Engineering Management Strategy in the New Form

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Abstract. China's construction industry has made great progress in the past few decades, its influence and status in the global scope. However, with the adjustment of economic structure and the change of the market, China's construction industry is facing many challenges. At present, the construction industry generally has problems such as single industrial structure, over-reliance on investment drive, and insufficient technological innovation ability. To study how to use BIM technology, construction robots and other efficient and innovative new technologies to improve enterprise management, and enhance the economic efficiency and competitiveness of enterprises. Through the actual use of BIM technology, construction robot and traditional technology in the project, it is found that the use of new technology can reduce errors and repeated work in the construction process, and bring significant advantages in efficiency, cost, quality, safety and environmental protection, which is an important trend of the future development of the construction industry.

Keywords: engineering management, BIM technology, cost reduction and efficiency increase, construction robot

1 Introduction

1.1 Research Background

As an important part of China's economy, the construction industry has been influenced by macroeconomic policies, market fluctuations in the financial market, market demand changes and other factors in recent years. The growth rate of the market scale of the construction industry has gradually slowed down, and the construction capacity has appeared, ushering in the first trough period of the construction industry in recent years. In this trough period, construction enterprises are faced with problems such as reduced market demand, reduced projects and intensified competition, and the challenges faced by project management also increase accordingly. Therefore, it is of great significance to study the engineering management strategy of the construction industry in the new period. This article will explore this from several perspectives.

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1.2 Research Meaning

At present, the construction industry is facing many challenges. In 2022, the overall financing environment of real estate enterprises shows a continuous tightening trend, and the annual investment in real estate development declines year on year, showing negative growth for the first time. The area purchased by housing enterprises decreased by more than half, and the area under construction, new construction and completed housing all decreased, among which the area under new construction decreased by about 40% year on year[1]. The severe external environment has put forward new requirements and challenges to project management. Enterprises can only transform and upgrade, only to change the traditional management concept, and seek efficient, information, intelligent BIM, construction robots and other new technologies for project management. Only by keeping pace with The Times can we reduce the project cost and improve the competitiveness of enterprises in the industry.

2 Reasons for the Industry Downturn

2.1 Macroeconomic Environment

After decades of rapid growth, China's economy is now undergoing structural adjustment. In the past, mainly investment and export-driven economic growth, especially investment in areas such as infrastructure and real estate played a crucial role in the development of the construction industry. However, as China's economy gradually shifts to become more focused on consumption and innovation-driven growth, investment demand has weakened accordingly. In addition, China's slowing economic growth and corporate profitability have declined, leading to insufficient construction investment and demand. Finally, the demographic changes and the slowdown of the urbanization process also affect the development of the construction industry.

2.2 Internal Factors of the Industry

With the continuous development of the construction industry, the market competition is becoming increasingly fierce, and the price war and vicious competition between the construction enterprises are becoming increasingly serious. In recent years, the real estate market has fluctuated, the rate of price prices has slowed down, and even a downward trend in some areas. This market change directly affects the development of the construction industry, the real estate development projects are reduced, and the order volume and profit space of the construction industry are also squeezed. At the same time, the construction industry has long been in the process, materials, design and other aspects of the innovation is relatively backward, resulting in the construction quality, safety, efficiency and other problems.

3 Abandon Traditional Technologies, Embrace New Technologies, and Help Projects Reduce Costs and Increase Efficiency

3.1 Selection of New Technologies

With the continuous development of science and technology, many new technologies have emerged in the construction industry, which have brought unprecedented changes and opportunities to the industry. However, not all technologies can play an equally significant role in all kinds of engineering projects. In order to ensure the authenticity and reliability of the experimental data, we must select the characteristics of specific projects. In this context, the application of BIM technology and construction robots have become our research focus. The selection of BIM technology and construction robots as the research objects is based on a deep insight into the current technology development trend of the construction industry, and an accurate grasp of the needs of future engineering projects. These two technologies complement each other and will bring new development opportunities for the construction industry.

3.2 The BIM Technology

(1) Technical Definition of BIM. Entering the 21st century, information has more and more affected the life of everyone, all walks of life to the direction of information, intelligent development[2]. As the pillar industry of the national economy construction field, people's "living" and "travel" in the food, clothing and housing can not be absent. The Chinese version of BIM (Building Information Modeling) technology refers to the building information model, Is a data-based tool applied in engineering design, construction, and management, Through the data and information model integration of buildings, Sharing and transfer during the full life cycle of project planning, operation and maintenance, Make the engineering and technical personnel to make a correct understanding and high effect of all kinds of construction information, Provide the basis for the collaborative work of all the construction subjects, including planning, design, construction, supervision and operation units, It plays an important role in improving the production efficiency, saving costs and shortening the construction period[3].

(2) BIM Technology improves the Drawing Quality. The application of BIM technology in the construction stage greatly reduces the rework rate of the project, BIM technology builds buildings on computers as in reality, In the virtual construction process, find the defects in the design, And passed to the designer through the flow of information, The designer redesigned the drawing design of the problem parts, Improve the quality of the drawings, More traditional review of drawings by two-dimensional drawings, BIM technology more intuitive, fast and comprehensive discovery of problems in drawings, By modeling the project in this project, Then the various professional models are linked to check the problems in the drawings, A total of 42 drawing problems were found, Greatly reduce the site demolition rate. As shown in Figures 1-4.

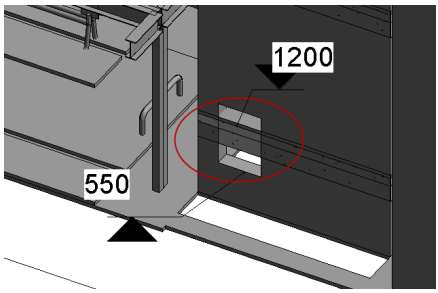

Fig. 1. Defects in structural design

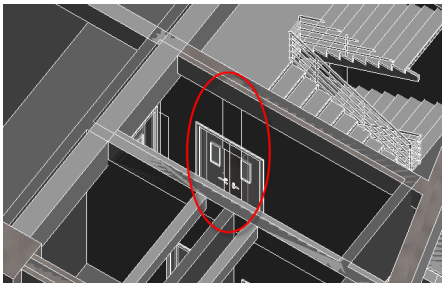

Fig. 2. Defects in structural design

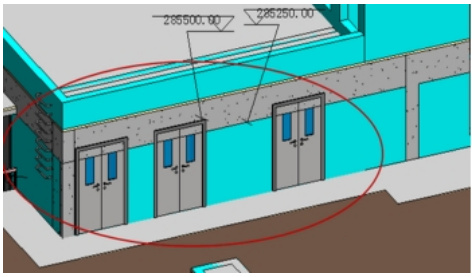

Fig. 3. Defects in architectural design

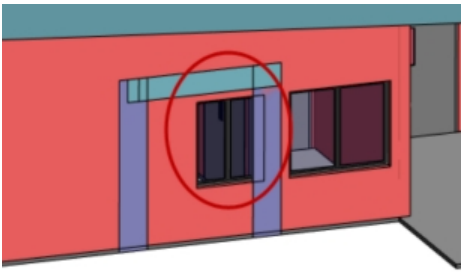

Fig. 4. Defects in architectural design

(3) BIM Technology Changes the Traditional Technology. The intervention of BIM technology makes the project management more forward-looking, and the whole construction deployment can be considered with the help of the model to change the traditional construction process. For example, the mechanical and electrical pipeline is opened on the building wall. Because the traditional construction technology can not determine the positioning and elevation of the electromechanical pipeline in advance in the wall masonry, it can only choose to open the wall according to the actual situation of the installation during the wall installation. This process is relatively backward, resulting in cost loss and a large amount of construction waste. BIM technology can be used to arrange the electromechanical pipelines in advance to determine the elevation and size of the pipeline through the wall, and then reflect the information on the drawings, and the electromechanical holes can be reserved in advance to avoid the later opening. As shown in Figures 5-8.

Fig. 5. Then open the electromechanical hole

Fig. 6. Then open the electromechanical hole

Fig. 7. Reserved mechanical and electrical holes

Fig. 8. Reserved mechanical and electrical holes

3.3 Construction Robots to Improve the Construction Efficiency

In the past hundred years, although the continuous innovation in the field of engineering technology and the form and function of the building itself are very different, the business form of construction has not changed significantly. The construction industry is one of the industries with low digitalization and automation in the world. In recent years, the state has strongly recommended and advocated intelligent building and informatization, and with the aging of China, the construction industry has fallen into the dilemma of lack of workers, and the traditional construction industry has gradually lost its attraction to the younger generation, and the construction robots have stepped on the stage.

In this project, the new technology is contrasted with the traditional process, and it is discovered that the wiping robot, the cloth robot, the putty coating robot and the measurement robot are more pragmatic, and they possess greater advantages in terms of efficiency, quality, environmental protection and cost when compared with manual operation. However, the majority of the construction robots have the drawback of being incapable of completing the construction of shadow corner areas such as the wall base and the column root. As shown in Figures 9-12.

Fig. 9. Putty coating on the robot

Fig. 10. Measuring robots

Fig. 11. Grinding robot

Fig. 12. Ground-leveling robot

4 Advantage and Limitations

4.1 Advantage

Project management under the new form needs to be innovative and advanced, and one of the most prominent advantages is the deep integration of science and technology. The application of modern technology, especially information technology, intelligent robots, big data and the Internet of Things, greatly improves the efficiency and accuracy of engineering management. For example, through BIM technology, the planning, design, construction and maintenance of engineering projects can achieve the digital management of the whole life cycle[4]. This not only improves the coordination and visualization level of the project, but also effectively reduces the cost and shortens the construction period. In addition, big data analysis can help managers to better predict and control project risks, optimize resource allocation, and thus improve the success rate of projects[5].

4.2 With Limitations

However, while seeing these advantages, we must also face up to the limitations of engineering management in the new situation. Although information technology and intelligent tools have brought many conveniences, there are also certain thresholds for their application. Many small and medium-sized enterprises are difficult to fully introduce advanced engineering management systems due to their limited capital and technical capacity. In addition, technology updates rapidly, and managers need to constantly learn and adapt to new technologies, which puts forward higher requirements for their knowledge reserve and learning ability. Secondly, the human resources problem in project management is still prominent. Despite the improvement of automation and intelligence, the implementation of engineering projects is still inseparable from the participation of human resources. The lack of high-quality engineering management talents, especially in some remote and underdeveloped areas, the shortage of professional talents seriously restricts the improvement of engineering management level.

5 Conclusion and Outlook

In the new form of the development of the construction industry, the traditional engineering management methods face many challenges and have no market competitive advantage. The rapid development of digitization and information technology also puts forward new challenges and opportunities for engineering management. Modern engineering management increasingly relies on data-driven decision-making and real-time information management, which requires managers to have stronger technical ability and information technology application ability. The static and centralized characteristics of traditional engineering management may not be able to meet this highly dynamic and decentralized management needs, and will certainly face transformation and upgrading. Through research, new engineering management models need to be more

flexible, innovative and technical to cope with the complex and changeable market demands and challenges. Only by constantly updating and adapting to new technologies and management methods can we maintain our competitive advantage in the highly competitive market.

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