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Research on Implicit Cost Control of Construction Projects Based on Lean Construction Theory

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Abstract: By illustration to the lean construction theory, the reasons for the existence of implicit cost were analyzed. It is then proposed to apply the idea of lean construction to construction projects to control the implicit projects, hence to reduce the total cost and promote the healthy development of the construction industry. The implementation procedures and the attention issues for lean construction were described with example projects. It is shown that the adoption of lean construction can improve the company's image and enhance its competitiveness. Its application should be promoted.

Keywords: Project management, Lean construction, Implicit cost.

1. Introduction

The continuous development and innovation of science and technology lay a good foundation for the construction industry. However, due to the defects of "hardware and software" measures such as management tools and management methods, there are still some problems in today's construction industry, such as low production efficiency, uneven construction quality, high construction cost and hidden dangers in operation safety [1]. This phenomenon is more common in large projects with tight projects and heavy tasks. In these problems, the hidden cost of quality is the first to bear the brunt, which is the focus of construction projects. If these problems can not be effectively controlled and prevented, it will directly affect the cost and overall process of the construction project. The consequence is that the credibility of the construction enterprise will be reduced, the good image will be damaged, the market share will be lost, and the loss of its economic and social benefits can not be estimated [2].

Scholars generally believe that the traditional cost management method, due to the lack of guidance of advanced concepts, has little effect on the construction

management of the construction industry and cannot solve the fundamental problems, while the implementation of lean construction can effectively control and reduce this cost, which is the best way to solve these problems [3].

2. Lean construction theory and implicit cost

The theory of lean construction was first put forward by lauris Koskela, a Danish scholar. He applied Lean Management in manufacturing industry to construction industry. Due to the complexity of the construction project, lean construction makes a comprehensive evaluation of the whole construction process, penetrates the idea of lean production into the whole construction system, and forms a new production and construction system under the lean construction theory [4]. It integrates the advantages of production management, construction management and system management. It can save and control the cost to the maximum extent in the life cycle of the whole construction product until the waste is eliminated, so as to meet the final needs of customers [5].

The so-called lean construction is to transform and apply the "lean idea" in the construction industry, completely eliminate the waste and uncertainty in the construction process, and meet the customer's requirements to the maximum extent, so as to realize the maximum profit of the construction enterprise [6].

Lean construction originated from Toyota Motor Company of Japan, which is a production system. Its characteristics include the following three aspects.

(1) It has a complete transmission target system.

(2) Focus on customers and maximize value as much as possible. Because the ultimate goal of enterprise production is to maximize the benefits, while lean construction emphasizes the transformation of the relationship between the production enterprise and the end customer[7]. It organically combines the maximum goal of enterprise production with the ultimate demand of the customer, and weakens or eliminates the misunderstanding or contradictory relationship between the enterprise and the customer [8]. Therefore, in the initial stage of construction engineering, comprehensive design should be carried out, which should reflect the needs of customers and maximize the value of customers. This requires that in the process of construction engineering production management, the project members of each link and process should communicate and coordinate with the customers, listen to their opinions continuously, and adopt and organize them, finally combine this idea with the needs of customers, truly turn the needs of customers into design schemes, and design and present personalized products for customers.

(3) Lean construction is to control the whole life cycle of the project, which can fully guarantee the smooth realization of the established goal of the construction project.

Lean construction focuses on the integration of design, construction, production process, supply, project management and other aspects, and this theory runs through the whole construction project. It is a set of new theoretical system that integrates production process and value theory.

3. Implementation of lean construction

The implementation ideas of lean construction are mainly reflected in customer management, design change, standardized management, performance evaluation and other aspects.

3.1 Customer demand management

The customer's demand is the working standard of the engineering project. In recent years, the customer's requirements for quality are gradually improving, which forces the engineering project to be more perfect, and its quality is more excellent, so as to meet the customer's standard.

In order to make the project more perfect, we should attach great importance to it ideologically. From the beginning of the design of the project, we should embody the idea of lean construction in an all-round way, because the success of a project depends to a certain extent on whether the design of the project is complete. In this process, each member of the design team should fully grasp the needs of customers and how much to do with customers Second extensive and in-depth communication, with more details.

In addition, we should do a good job in communication and coordination to achieve mutual contact and exchange between the two sides. On the basis of mastering the needs of customers, it is necessary to comprehensively measure and analyze the benefits of the project. In the process of measurement, we should use the analysis of the theory and technology of lean construction to make a comprehensive, objective and scientific analysis of the interests of the whole project, and constantly correct the unreasonable places in the operation process. The purpose is to make the engineering side and the customer achieve a win-win situation, and to make the implementation of lean construction get a wide understanding and support.

3.2 Changes in design patterns

According to the traditional design mode, the specific person in charge of the design is the contractor. Before the commencement of the project, they have made clear the scope of activities, rights and obligations of the project design, and then handed over the design scheme to the subcontractors and manufacturers. The disadvantage of this is that the designers of the project scheme are often unable to enter and participate in

it, and some of the problems are difficult to get very good The solution. Lean construction is to make up for this defect of the traditional design mode. It requires the designer to consider the interests of both the project side and the customer, integrate lean thinking into the construction process, and optimize accordingly to achieve the best management mode.

Specifically, managers or designers in construction field should gradually abandon the original design and construction mode. What they consider is what to build. After completion, do not leave defects or regrets to the construction or the next process, highlighting the highly consistency of products and processes, so as to embody the essence of lean construction.

3.3 Standardized management of engineering projects

Because variability is a common problem in engineering projects, it is necessary to manage the project effectively. The so-called effective management is to carry out according to the standardized management mode in every detail link and procedure, combine the general standard of the project with the standard of the specific process, and form the standardized system of the whole project. Lean construction is to standardize the operation of standardized objects according to the management mode of standardized system, improve labor productivity, reduce costs and achieve the unified goal of engineering standard management through the control of variability.

3.4 Performance evaluation

Performance evaluation is an important part of management. It can improve reasonably according to the real feedback information and adjust the decision in time. However, in practice, the lack of effective and reasonable performance evaluation system often affects the healthy development of the construction industry. It is not until the introduction of lean construction that the project engineering enters a controllable process of total quality management. The traditional performance evaluation model usually only looks at the results and the main causes of the problems, while lean organization is favored for its ease of operation and economy. In the evaluation process, it also urges the bad behaviors caused by human factors, guides and motivates the unsatisfactory parts in the continuous improvement project, so as to provide correct feedback for the decision-makers and managers, and makes changes Enter.

4. The control of quality hidden cost by lean construction

The important responsibility of project management is cost control, so cost control is also the focus of project cost management. The traditional cost control system is not

suitable for the development of lean construction projects. Lean construction plays a very good role in the management theory, method and practice of the hidden cost control of engineering projects.

In the process of using, consumers' loss caused by the exposed quality problems is called hidden quality cost. The hidden quality cost is apportioned on the customers. On the surface, it seems that the hidden quality cost is the loss outside the manufacturer. But the deep reason is that the project is not paid attention to prevention and the investment in appraisal is not enough. Although it is not clear that such hidden cost does not need to be borne by the manufacturer, it can be borne by the purchased customer himself, and the manufacturer may not suffer loss of temporary interests, but in the long run, what the manufacturer loses is not temporary interests, but intangible reputation and loss of the enterprise, which is difficult to measure with money. In the process of project production, although the hidden cost is not actually paid, the hidden cost increases the product cost invisibly.

4.1 Characteristics of implicit quality cost

(1) Hidden cost is hidden

Hidden quality cost is a kind of cost that is free from management and supervision and hidden in the process of enterprise operation. It is often overlooked because it cannot be seen directly. Therefore, the managers sometimes know that there are many quality problems in the enterprise, but they don't know which link these quality problems are in, which problems are more critical, how much loss these quality problems bring to the enterprise, and how to solve them.

(2)Hidden quality cost is difficult to measure and estimate

Many implicit quality costs are known to exist, but it is impossible to say how big they are. For example, the loss of reputation caused by quality problems is an objective problem, but the loss is difficult to measure and estimate, even if it can be measured, it can not be as accurate as the explicit quality cost.

(3)Implicit quality cost is dynamic

The implicit quality cost will change with the change of social environment and business operation. At the same time, the development and change of some implicit quality cost also have uncertainty, which is an irregular non-linear change.

4.2 Control of hidden quality cost

Under the lean construction model, in order to control the hidden quality cost, we must fundamentally improve the economic benefits of enterprises. In order to improve the economic efficiency of enterprises, it is very important to control the hidden cost. The hidden cost is caused by the defective product quality or the product quality has not

met the customer's requirements or the excessive production. Due to its strong operability and successful experience in practice, lean construction mode plays a good role in controlling the hidden quality cost of construction projects. It is a comprehensive quality management, focusing on process control, taking the characteristics, standards of construction products and customer satisfaction as the monitoring objectives, and carried out through the way of financial cost All round management, to achieve direct communication, communication and coordination with relevant departments, to establish the relationship of cooperation and trust based on the win-win situation of both sides, so as to achieve the smooth delivery of the project.

The control of hidden quality cost is a process of implementing lean construction, a process of continuous improvement and pursuit of perfection, a process of constantly reducing cost and a management process of achieving zero quality defects. It is consistent with the characteristics of quality hidden cost.

5. Example analysis

5.1 Project profile

The construction project investment of a group project in Wenzhou is 1.4 billion yuan, the construction period is 53 months, the concrete pouring amount is 2.89 million m3, and the foundation structure grouting is 4685t.

5.2 Specific operation

(1) Schedule

The construction schedule of lean construction adopts the principle of "democratic centralism", which is discussed by the last operator of the construction project first, and on this basis, it seeks opinions from many parties for centralized analysis and makes a reasonable project schedule. In the process of preparation, the plan is not carried out in teams or groups, but requires the whole team to gather ideas and make it based on the specific situation of construction, so that the classes can not only cooperate with each other but also restrict each other, improve the execution, but also improve the work efficiency, so as to achieve the purpose of reducing costs and completing the project ahead of time.

(2) Just in time production and construction mode

The advantages of just in time production are to shorten working hours, reduce costs and improve production efficiency. Under the lean management mode, the basic principle of just in time construction is adopted in the project, and seamless and timely construction management measures are formulated in every link of concrete pouring, mixing, transportation, loading and unloading. Under this mode, the project effect is very significant, the project progress is obviously accelerated, the human waste is

obviously reduced, and the project benefit is obviously improved.

(3) Cost management

Under the guidance of lean construction, cost management is no longer a superficial management, but a pressure on every construction personnel involved. The cost of the whole project is apportioned to each member, so that each of them has indicators. In the process of management, strengthen the assessment of cost management responsibility system, and form a perfect cost management system in the whole construction process of the project, which fundamentally saves the cost and embodies the cost control under lean construction.

(4) Raw material management

According to the budget, the loss of concrete in this project is controlled within 3%. In order to achieve this goal, there are many links. In order to control the loss, we must strictly control the raw materials in every detail. According to the traditional engineering practice and experience, the best statistical data is about 2%, and according to the lean construction under the strict management of raw materials management mode, the final assessment results determine that the concrete loss is 1.5%. According to such calculation, the concrete loss of this project will save 4.5 million yuan. In the actual construction, on the basis of ensuring the quality of the project, the project engineers optimized the mix proportion of concrete, improved the performance and saved the cost, which alone saved nearly 8 million yuan.

(5) On time and accurate management of mechanical equipment

The equipment management shall be reasonably configured, and the resources shall be allocated as a whole according to the predetermined requirements to achieve the optimal quantity control requirements. On this basis, the use frequency and efficiency of each equipment shall be comprehensively and carefully assessed and recorded to avoid the phenomenon of equipment idling and low use frequency. According to the statistics of the engineering office, the cost saving of concrete pouring equipment alone is 5.21 million yuan.

(6) Effect test

After accurate comparison and analysis, the operation efficiency of the project under the lean construction management mode is 25% higher than other management modes, and the construction period is reduced by nearly 30%. The completed projects of the project are compared and analyzed in many aspects. The management mode under lean construction is more cost-effective, more efficient and produces higher profit and output value.

6. Conclusion

Lean construction is the specific application of lean thinking and lean management in

the construction industry. Generally speaking, it is a knowledge to eliminate waste. It is a new way to think and act. It carries out comprehensive management and control from the whole process of project initiation, design, construction, construction to project delivery, especially lean construction in controlling the hidden quality cost of construction projects It has unique advantages. The above-mentioned elaboration of lean construction theory, the implementation of lean construction ideas and the control of implicit quality cost provide a reference model for the cost control of China's construction industry, which will effectively promote the healthy and rapid development of China's construction industry, greatly improve the image and core competitiveness of construction enterprises, and is worth promoting and applying.

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