



Analysis of Construction Project Quality Management

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Abstract At present, construction projects facing the development trend of large-scale and complicated, previous construction projects quality management need much manpower and cost increase which can't meet the requirements of the construction project. Therefore, this article through the analysis of the characteristics of the construction project quality management, management factors, management processes and management methods, points out the shortages of construction project quality management, and puts forward some suggestions on the future direction of perfect quality management.

Keywords Construction Project, Quality Assurance, suggestions

Introduction

Construction projects often have the characteristics of large investment scale, many divisional and sub-divisional projects, the conditions are complex and variable, diverse raw materials, temporary organizations, one-time and irreversible .Therefore, quality management is the key to any construction project. Before the project, the quality objectives have been determined strictly, then the stand or fall of quality management will directly affect the success of a project. At home and abroad about the research of quality management in the early 1960 s, "the great management thinker "Philip b. Crosby put forward about the quality of Zero Defects theory, the concept of "do it right for the first time" go deep into the field of quality management. Then, on the basis of the theory of Zero Defects [1], 6σ theory arises at the historic moment, and it greatly reduced the quality cost [2].Then, they put forward a comprehensive quality management [3], quality management was deepened. Quality is not an abstract concept, it refers to the technical standard content and product or service meet the degree of technical standards.ISO9000 defines quality as the degree to which a set of inherent characteristics meet the requirements. Mainly including the follows: ①Feature means that a characteristic different from the other things; ②Meet the needs of customers; ③Meet the technical and normative requirements; ④Comply with the provisions of the contract. Thus, a point of view on the quality of the construction project is managed: wait until after the end of a construction project to check whether the quality meets the requirements of technical, specifications or the contract would be unwise, quality management should implement the whole process of construction projects.

The main features of project quality

Many factors affect the quality

From the project examination and approval, feasibility study, project construction preparation, project construction and project completion inspection and acceptance, the influencing factors on the quality of the project is ubiquitous, and diverse. Mainly refers to 4M1E, namely the impact of man, material, machine, method and environmental on the quality. The factors affecting the quality of personnel mainly refers to the technical level of personnel, cultural level, professional experience, behavior, physical condition and professional ethics; the influence of materials on quality is reflected in the quality of materials; the influence of the machine on the quality lies in the machinery into the playing time and the choice of the machine, the mechanical performance and the operation of the machine; the influence of the method on quality depends on the rationality of the implementation plan, the standard of the operation method and the selection of the technical method . Environment's influence on the quality include technology in the project, such as weather conditions required by the project work; the hydrological conditions and geological conditions required by engineering, the operation



environment of the project such as working conditions, operating facilities, communication and security, project management environment refers to the contract structure of the project and project management relations determined, project organization system and the management system; social environment refers to the project area of the political and economic situation. These series of factors will directly or indirectly affect the quality of the project.

Large fluctuation ranges of quality

Engineering construction projects have characteristics of one-time, liquidity and irreversible, determines the construction of the project at many time is the flow water construction, and a lot of the time is in accordance with a standard set of procedures to carry out the construction operation [4]. However, the difference with the factory assembly line work is that it has a fixed production location, it is a very standardized mechanical production technology, it is a strict standardization of detection technology, it has intelligent sets of production equipment and stable production environment. The degree of mechanization of construction projects is often not very high, most of time require manual operation and most of the operation is not high degree of precision. At the same time, the operating environment is generally exposed to harsh outdoor environment and the quality of the detection of poor accuracy. Therefore, the quality of construction engineering project will produce larger volatility, combined with the building itself big bulky weight as well as many factors that influence the quality ,most of the time initial a little quality problem to later may have evolved into a quality accident.

A lot of concealed works lead to the quality of concealment

General product production, in the production of each working procedure is not to need to test the quality, only need to inspect the finished product to determine whether products meet quality requirements. However, construction project is different with the product production, in the process of construction project of the production, due to its own characteristics and construction process logic problem; often need to take a lot of divisional and sub-divisional work to hidden construct. Because there are many concealment engineering, and there may be negligence in the quality inspection, simultaneously after the event on the surface can hardly see concealment engineering quality problems, therefore, the construction project general ahead in front of the concealed construction strict inspection of construction quality.

The Completion inspection and acceptance have limitations

Construction project is different with the product production, the construction project once completed, will not be able to dismember engineering check all parts, only general check for the appearance of the project; If there are some quality problem, it's hard to remedy, or remedy it will cost a lot of cost, at the same time lead to delay in construction period, suffer great losses. As a result, this causes the inspection and acceptance of construction project has great limitations.

The method of evaluation is still exist deficiencies

The process of inspection and acceptance of construction projects are carried out in accordance with the inspection lot, sub-projects, engineering division, the unit works [5]. The usual practice is for basic construction quality(inspection lot)sampling, and inspection lot is qualified mainly determined by the results of the main control items and general items ,then detected by the quality inspection lot and judge the quality of the whole project meets the quality requirements. Firstly, inspection is generally carried out by the construction unit self inspection, and then by the supervision unit to organize relevant personnel to check and acceptance confirmation. Although the whole process of inspection do the process control, test evaluation of separation and strengthen the acceptance, but by the local inspection results instead of the overall level of unavoidable appear deviation, can only be as much as possible to reduce the quality problem, but cannot do one hundred percent to eliminate [6].So, the method of evaluation still exist deficiencies, there is room for improvement.

The quality is easy to be influenced by the duration and cost

The quality of construction projects is usually closely related with the duration of the project and the cost of the project. Generally speaking, other factors are constant, the quality of the project and the project duration is negative correlation, the longer project duration is more favorable to the quality of the project, on the contrary, the quality of the project is more unfavorable. In the case of other conditions unchanged, the project quality and the cost of the project was a positive correlation, the higher project investment, the higher the quality of the project; conversely, the smaller the project investment, the lower the quality of the project. Therefore, it's necessary to correctly handle the relationship between quality, cost and duration.

The elements of project quality management

To ensure the quality of the project, it is necessary to manage the quality of the project. In order to obtain a good quality project product, it is necessary to carry out the whole process of the project and the comprehensive management. A complete project management should include the following elements of management.



Quality of the project

Project management should include not only the quality of the final product quality management, but also should include the project quality management of the intermediate product. All of the project quality management measures should be around the quality of the product, the ultimate goal of the measures should be the project quality. For a long period of time after the project is completed and delivered to the owner, the quality of the project will have an impact on the use of the owner, and this effect will directly enhance the understanding of owner to the project and the investor.

The whole process of the project and the comprehensive quality management

The quality of construction project should be gradually formed in the process management, only to ensure the quality of the whole process of management of scientific and rationality, which can make the construction project to achieve high quality. This means that the organization of the project development and management process is extremely important. These management process include: construction management, construction program management, people management and material management, etc. Meanwhile, only management in the whole process are not enough, if the content of the management is not comprehensive, also will have great influence on the quality of the project. Therefore, management in the whole process combine with comprehensive management will greatly improve the quality of the project.

The guarantee of project quality

Quality assurance refers to in the process of the implementation of project quality plan, regularly to assess, inspection and improvement the implementation of quality plan, make the project quality can meet the quality requirements of work. Its purpose is to reduce rework the project, so that the quality of construction projects can achieve specification requirements at once.

The control of project quality

Project quality control is to control the process by taking a series of operation technology and activities, which includes two aspects of professional technology and management technology. From the point of view of how to ensure the quality of the product forming process of the construction project, it is necessary to control the factors which affect the quality of construction project. In the process of project implementation, monitor the quality of the production process of the project, found the quality problem of the production in time and take appropriate measures to remedy. Quality control is to implement the principle of combining prevention and testing, which is equal to governance quality of the construction project, which aims to achieve zero defects quality of construction projects.

The management of the environment

Effects of environmental conditions of the construction should not be underestimated, in a large extent, which will affect the formation of project quality products such as the temperature impact on the strength of concrete, the rain impact on material properties.

The program of the project quality management

At present, the project quality management program is mainly based on the PDCA cycle to build up. PDCA cycle is also called quality loop, first proposed by Shewhartin 1930, the US quality management expert Dr. Deming widely promoted in 1950, thereby resulting in today's project quality management program. PDCA cycle is mainly a method which can constantly diagnosis, treatment and improve the quality in the process of project implementation , it can ensure the project products conform to the technical regulations, standards, meet the requirements of product quality, and ultimately ensure that accepted by customer satisfaction.

Set up a quality plan

After the start of the project, project management personnel should prepare a quality plan, in order to ensure the project's technical standards can be accurately realized. Quality planning should not only define the technical standards of the final product, but also have a clear quality requirements of the intermediate output of the project. Such as the project milestone plan, it specifies the intermediate product or intermediate results of the project, describing the intermediate products to be implemented in each status. With the milestones of the project plan, you can set evaluation criteria to reach the milestone plan , evaluation criteria usually involves technical standards, time, cost and customer satisfaction, which formed the main content of the quality plan. In general, the quality of the project plan will continue to deepen with the progress of the project.

Implement quality plan

Implementation plan includes two important aspects: first, before the implementation of the plan let all members understand the purpose of the project plan, requirements, standards and specific content; second, to carry out the work in accordance with the method of operation specified in the project plan. Only in this way can it be able to regulate the behavior of all members, to fully implement the requirements of the plan, let the team members to work toward a common quality objectives.



Check the quality of project

Through the inspection on the quality in the process of project implementation, meanwhile comparing with pre-established standards of quality plans, the plan calls for personnel, materials, machinery, methods and environment standard comparing with the actual situation respectively. Through the comparison to find out the existence of the gap, and analysis of the causes of these gaps, then taking appropriate measures to handle the specific issues. Timely detection of quality problems or risks in the project, at the same time to resolve it, and avoid the similar problems in the next work.

Take measures

Timely taking measures to correct the quality problems which find in the inspection process, and ensure the quality in the controlled state. There are two steps to deal with quality problems: prevention and correction. Prevention is to prevent similar quality problems later. When quality problems arise, managers should examine the quality plan if there is a problem, and consider the necessary adjustment to meet the project quality requirements, or comply with the new requirements under the environmental situation. Usually it is necessary to make the necessary adjustments to the quality plan. The main method of correction is to rework.

The method of the quality management

The right quality control methods include: quality variation analysis, Pareto analysis and so on.

The quality variation analysis method

The quality variation analysis method considers that there are five main factors that affect the quality of the project, namely 4M1E, the performance of the project quality is different because of the comprehensive function of these factors. At the same time, the causes of quality fluctuation are summarized into two categories: ①Accidental reasons. Quality difference is caused by the 4M1E factors small changes, it is random, can not avoid, difficult to predict and hard to identify. ②System reasons. Quality difference is caused by the 4M1E factors large changes, it is great influence on quality and easy to recognize.

The Pareto analysis

The Pareto analysis is named after a Italy economist. The method considers that 80% of the quality problems are caused by 20% factors, and the other 20% of the quality problems caused by 80% factors, namely the so-called 80/20 rule. Through the Pareto analysis method can quickly find the main factors which affect the project, so you can focus on the way to solve the quality problem

Conclusion

This paper analyzes the basic characteristics of the construction project quality issues, and giving the elements which managed by the project quality issues, meanwhile introducing the project management processes and quality management approach. Through the analysis and introduction, it is found that the quality of construction project management still has a lot of problems, mainly including the following:

1. Although it is put forward the overall and whole process management for the quality of construction project management, but the concrete operation is difficult and the lack of specific operation method, the management still stays in the concept stage, it needs further research.
2. At present, although there are many quality management methods, they are not systematic, mostly belonging to the afterwards quality management method, the lack of before and during quality management methods. Therefore, the quality management method is more attentive to be further developed.
3. Lack of informatization quality management. At present, the project is larger and more complicated, traditional methods of quality management has been difficult to meet the needs of practical engineering and traditional methods of quality management need more human resources, virtually increased costs .So, it is necessary to establish a quality management information platform, real-time monitoring of the project quality, timely feedback the construction project quality information, to achieve the fine management of the quality of construction projects.
4. Humanized management needs to be further strengthened. Construction project quality management, to a large extent is belong to the management of people, only every participants treat construction project quality as its mission can make the best project quality. However, the staff don't have high quality, therefore, it is necessary to strengthen the quality of management education and strengthen the humanistic management.

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