuous advancement of infrastructure construction, the market scale of the construction industry is expected to continue to expand [4]. Especially infrastructure construction and urban renewal projects, the implementation of these projects requires a lot of funds and high-quality architects and skilled workers. The construction industry will accelerate the digital transformation, and use technologies such as Internet of Things (IoT), big data and cloud computing to improve project management efficiency, construction safety and construction quality. Intelligent buildings and smart construction sites will become the new trend of industry development [5]. The national and local governments have continuously strengthened their supervision over the construction industry, and at the same time issued a series of policies to support the development of the industry, such as building a unified national market and breaking down regional protection barriers, which provided a guarantee for the healthy development of the industry.

2.3 Market environment

The development of the construction industry is greatly influenced by the macroeconomic situation, and the investment in fixed assets directly drives the growth of the industry [6]. At present, China's economy has shifted from a high-speed growth stage to a high-quality development stage, and the growth rate of fixed assets investment has slowed down, but it still maintains a certain growth. The government continues to optimize the policy environment and promote the transformation and upgrading of the construction industry. For example, promote new construction methods such as prefabricated buildings and green buildings, and improve the level of industrialization, digitalization and intelligence of buildings. The market has entered the stage of stock renewal from large-scale development, the number of new projects has dropped sharply, and the market demand has shrunk. Regional protectionism still exists, and it is difficult for small and medium-sized enterprises to operate across regions.

2.4 Development trends

New building materials such as green building materials, energy-saving materials and intelligent materials will be more widely used. These new materials have the advantages of environmental protection, energy saving and high efficiency, and will promote the development of the construction industry in a greener and sustainable direction. Intelligent construction and building industrialization are the general trend. BIM technology, construction robots, assembly component production and other sub-tracks will rise, which will promote the development of the construction industry in a more intelligent and efficient direction. Traditional infrastructure is still in great demand in the central and western regions, and overseas infrastructure projects have also opened up new battlefields for enterprises. Developed areas in the east focus on urban renewal, renovation of old residential areas and other fields, resulting in considerable project opportunities. Enterprises

should conduct differentiated competition according to their own advantages and market demand. Colleges and universities are accelerating professional reform, strengthening practical teaching links and cultivating more high-quality talents that meet the market demand. At the same time, enterprises should also increase internal training investment and the construction of talent incentive mechanism to attract and retain talents.

3. Present situation and problem diagnosis of engineering cost control mechanism

3.1 Analysis of current regulation mechanism

China's project cost management has gradually shifted from government pricing to a dynamic model of "control quantity, guidance price and competition fee", forming a market-oriented price mechanism. For example, the valuation method of bill of quantities gradually replaces the traditional quota mode, realizes price competition through bidding, and improves the efficiency of resource allocation. At the same time, the state still retains macro-guidance functions, such as issuing unified quotas as a reference, and exerting influence in environmental protection policies and other fields. Theoretically, it emphasizes the cost control of the whole life cycle of project construction, including feasibility study in decision-making stage, quota design in design stage, budget implementation in construction stage and settlement audit after completion. Some enterprises try to introduce BIM technology and big data analysis tools to enhance data transparency and real-time monitoring capabilities. However, in practical application, the links are not closely connected and the dynamic adjustment is insufficient.

The government indirectly regulates the cost through tax incentives, subsidy policies and environmental protection standards. For example, the value-added tax reform has changed the structure of taxes and fees, while green building requirements have increased the upfront input cost. In addition, the adjustment of land supply policy and planning may also lead to engineering changes and lead to cost fluctuations. The construction unit, the construction unit, the supervisor and the consulting organization participate in the cost control together, but the division of power and responsibility is still unclear. Some projects adopt flexible contract terms to cope with market changes, such as setting price adjustment thresholds or binding raw material indexes to improve flexibility.

3.2 Typical problem identification

There is a phenomenon of multi-department separate management in the current system, which leads to standard conflict and implementation contradiction. The tendency of local protectionism restricts the cross-regional resource flow and weakens the formation of a unified national market. In practice, it pays too much attention to the cost reduction of construction links, ignoring the potential space saving of pre-design and post-operation and maintenance [7]. The economic demonstration of the design scheme is insufficient, resulting in the subsequent over-budget; The completion audit only corrects the deviation afterwards, which can't recover the loss of previous decision-making mistakes. The price of materials is greatly influenced by the international commodity market and the stability of supply chain, but most enterprises lack effective data acquisition systems and early warning models. Under the rising trend of labor cost, the proportion of labor cost is increasing year by year, but the existing pricing model fails to fully reflect the difference of skill premium. In the face of sudden changes in policies and regulations, extreme weather and other emergencies, the emergency plan is insufficient. The terms of the contract are too rigid, which makes it difficult to adapt to market fluctuations and easily leads to disputes. Some small and medium-sized enterprises were forced to withdraw from the market because of their weak ability to resist risks, which aggravated the imbalance of industry concentration.

Although new technologies such as BIM and IoT are gradually popularized, their accuracy in cost forecasting still needs to be improved. At the same time, the lack of compound professionals, especially high-end talents who know both engineering technology and economic analysis, restricts the implementation effect of intelligent management and control. The builder tends to lower the

initial contract price and transfer the risk, while the contractor makes a profit by claiming after winning the bid at a low price, forming a vicious circle. Intermediaries lack independence due to the limitation of charging mode, so it is difficult to provide objective and neutral consulting services.

4. Construction of dynamic regulation mechanism

4.1 Design principle of regulation mechanism

The dynamic regulation mechanism should take "adapting to market changes, protecting the rights and interests of all parties and improving the efficiency of management and control" as its core goal, and follow the following principles as shown in Figure 1.

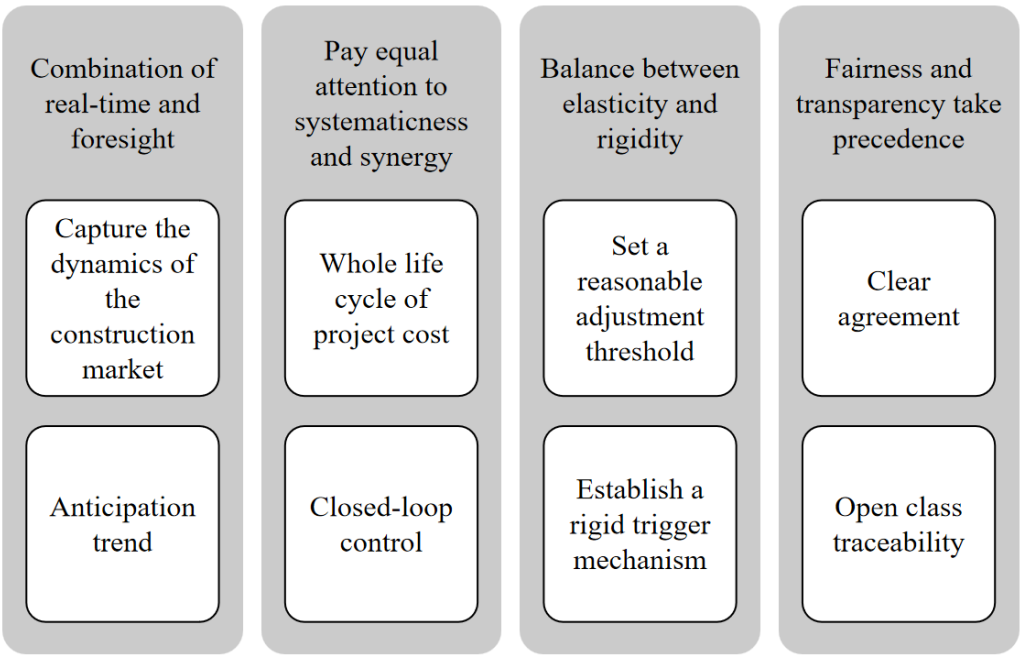

Figure 1 Principles to be followed in the design of regulation mechanism

4.1.1 Combination of real-time and foresight

It not only captures the real-time construction market dynamics through the data monitoring system, but also predicts the trend based on historical data and forecasting models to avoid passive adjustment.

4.1.2 Pay equal attention to systematicness and synergy

Covering the whole life cycle of project cost (investment estimation, design budget estimation, construction drawing budget, settlement, etc.), and linking government supervision departments, construction units, construction enterprises, consulting institutions and other subjects to form a closed-loop control.

4.1.3 Balance between elasticity and rigidity

Set a reasonable adjustment threshold for short-term market fluctuations to maintain cost stability; For major policy changes or systemic risks, a rigid trigger mechanism is established to force the adjustment process to start.

4.1.4 Fairness and transparency take precedence.

The adjustment rules should be clearly stipulated in the contract, and the data sources should be open and traceable to avoid disputes caused by information asymmetry.

4.2 Regulation module

The dynamic control mechanism realizes the dynamic intervention of the project cost through the cooperative operation of the three modules, as shown in Figure 2. First of all, by integrating government data and industry platform information, a multi-dimensional database is built, and big data and AI analysis are used to identify price anomalies and automatically warn them; Secondly, the price adjustment clause is agreed in the contract, the adjustable factors, calculation formula and responsibility division are defined, the price adjustment process is automatically triggered in the implementation according to the monitoring data, and the optimization model is repeated after settlement [8]; Finally, the linkage mechanism between the government and the market is established, and the data sharing and online approval of the construction unit, the construction party and the consulting organization are realized by relying on the online platform, so as to improve the response speed and execution efficiency of dynamic price adjustment.

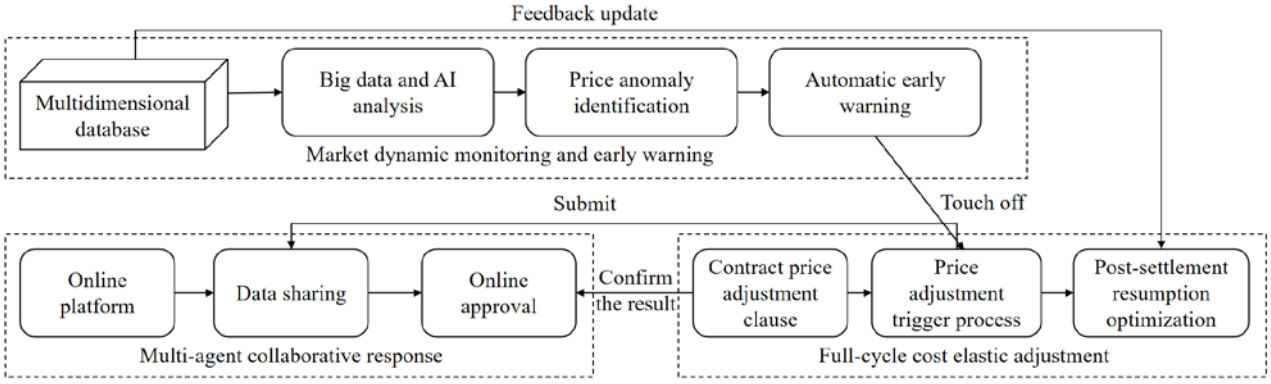

Figure 2 Dynamic regulation mechanism

4.3 Safeguard mechanism

In order to ensure the effective implementation of dynamic control mechanism, it is necessary to build an all-round guarantee system covering system, technology and resources. At the institutional level, the application scope and dispute settlement mechanism of dynamic price adjustment are clarified by perfecting laws and regulations, and the industry standards are unified to standardize the compilation of price index and price adjustment formula, so as to reduce the implementation differences; On the technical level, build a digital management and control platform integrating BIM, blockchain and IoT to realize the visualization and traceability of cost data, and develop an intelligent decision-making system based on machine learning to improve the accuracy and automation level of price adjustment model; On the resource level, strengthen the capacity building of cost talents in data analysis and AI tool application, and support enterprises, especially small and medium-sized enterprises, to build digital platforms through government subsidies and tax incentives, lower the threshold of technology application, and fully support the sustainable operation of dynamic regulation.

5. Conclusion

At present, the construction market environment is undergoing significant changes, including profound changes in policy, economy, technology and market. These changes have had an important impact on the operation mode of the construction industry, making the cost structure more complicated, and enterprises are facing great pressure in cost control. At the same time, the industry's profit margin is declining, the competition is fierce, the project promotion is blocked, and the charging is difficult, which further aggravates the business risks of enterprises. There are some problems in the current engineering cost control mechanism, such as lag, unbalanced risk sharing mechanism, low information transparency and insufficient technology integration. These problems hinder the transformation of enterprises to data-driven decision-making and intelligent management and control tools, and affect the project quality and enterprise competitiveness. In view of the above problems, this study puts forward the design principles of dynamic regulation mechanism, including

the combination of real-time and foresight, the equal emphasis on systematicness and collaboration, the balance between flexibility and rigidity, and the priority of fairness and transparency. Through the construction of three control modules-multi-dimensional database construction and anomaly identification, contract price adjustment clause agreement and automatic trigger price adjustment process, government and market linkage mechanism-the dynamic intervention of project cost is realized. In addition, in order to ensure the effective implementation of dynamic regulation mechanism, this study also puts forward an all-round guarantee system covering system, technology and resources. At the institutional level, improve laws and regulations to clarify the scope of application of price adjustment and dispute resolution mechanism; On the technical level, build a digital management and control platform and develop an intelligent decision-making system; On the resource level, strengthen the capacity building of cost talents and support the construction of enterprise digital platform. The dynamic control mechanism and guarantee system proposed in this study provide an effective solution to the project cost challenge under the changing construction market environment, which is helpful to enhance the competitiveness of enterprises, ensure the quality of projects and promote the healthy development of the construction industry.

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