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Construction Cost Optimization of Prefabricated Buildings Based on BIM Technology

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ABSTRACT

Prefabricated assemblies are popular in the construction industry due to their minimal carbon footprint, enhanced safety, and reliability. A combination of software, including Revit, Navisworks, and Practical Structural Design and Construction (PKPM) software, is used to reduce costs by refining the specifications and dimensions of components, streamlining the variety of molds, enhancing design performance through rigorous component collision inspections and structural optimization, and ensuring cost-effectiveness. The integration of building integration modeling (BIM) visualization significantly diminishes errors attributable to information asymmetry and minimized material wastage stemming from production inaccuracies. The implementation of a Radio Frequency Identification (RFID) information exchange platform enables real-time component tracking, provides insights into the transportation dynamics of these components, and facilitates cost optimization during the transportation phase. Moreover, simulations conducted using Fuzor software preemptively identify potential construction site issues. There is a substantial cost savings of 710,000 yuan.

KEYWORDS

Prefabricated Building, BIM Technology, Cost Control, Construction Cost

INTRODUCTION

With the progress and rapid development of science and technology, people are paying increasingly more attention to environmental protection, green initiatives, and low-carbon ecological issues (Shang & Lv, 2023). The traditional construction industry has serious environmental pollution, serious waste of resources, and low construction efficiency (Wu et al., 2023), all of which have become obstacles to the development of green buildings and sustainable economic development, and the construction industry is facing new opportunities and challenges (Ebekozien et al., 2021). This is particularly true with the rapid development of prefabricated buildings. Their characteristic low carbon and positive influences on environmental protection ensure the progress of these projects (Lin & Zhang, 2023) and have attracted the wide attention of engineers from all over the world. Consequently, China's construction industry has experienced a refresh in development thanks to the sustainability and progressive direction of prefabricated buildings (Zhang et al., 2023). Prefabricated buildings have been fully developed, and are now mainly used in commercial housing (Masood et al., 2023). This study found that the cost of prefabricated houses is only half of the cost of traditional cast-in-place

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houses. Therefore, prefabricated buildings have become the inevitable development trend across the construction industry (Han et al., 2023). Figure 1 shows the change in scale of China’s prefabricated building market from 2010 to 2020 and exhibits just how rapidly the assembled building market in China is growing year by year.

With this rapid development of China's construction technology, the engineering construction industry quickly moved from swift growth to stable development (Zhang et al., 2023). Urban construction has experienced a shift from pursuing modernization to paying attention to green initiatives, environmental protection, smart building, and optimal livability. The traditional construction mode no longer meet people's requirements for building quality and efficiency. With an increase in labor costs, the demand for quality of life has increased (Zhang et al., 2023). At the same time, with the improvement of people's requirements for protection of the environment and the prefabricated construction of green, environmentally friendly and efficient buildings, the development and implementation of prefabricated buildings have become the top priorities for the country. In the process of actively promoting prefabricated buildings, the components are manufactured in advance and then transported to the construction site for installation. This method greatly shortens the construction period, reduces building costs, and minimizes environmental pollution and material loss (Zhang et al., 2023). Figure 1 shows the scale change of the prefabricated building market in China from 2010 to 2020.

In the development of the construction industry, the primary factor of consideration is cost control (Sayed et al., 2020). By analyzing the differences between fabricated buildings and cast-in-place concrete buildings (Sayed et al., 2020), some researchers have comprehensively considered the cost of prefabricated building components in the purchasing and transportation processes and have established purchasing logistics models of prefabricated building components (Chen et al., 2023).

Some researchers have carried out cost analysis of prefabricated buildings, which led to reduced construction costs from architectural design, and effective cost control in the design stage of prefabricated buildings. In addition, some researchers have conducted comprehensive cost analyses of the architectural design of prefabricated buildings, components production, and transportation and construction processes, as well as adopting aerodynamic models to optimize the costs of prefabricated buildings, putting forward additional improvement measures (Lyu & Chen, 2023). Building integration modeling (BIM) technology (Lyu & Chen, 2023), as an important driving force of information reform in the construction industry, provides information technology to reduce and control construction costs through its characteristics of visualization, cooperation, and refinement, thus, promoting the development of green buildings in China (Liu et al., 2023).

BIM technology realizes three-dimensional visualization and transmits information about engineering construction projects in a digital way (Ng et al., 2023). It is of great use value in comparison of engineering schemes, development of preliminary design, improvement of construction drawings, enhancement of production and transportation components, and optimization of construction and installation (Maglad et al., 2023). The influence and impact of BIM technology on the construction industry is global. At present, BIM technology is not limited to three-dimensional models, but it is useful in developing four-dimensional time models and SD cost models. BIM technology has achieved fruitful results in project cost control. Some researchers use the BIM model, according to the input project information in the architectural design stage (Tu et al., 2021), to automatically extract the engineering quantity and progress and compare them with the design objectives to achieve dynamic rectification to evaluate the effective control of BIM technology on the performance and cost of engineering projects (Tu et al., 2021). Some researchers selected 180 project cost personnel for investigations and found that BIM technology was rarely used for project cost control, but rather was mostly used to solve the difficulties of project construction, mainly because the accuracy of BIM software in extracting engineering quantities and project progress cannot be guaranteed. Some researchers combine BIM technology with the earned value method and input time, cost, and target into the model in the design stage, so as to realize the optimization of project cost and schedule by BIM model, further controlling the cost and optimizing the construction time (Essam et al., 2023).

At present, BIM technology is combined with the development of fabricated buildings (Essam et al., 2023). By adopting BIM technology and its information management system, the collaborative management of design, construction, production, transportation, and hoisting is realized, and the cost problem of prefabricated buildings is significantly solved (Han et al., 2023). At present, the most widely used cost software includes modeling in BIM software, AutoCAD model import, Timberline accurate cost estimation software and Success Estimator. Although the cost of software is very extensive, the calculation and cost calculation of BIM technology have not really been realized (Sompolgrunk et al., 2023). The BIM model benefits the whole management life-cycle of engineering and construction, and all participating units need to rely on this model to complete their respective work. Some researchers import the design data from AutoCAD and Revit into the visual BIM module through the INV interface program to realize a 3D visual model, distinguish component costs with different colors, and set specific conditions to automatically associate costs with the components (Hedayatzadeh et al., 2024). However, foreign engineering pricing software cannot fit the combination of relevant codes and standards in China; therefore, it is hard to use in domestic projects.

There is much research on BIM technology and the construction cost of prefabricated building, but there are few reports on how to control the construction cost of prefabricated buildings by BIM technology. Taking prefabricated buildings as the research object, through the analysis of the cost control in different stages of the prefabricated building, this paper analyzes the main factors influencing the cost of the prefabricated buildings and advances some effective solutions for cost control. BIM technology is used to analyze the cost control of prefabricated buildings in the process of architectural design, construction, production, transportation, and construction, so as to achieve collaborative, visual, and streamlined cost control and reduce the overall cost of construction. This study verifies the assembly building cost control system based on BIM technology is established and its feasibility and effectiveness are verified (Li et al., 2022).

METHODS

From an economic point of view, the cost components of assembled buildings are more complex than those of traditional cast-in-place buildings, and the excessive number of processes adds additional costs to assembled buildings. At the same time, assembled buildings are more commonly sold as products today, a form that increases the additional taxes and profits on assembled buildings, leading to a sharp increase in the cost of assembled buildings (He et al., 2024). When the future development of architecture depends on the environment, quality, energy and other factors, compared with traditional architecture, assembled building can improve building efficiency by 50%, save wood by 80%, reduce energy consumption by 40%, save water resources by 50%, and reduce noise and dust pollution. Compared with traditional cast-in-place buildings, the cost of prefabricated buildings is obviously higher, and it seriously affects the popularization speed of prefabricated buildings in China. How to effectively reduce the cost of fabricated buildings is a hot topic in the current construction industry (Roxas et al., 2023). By analyzing the cost of the prefabricated building, the main factors that affect prefabricated building are analyzed in Table 1.

Assembly Building Construction Cost Composition

The main core of prefabricated building construction is prefabricated building, and it is transported to the construction site by workers and installed on site. At present, the most commonly used prefabricated building materials are block, flat plate, box, and skeleton plate. By analyzing the cost composition of the prefabricated building construction stage, we find it mainly includes planning costs (Zhou et al., 2023), design costs, component manufacturing costs, building installation costs, and

Table 1. Main factors affecting the cost of prefabricated construction

Type of cost	Main content
design costs	Engineering design costs, preparation costs, non-standard equipment design costs, software preparation costs
operating costs	Labor costs, materials costs, machinery and equipment use costs, measures, management costs, maintenance costs
transport costs	Lifting, in-plant transportation, stacking, off-plant transportation, loading charges, auxiliary materials charges, transportation amortization charges, labor costs, fuel costs and maintenance costs
construction costs	Labor and machinery costs, construction measures costs, embedded costs and grouting and consumables costs

later, maintenance costs. This also includes the whole process of prefabricated building construction, and the cost of each stage has different effects.

1. In the planning stage, the total construction cost is less, but it has a great influence on the construction accuracy and assembly efficiency. If the pre-planning is not accurate, it will increase manpower and financial costs in construction.
2. In the design stage, if the situation of the project and the interests of all construction parties are not considered, when the prefabricated building enters the production stage, the construction cost will increase sharply. In the design stage, the size and shape of the building should be determined, so the maximum benefit can be achieved through reasonable planning.
3. The component production stage mainly includes labor, materials, mechanical equipment, land use, management, molds, and other expenses. While labor and mechanical expenses account for the majority of these costs, and this stage is the biggest expense in the whole construction stage, effectively reducing the production costs of components is key in promoting prefabricated buildings.

Assembly type is a large-scale factory production, and it can effectively control the quality of parts. Compared with cast-in-place, it is less influenced by the environment, time, and construction conditions, and can better control the quality and reduce the use of materials.

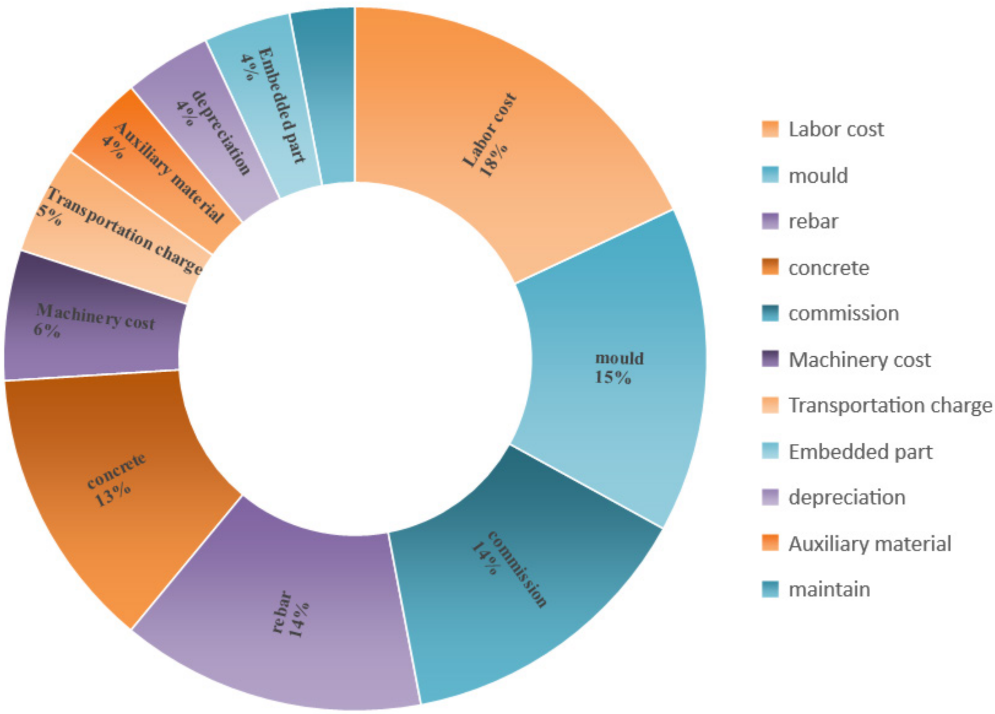
In the production of components, the amount of labor required for assembled building components is small, but a large number of workers with professional skills are needed to ensure that the production construction meets the standards, so the wage level of labor is also high. At the same time, with the improvement of assembly level and the strengthening of manual skill training, the labor cost will gradually decrease, thus reducing the labor cost of parts production.

In the production of components, the cost of materials accounts for 45%–55% of the project cost, and the savings in material cost are relatively limited. At the same time, once the assembled components are completed, they cannot be corrected, and this puts forward higher requirements for the production accuracy of the components.

In the production of components, the degree of mechanization is higher than that of cast-in-place buildings. The use of large machinery, such as conveyors, levelers, and sweepers, greatly saves human resources, but increases the cost of purchasing, disassembling, maintaining, and fueling machinery.

1. The transportation cost in the transportation of components includes transportation, secondary handling, and short-term storage, and it is positively related to the transportation route, time and distance, and weight and volume of components. At present, decentralized transportation is widely used in China, and the difficulty and cost of prefabricated construction transportation are greatly increased due to the different shapes of components. At the same time, the construction

Figure 1. Cost ratio analysis table for each part of prefabricated building



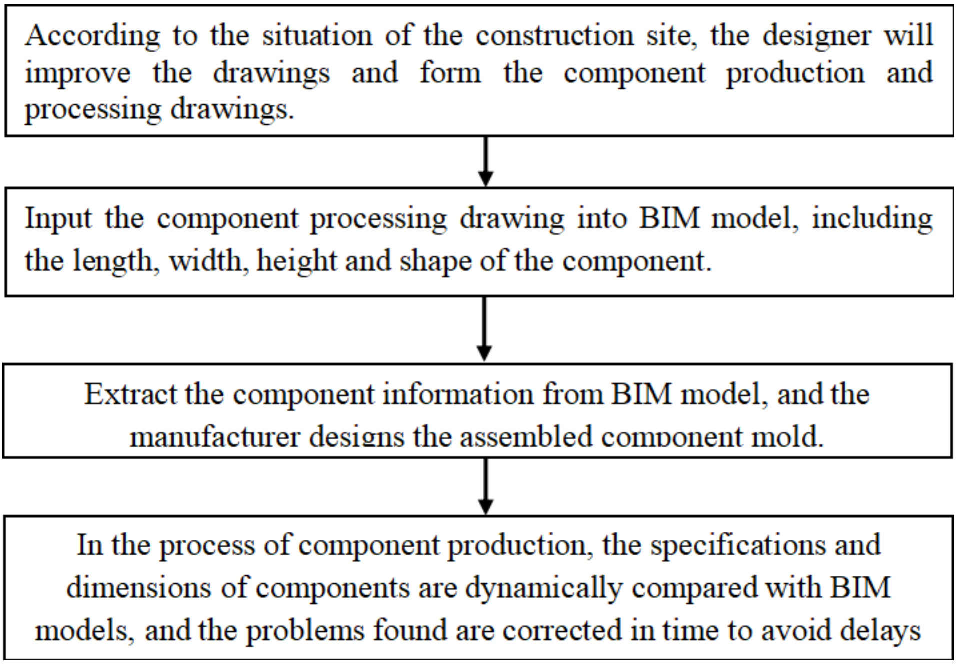
party's unfamiliarity with the installation process of components also leads to low transportation efficiency and an increase in transportation costs. The transportation cost of prefabricated components also directly affects the engineering cost and the economic benefit of the project.

2. In the process of construction, there are mainly component installation costs, including installation workers' labor costs, mechanical removal costs, and vertical transportation costs. Among them, the crane is determined by the shape, volume, and weight of components. The installation efficiency of the components is the main determining factor that determines the cost of prefabricated components. Due to the underdeveloped construction technology and management of prefabricated buildings in China, construction workers are prone to lack communication and professional skills. In this case, the installation of prefabricated buildings is affected, and the installation cost is indirectly increased. Therefore, it is necessary to further strengthen the installation level and skills of operators to improve construction efficiency.

After the completion of the project, it needs maintenance. The cost of this stage is less, but it will not affect the total cost of the project.

In order to control the construction cost of assembled buildings, an analysis by Liu et al. shows the main cost components in the construction phase (2023) and then incorporates BIM technology into construction cost management. This construction cost control system focuses on the production, transport, and construction of prefabricated components. In order to optimize the cost and improve the efficiency of the construction process, Figure 1 shows the cost ratio analysis of different parts of prefabricated buildings in China, and this data will help stakeholders to understand the centralized use of costs.

Figure 2. Component production process



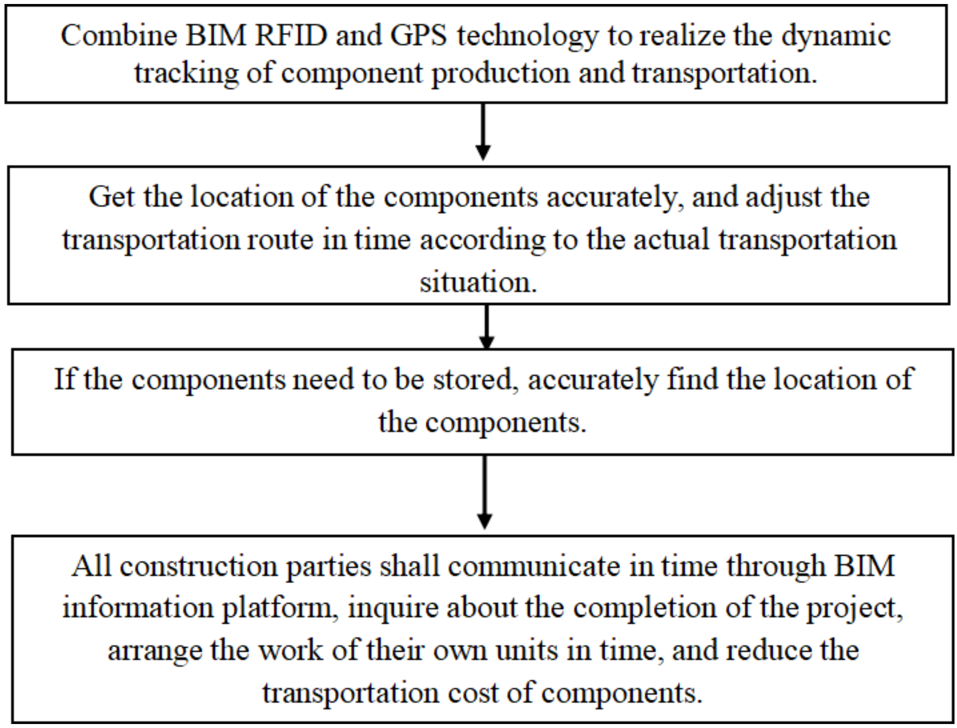
Cost Control of Fabricated Components in Production Stage

In assembly engineering construction, the component cost accounts for a large part of the total engineering cost, and the control effect of the component cost plays a decisive role in the total engineering cost control. The production of parts mainly refers to the manufacturer's production and processing after receiving the two-dimensional drawings of the parts. However, 2D drawings provide limited information about the length, width, height, and shape of components, and they are likely to lead to misunderstandings and errors in the production process. At the same time, there is little communication between the manufacturer and the construction subject, and errors are discovered only after the components are produced. In this case, the construction period is delayed and the cost of component production and installation is increased.

In order to effectively control the production cost of components, in the process of component production, the main processes should be practiced, as shown in Figure 2. First, technicians must improve the engineering design drawings and draw the production and processing drawings of components according to the on-site construction situation. They must also input the machining drawing into the BIM model, and record the length, width, height, and shape of the parts. By extracting the information about the components in the BIM model, the production personnel can design the production mold of the components and compare it with the specifications and dimensions of the components, so as to correct the problems found in time and avoid a delay and rework of the construction schedule.

The BIM model carries all the information about components and construction, and it runs through the whole life cycle of the project. By establishing a BIM information platform to provide manufacturers with detailed information about components, technicians can better understand the design drawings with the help of three-dimensional models of components. In addition, the BIM model contains accurate information about components, so technicians can purchase suitable materials and complete the preparation of technology and funds in a shorter time, thus greatly reducing the production cost of components and avoiding the risk of price increase in production materials.

Figure 3. BIM model control process of component transportation cost



Cost Control of Prefabricated Components in Transportation Stage

In the transportation stage of components, the cooperation of the BIM information platform is needed to realize the docking between manufacturers and constructors. The constructor lists the use plan according to the construction progress, so it is convenient for the component manufacturers to grasp the component use information transmitted by the BIM model in time, plan the component transportation plan and sequence in advance, reduce the shutdown phenomenon, and reduce the cost of on-site storage and secondary handling of components.

BIM information platform has information about components, but it cannot record the location and production of components. On this basis, in the process of component transportation, RFID technology and GPS positioning technology are used to provide a unique two-dimensional code for components, and GPS positioning technology contains real-time information of component transportation routes. The process of controlling the transportation costs of components through the BIM model is shown in Figure 3. By combining BIM, RFID, and GPS positioning technology, the dynamic process of component production and transportation can be tracked at any time. This allows for accurate location, route, and status of parts transportation, the ability to adjust the transportation route in time according to the actual situation of the transportation route, and the convenience of reducing transportation time and damage to sparts during transportation. If the components are transported to the construction site and need to be stored, the position of the component can be obtained in time, and the search time can be reduced. All project participants use the BIM information platform to communicate in real time, inquire about the completion of construction work by all parties, and do their own work better, so as to reduce the transportation cost of components.

ANALYSIS

Analysis of the application of BIM technology in prefabricated buildings, through the cost model control of design, production, transportation, and construction, studies the practical role of BIM technology in building cost control. Through the detailed study of BIM technology in specific cases, it proves the value of BIM technology in engineering construction cost management. The following is a case study of assembly building cost optimization based on BIM technology.

Project Overview

This project is a public rental housing project in Chongqing. It consists of two buildings, each six stories high, with a building area of about 4,328 square meters, a service life of 50 years, and an earthquake intensity of eight degrees. It is mainly prefabricated concrete structures. The construction accessories used in the project include precast columns, precast composite panels, precast reinforced concrete steps, precast caisson, etc. The construction period of the project is 20 weeks, and the total budget cost is 28 million yuan, including the budget cost of Building 2, which is about 14 million yuan. BIM level refers to the depth and richness of information contained in the model at different stages of the construction project. When choosing the appropriate BIM level to build a Revit model, you need to consider the specific requirements of the project, the budget, the timeline, and the technical capabilities of the project team. In this paper, Building 2 is taken as the research object, the LOD 500 model is used to simulate components, and the cost of the prefabricated building project is analyzed by combining Revit, PKPM-PC, and Navisworks software, so as to effectively control the cost.

In this paper, IFC file exchange is used to exchange and share data between different building information modeling software, thus achieving more efficient collaboration and integrated workflow.

When creating BIM objects, we must first ensure that the selected prefabricated project matches the required BIM visual effect. Then use the tools and features in the BIM software to create or build BIM objects, ensuring that they accurately reflect the design and specifications of the project. Rendering function in BIM software can also be used to enhance the visual effects of BIM objects and make them more attractive and realistic.

BIM Technology Cost Control in the Design Stage

In the design stage, the BIM platform is used to carry out collaborative function design, and the design functions and component libraries of Revit, Navisworks, and ppm-PC software are called to carry out in-depth design and cost calculation of the project structure, installation, decoration, equipment, and so on. Ppm-PC software is used to generate statistical data of materials and provide reference data on material supply, so as to ensure the maximum benefit of engineering construction.

1. Utilization of BIM Platform for Collaborative Design: The BIM platform serves as the central hub for collaborative design activities. It enables teams to work together efficiently and integrate various design functions seamlessly.
2. Integration of Design Functions and Component Libraries: Revit, Navisworks, and ppm-PC software are integrated to perform detailed design tasks and cost calculations across multiple aspects of the project, including structure, installation, decoration, and equipment.
3. Generation of Statistical Data for Materials: ppm-PC software plays a crucial role in generating statistical data for materials. This data aids in material supply planning and ensures maximum cost-effectiveness during the construction phase.
4. Establishment of Engineering Information Model: Revit and PKPM are used to create an extensive engineering information model comprising building, structure, equipment, and decoration models. These models are imported into the BIM platform and refined through mutual adjustments to create a comprehensive information model.

Table 2. List of components

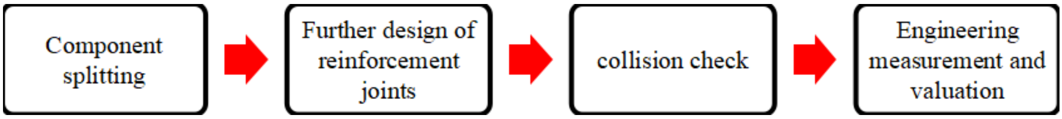
Number	Specifications	Volume (m)	Weight (t)	Quantity	Total volume (m)	Total weight (t)
GJ-1	AZ1	0.08	0.20	2	0.18	0.44
GJ-2	AZ4	0.32	0.77	2	0.62	1.56
GJ-3	AZ10	0.12	0.22	3	0.18	0.44
GJ-4	AZ4	0.51	1.38	1	0.14	2.31
GJ-5	AZ2	0.23	0.54	4	0.22	0.58
GJ-6	AZ6	0.31	0.78	2	0.62	1.56
GJ-7	AZ3	0.35	0.10	1	0.64	1.5
GJ-8	AZ2	0.39	0.89	5	0.75	1.85

5. Design Optimization and Component Splitting: After the preliminary design phase, components are systematically split to optimize design efficiency and reduce costs. Design optimization principles prioritize fewer parts and more combinations, resulting in a reduction in the types of prefabricated components required for the project.
6. Reduction of Types of Prefabricated Components: Through comparative analysis of multiple split models, the types of prefabricated panels, walls, and bay windows are significantly reduced. This reduction simplifies procurement processes and mitigates cost increases associated with specialized components.
7. Collision Checking and Cost Savings: During the deepening design phase, Navisworks is utilized to perform collision checks on various Revit models. By identifying and adjusting collision points, significant cost savings totaling 350,000 yuan are achieved.

This project uses Revit and PKPM software to establish engineering information models, including building models, structural models, equipment models, decoration models, etc., and then imports them into BIM platform. Through the mutual adjustment of different models, a complete information model is finally formed. Through the collaboration of the platform, the time cost of design can be saved, the accuracy of design can be improved, and collaborative optimization among various specialties can be ensured. After the preliminary design is completed, the components will be split to form the summary statistical table of prefabricated components of this project, and the list of components of this project will be listed (see Table 2). Design optimization will be carried out according to the principle of fewer parts and more combinations, and the size and shape of parts will be optimized to reduce the types of parts. The types of prefabricated panels were reduced from 12 to 8, prefabricated walls from 11 to 7, and bay windows from 3 to 2 through the comparison of multiple types of split models. The use of prefabricated components that can be directly produced by the prefabricated component factory makes the procurement of prefabricated components more convenient and effectively reduces the cost increase caused by special-shaped components or component factories. Through the cost analysis of the model, it is found that the splitting of prefabricated components saves about 180,000 yuan in the cost of mold making and 260,000 yuan in the cost of reinforced concrete.

During the deepening design, it is necessary to check the internal collision of components. All kinds of Revit models are imported into Navisworks to carry out the collision check. According to the collision report, the characteristics of each collision point are analyzed in detail, the collision points are divided into hard and light ones, and the collision points are modified and adjusted one by one. A total of 350,000 yuan was saved by adjusting the collision point. Figure 4 shows the relation between the collision point and the deepening design process.

Figure 4. Deepening the design process



Cost Control of BIM Technology in the Production Stage

During the production stage, effective management of production plans, personnel, materials, machines, and the production process is crucial. BIM technology plays a significant role in improving quality and efficiency in this project. Here are the key points mentioned, as follows:

1. Management of Production Plan and Resources: The BIM collaborative platform enables efficient management of the production plan by providing real-time information on component design modifications. By uploading these modifications to the platform, the production department can adjust the production plan accordingly, minimizing economic losses.
2. Using BIM for Component Production: The project utilizes BIM technology to produce components, ensuring that they align with the design specifications. This integration helps overcome inconsistencies between the design and actual production, improving overall quality.
3. Modification of Component Shape and Size: In some cases, the shape and size of components may require modification during the production stage. By utilizing the BIM platform, these modifications can be communicated promptly, allowing the production department to make necessary adjustments. This proactive approach helps avoid economic losses associated with producing incorrect components.
4. Reduction in Losses: Through the use of BIM technology and the timely communication of component modifications, a total of eight components were successfully modified. This resulted in a significant cost reduction, saving 150,000 yuan in potential losses.

By leveraging BIM technology and its collaborative platform, the project achieves improved quality, increased efficiency, and cost savings in the production stage.

Cost Control of BIM Technology in Transportation Stage

In the pre-transportation phase, the project emphasizes real-time communication and dynamic adjustments to optimize component manufacturing and transportation processes. Here's how BIM technology facilitates these efforts:

1. Synchronous Upload of Production Progress and Inventory: Production progress, storage status, and component types and quantities are uploaded to the BIM information platform in real-time. This ensures that manufacturers have up-to-date information to adjust component manufacturing as needed, minimizing losses due to communication delays.
2. Consideration of Transportation Constraints: Local road restrictions, traffic control measures, and transportation capacity are carefully considered when planning component transportation. Optimal transportation routes are identified and imported into the BIM platform, allowing the construction team to monitor transportation dynamics and schedule transportation times efficiently.
3. Planning Placement Order Based on RFID Chip Scores: Upon arrival at the construction site, the placement order of components is planned according to the scores of RFID chips. This facilitates organized construction by ensuring that components are placed in the most suitable order, streamlining the construction process.

Table 3. Cost savings in each stage

Stage	Design	Production	Transportation	Construction
Balance cost (in 10,000 yuan)	35	15	7	14

4. Information Sharing and Optimization: Through the information-sharing capabilities of the BIM platform, the project achieves timely transmission of information, optimizes transportation routes, and ensures proper stacking of components. This proactive approach helps avoid issues such as road construction restrictions and improper component placement, resulting in significant cost savings of approximately 70,000 yuan in transportation costs.

The integration of BIM technology into the transportation phase enables efficient coordination, improved decision-making, and cost savings throughout the transportation process.

Cost Control of BIM Technology in the Construction Stage

BIM technology plays a crucial role in optimizing the construction process and controlling costs in prefabricated building projects. Here's how it achieves these objectives:

1. Space Optimization and Work Efficiency: BIM technology maximizes the utilization of site space, reducing the need for secondary handling of materials and improving overall work efficiency. By accurately simulating the construction process, it helps in planning and executing tasks more effectively, minimizing wasted time and resources.
2. Real-time Monitoring and Progress Grasping: The dynamic monitoring capabilities of the BIM platform enable real-time tracking of construction progress. This ensures that any delays or issues can be identified promptly, allowing for timely adjustments to maintain a smooth construction period.
3. Simulation of Complex Construction: BIM software like Fuzor allows for the simulation of complex construction scenarios. By analyzing potential problems in advance and formulating improvement methods, construction quality and efficiency are enhanced. Real-time adjustments to the construction organization plan further optimize the utilization efficiency of components, leading to cost savings.
4. Improved Hoisting Efficiency: RFID tags accurately locate the position of components during hoisting, reducing the need for secondary handling and improving the efficiency of mechanical operations. This not only saves costs but also enhances safety levels at the construction site. This adjustment saved a total of 140,000 yuan.
5. Comprehensive Platform Information and Visualization: BIM provides a comprehensive platform for time-sensitive information. Integration with tools like Revit and Navisworks ensures seamless data connectivity, maintaining information integrity. The 3D visualization capabilities of BIM models make construction processes intuitive and easy to understand, reducing rework, material waste, and construction delays.
6. Technical Problem Solving and Process Optimization: BIM technology addresses technical difficulties in construction by optimizing complex processes through animation demonstrations. This reduces the overall difficulty of construction tasks and promotes smooth progress.

By applying BIM technology to the prefabricated building project, the project saved a total of 710,000 yuan, and the construction cost was controlled, as shown in Table 3.

RESULTS AND CONCLUSION

1. Prefabricated buildings will be the main development trend of China's construction industry in the future. By analyzing the life cycle cost of prefabricated buildings and comparing it with the cost of traditional buildings, we should focus on controlling the nodes that lead to the high cost of prefabricated buildings, analyzing the characteristics of prefabricated buildings and BIM technology, using BIM technology to sort out the cost management of each stage of prefabricated buildings, and conducting a separate study on each stage to control the cost in effective ways, so as to optimize the cost of prefabricated buildings.
2. Revit, Navisworks, and PKPM software was used to optimize the specifications and sizes of components, minimize the types of molds, improve the design performance through component collision inspection and structural design optimization, and provide a guarantee for cost optimization. In addition, BIM visualization technology helped reduce the errors caused by information asymmetry and the waste of materials caused by production errors, and the RFID information exchange platform served to locate the components in real time, grasp the transportation dynamics of the components, and realize cost optimization at the transportation stage. Finally, Fuzor software simulations of the construction site helped avoid construction problems in advance. Collectively, these technologies saved 710,000 yuan in total construction costs.

CONFLICT OF INTEREST

The authors of this publication declare there are no competing interests.

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