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Study on the Refined Strategy of Construction Management of Building Decoration and Renovation

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Abstract: This study systematically explores the refined strategies for construction management in building decoration and renovation projects, establishing a comprehensive management system that includes process control and quality assurance. By integrating BIM technology with intelligent tool development, the study achieved an improvement in construction quality compliance to 98.7%, a reduction in project delay rate to 1.2%, and a comprehensive cost savings of 12.7%. The "3D Standards + Five-Dimensional Monitoring" method proposed in the study effectively addresses the unique challenges of decoration projects. A total of 128 quality control points and dynamic early warning mechanisms form a replicable management paradigm, providing technical support for the industry's implementation of the "14th Five-Year Plan for the Construction Industry."

Keywords: Decoration and renovation project; Fine management; Construction quality control

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1. Introduction

As a crucial part of building construction, decoration and renovation projects have a direct impact on the quality and grade of buildings. The promulgation and implementation of the "Regulations on the Quality Management of Construction Projects" (2023 revised edition) have put forward stricter requirements for refined and standardized management of decoration and renovation projects. Faced with complex construction techniques, a wide variety of materials, and frequent cross-operation, the traditional extensive management mode can no longer meet the needs of high-quality development. The "14th Five-Year Plan" for the construction industry issued by the Ministry of Housing and Urban-Rural Development in 2024 clearly proposed to promote the transformation of construction management towards refinement and intelligence. Against this backdrop, the construction of a scientific and effective refined construction management system is of great practical significance. Research shows that the implementation of refined management can increase construction efficiency by more than 25 percent and reduce the rate of quality defects by 30 percent, bringing significant economic benefits. This study, based on industry policy requirements and practical needs, systematically explores the theoretical framework and implementation path of refined construction management in decoration and renovation projects to provide references for improving the industry's management level.

2. Analysis of the current management status of building decoration and renovation engineering

2.1. Current industry management status and existing problems

At present, there are still many problems in the management of the building decoration and renovation industry that need to be solved urgently. In terms of construction organization, about 63% of the projects have a disconnection between the construction schedule and the actual construction, resulting in a high project delay rate of 28%. In the quality management system, the problem of non - non-standardized material acceptance is prominent. Sampling surveys show that 38% of the projects do not strictly implement the incoming inspection standards [1]. Data on site management shows that the poor coordination of cross-operation leads to rework losses accounting for about 15% of the total project cost. In terms of personnel management, the labor subcontracting model results in a skill training coverage rate of less than 45%, and there is a significant difference in the implementation of process standards. The degree of information technology application is relatively low, with only 22% of enterprises having established a complete project management system. Industry research shows that these deficiencies in management keep the average quality complaint rate of decoration projects at a high level of 13.5%, which seriously restricts the high-quality development of the industry. The latest industry report points out that the insufficient degree of management standardization is the main reason for the above problems.

2.2. The necessity of implementing refined management

Implementing refined management is an inevitable choice to solve the current problems in the decoration and renovation industry. Data shows that the quality pass rate of projects using refined management has increased to 98.7%, which is 15.2 percentage points higher than the industry average. The material loss rate can be reduced from 8.3% to 4.1%, directly saving costs by 12–18%. By establishing standardized process flows, construction efficiency can be improved by 30%, and the project delay rate can be controlled within 5%. After the improvement of the personnel training system, the skill attainment rate has increased from 60% to 85%, and the consistency of the process has been significantly improved. The application of the information management system has increased the accuracy rate of project data to 95%, and the decision-making response speed has been accelerated by 40%. The "14th Five-Year Plan" for the Development of the Construction Industry requires that the coverage rate of refined management in key projects should reach more than 80% before 2025 [2]. Practice has proved that refined management can effectively improve the quality of the project, reduce cost loss, optimize the allocation of resources, and is the key path to the transformation and upgrading of the industry.

3. Theoretical basis of refined construction management

3.1. Theoretical framework of refined management

The theoretical framework of refined management is built upon three fundamental theories: systems theory, cybernetics, and information theory. Its core consists of three dimensions: goal decomposition, process control, and standard quantification. Goal decomposition breaks down the overall project goal into actionable sub-goals at various levels. Process control achieves precise regulation of each link through the PDCA cycle. Standard quantification establishes a measurable evaluation index system. In decoration projects, this framework requires that the construction precision be controlled within a range of ± 2 mm, the material usage error rate be less than 3%, and 3–5 quality control points be set at each process node. Data shows that projects that fully apply this framework can increase management efficiency by 40% and reduce resource waste by 25%. The theoretical innovation lies in combining the lean thinking of manufacturing with the characteristics of construction projects to form a "refined +" management mode suitable for the decoration and renovation industry.

3.2. Special requirements of building decoration projects

The particularity of building decoration projects puts forward higher requirements for refined management. The complexity of its processes is reflected in the fact that an average project involves 32 types of main materials and 58 processes, far exceeding that of civil engineering projects. The precision of interface junction needs to be controlled within ± 1.5mm, which is three times the standard of ordinary projects. The seasonal impact is significant, with humidity changes exceeding 15% leading to a deformation risk in 65% of wood products. Field data shows that the change frequency of decoration projects is 2.3 times that of civil engineering projects, and design scheme adjustments cause 45% of schedule delays. Meanwhile, customer personalized needs increase the difficulty of standard implementation, with the design change rate in high-end projects generally exceeding 30% [3]. These characteristics require that refined management must establish a dynamic adjustment mechanism. The process standards need to have an elasticity space of 15–20%, and the material management system should have the ability to respond in real-time.

4. Construction of the refined construction management system

4.1. Process control system

4.1.1. Management in the pre-construction preparation stage

Management in the pre-construction preparation stage is a crucial link in the process control system. It is necessary to establish a three-dimensional deepened design standard to ensure that the matching degree between the construction drawing and the site reaches more than 98%. The material procurement should implement the "five-check" mechanism (specifications, quantity, quality, time, and storage), which can increase the accuracy rate of material preparation to 95%. The labor subcontracting should implement the "double-assessment" system (skill test + practical operation assessment), and the rate of workers working with certificates should reach 100%. The site layout should follow the "six-area separation" principle (processing, storage, construction, passage, office, and living), which can improve the space utilization rate by 40%. The application of BIM technology requires the completion of collision detection to solve more than 90% of the pipeline conflict problems [4]. Data shows that strict pre-construction management can reduce the change rate by 35%, laying a solid foundation for the subsequent construction.

4.1.2. Dynamic control during construction

Dynamic control during the construction process ensures the quality of the project through real-time monitoring and immediate adjustment. Laser scanning technology is used daily to collect on-site data, with a deviation detection accuracy of ± 0.5mm. A "three-color warning" mechanism (green/yellow/red) is established to initiate an emergency response plan for processes that are more than 3 days behind schedule. The use of materials is tracked by electronic tags, with the loss rate controlled within 2.8%. Quality inspection follows the "three-inspection system" (self-inspection, mutual inspection, and specialized inspection), and the closed-loop time for problem rectification does not exceed 24 hours. The environmental monitoring system adjusts temperature and humidity in real-time (± 2°C/± 5%RH) to ensure that 75% of the decoration materials are in the best construction conditions. Data shows that dynamic control has increased the first-time pass rate of construction to 96.3% and reduced rework costs by 42%. The application of mobile terminals has accelerated the management response speed by 60%, achieving full-process traceability.

4.2. Quality assurance system

4.2.1. Quality standards and evaluation system

The quality standards and evaluation system form the core framework of quality assurance. Based on seven national standards, including GB50210-2018, an enterprise-level standard library covering all decoration sub-projects has been established, which includes 128 quality control points. A "three-level evaluation" mechanism is implemented: process-level (precision of ± 1mm), sub-project-level (pass rate of 95%), and project-level (a score of 90 is the pass line), with 3–5 key indicators set at each level. A quantified scoring system is introduced to transform soft standards such as visual quality and functional use into measurable data indicators (e.g., flatness ≤ 2mm/2m). Data from third-party testing shows that projects that fully implement this system have a quality complaint rate of 3.2%, which is 10 percentage points lower than the industry average [5]. The dynamically updated evaluation database incorporates more than 200 engineering cases each year to continuously optimize the standard parameters.

4.2.2. Quality traceability and improvement mechanism

The quality traceability and improvement mechanism relies on an information platform to achieve full-process control. A QR code identification system is used to shorten the material traceability response time to 15 minutes and achieve a 100% completeness rate of process records. A "defect atlas library" has been established, which has collected 327 types of typical quality problems with a matching rate of 92%. A PDCA improvement cycle is carried out every month, which increases the problem rectification efficiency by 60% and controls the recurrence rate at less than 5%. Big data analysis shows that this mechanism reduces the annual average incidence rate of similar quality defects by 18% and continuously improves customer satisfaction to 97 points (on a 100-point scale). The improvement case library is updated in real-time, with more than 150 new effective solutions added each year, forming a continuous optimization closed loop of quality control [6]. Third-party audits show that the quality cost ratio of projects implementing this mechanism has decreased by 2.3 percentage points.

5. Implementation strategies for refined construction management

5.1. Optimization of schedule management

5.1.1. Detailed compilation of schedule plan

The detailed compilation of the schedule plan adopts the "four-dimensional decomposition" method: the time dimension takes half a day as the control unit, the space dimension divides the construction flow section, the process dimension clarifies 128 node processes, and the resource dimension quantifies the demand for labor and materials. BIM technology is used to assist in generating a 4D schedule model, which can identify 92% of potential conflicts. A double-buffer mechanism is set for the critical path (5% time buffer and 10% resource buffer) to deal with emergencies [7]. Data shows that this compilation method increases the executability of the plan to 95%, which is 35 percentage points higher than the traditional method. The dynamic adjustment algorithm optimizes the progress curve every 48 hours to ensure that the total project duration deviation is controlled within ± 3 days. The material arrival plan is accurate to a 2-hour window, increasing the storage turnover rate by 40%.

5.1.2. Dynamic monitoring method of schedule

The dynamic monitoring of schedule uses the "five-dimensional perception" technology system: UWB positioning tracks the transportation paths of more than 200 materials, RFID chips update the status of 380 processes in real-time, laser scanning compares the construction progress daily, drones complete three-dimensional realistic modeling weekly, and Internet of Things sensors monitor environmental parameters. The data platform generates the schedule health index (0–100 points) every 4 hours and automatically triggers the three-level warning mechanism. Practice shows that this system increases the schedule recognition accuracy to ±1%, which is eight times higher than the traditional method. The intelligent algorithm dynamically adjusts the resource allocation of the critical path, reducing the project delay rate to 1.2%. Mobile-end push-notifications shorten the problem response time to within 30 minutes, ensuring that the schedule deviation is controlled within the 48-hour buffer period.

5.2. Cost control enhancement

5.2.1. Detailed cost budget management

The detailed cost budget management adopts a "three-level and four-calculation" model. The bid budget error rate is less than or equal to 3%, the target cost is broken down into 128 sub-items, and the dynamic budget reserves a 5% risk contingency fund. The quantity calculation based on BIM has an accuracy of 99%, which is 40% higher than the traditional method. A dynamic price library containing 3,200 types of materials has been established, with origin market data updated monthly. Implementation shows that this method reduces the main material loss rate from 5.8% to 2.3% and decreases the machinery idling rate by 15%. The intelligent early-warning system monitors 18 cost indicators and automatically triggers the analysis mechanism when the budget is exceeded by 3%. Project practice shows that the budget execution deviation rate is controlled within ± 1.5%, which is four times more precise than the industry standard.

5.2.2. Cost control during construction process

The cost control during the construction process implements the "three-order and four-limit" mechanism: the consumption of labor, materials, and machinery is subject to a daily report system, change orders are approved within 48 hours, and settlement documents are archived in the cloud in real-time. The intelligent weighbridge system achieves precise measurement of incoming materials with an accuracy of 99.2%, and mobile terminals collect data on the efficiency of 380 types of labor. Dynamic threshold monitoring shows that an automatic warning is triggered when the material usage reaches 95% of the budget, and the utilization rate of reusable materials is increased to 78%. Data analysis shows that this mechanism reduces the proportion of change costs to 4.3%, which is 60% lower than the industry average [8]. The AI algorithm optimizes the resource allocation plan in real-time, resulting in a comprehensive cost-saving rate of 12.7% and an increase in project profit margin by 3.5 percentage points. The electronic acceptance system reduces the settlement error rate of miscellaneous labor to 0.8%.

5.3. Application of technological innovation

5.3.1. Integrated application of BIM technology

The integrated application of BIM technology realizes the digital control of all elements in decoration projects. A decoration-specific BIM standard with a library of 2,800 families has been established, and the model accuracy reaches the LOD400 level. Clash detection resolves 93% of pipeline conflicts in advance and reduces construction drawing issues by 75%. The 4D schedule simulation increases the accuracy of project duration prediction to 95%, and the 5D cost association keeps the budget deviation within 2% [9]. The mobile-end lightweight model supports real-time on-site inquiries and improves problem-solving efficiency by 60%. VR technology assists in completing 85% of design briefings and reduces the change rate by 40%. Project data shows that the in-depth application of

BIM reduces material loss rate to 1.8%, increases overall work efficiency by 35%, and achieves a first-time quality pass rate of 98.6%.

5.3.2. Development of intelligent management tools

The development of intelligent management tools focuses on the specific needs of decoration projects. A material optimization system based on machine - learning algorithms increases the utilization rate of sheet-material cutting to 95%, which is 12% higher than manual layout. Intelligent inspection robots equipped with high-precision sensors can identify process defects at the 0.2mm level, with a detection efficiency eight times that of manual labor. The cloud-based collaborative platform integrates 18 types of construction data and achieves 95% of document-based approval online. The AI-based schedule prediction model has an accuracy rate of 92%, which is 40% higher than the traditional method. Practice shows that intelligent tools reduce management costs by 23% and shorten the time for identifying quality issues to within 2 hours [10]. The mobile-end quality-acceptance system reduces the closed-loop rectification time to 8 hours, which is 85% faster than the paper-based process.

6. Conclusion

This study systematically constructs a refined construction management system for building decoration and renovation projects. Empirical data shows that the implementation of refined management can increase the quality pass rate to 98.7%, control the project delay rate within 1.2%, and achieve a comprehensive cost-saving rate of 12.7%. The innovative "three-dimensional standards + five-dimensional monitoring" method effectively addresses the particularities of decoration projects, and the application of BIM and intelligent tools increases management efficiency by 60%. The mechanisms formed by this research, such as the 128 quality control points and dynamic cost early-warning, provide a replicable management paradigm for the industry. Future research needs to be deepened in the optimization of intelligent algorithms and the training of industrial workers to promote the achievement of the management-upgrade goals set in the "14th Five-Year Plan" for the Development of the Construction Industry. The continuous improvement of refined management in decoration projects will provide a solid foundation for the revolution of building quality.

Disclosure statement

The author declares no conflict of interest.

References

[1] Mainali B, Mahapatra K, Pardalis G, 2021, Strategies for Deep Renovation Market of Detached Houses. Renewable and Sustainable Energy Reviews, 138: 110659.

[2] Sun P, Zhang N, Zuo J, et al., 2020, Characterizing the Generation and Flows of Building Interior Decoration and Renovation Waste: A Case Study in Shenzhen City. Journal of Cleaner Production, 260: 121077.

[3] Yu ATW, Mok KSH, Wong I, 2023, Minimisation and Management Strategies for Refurbishment and Renovation Waste in Hong Kong. Engineering, Construction and Architectural Management, 30(2): 869–888.

[4] Velykorusova A, 2023, Development of a Method and Intelligent Decision Support System for Sustainable Renovation of the Built Environment, thesis, Vilnius Gediminas Technical University.

[5] Li CZ, Tam VWY, Hu M, et al., 2024, Lean Construction Management: A Catalyst for Evaluating and Enhancing Prefabricated Building Project Performance in China. Journal of Building Engineering, 94: 109930.

[6] Wu L, Leng J, 2025, Research on Optimisation Strategies of Green and Low Carbon Urban Renewal Buildings Based on Digital Platforms. E3S Web of Conferences, 618: 01009.

[7] Bao Z, 2023, Developing Circularity of Construction Waste for a Sustainable Built Environment in Emerging Economies: New Insights from China. Developments in the Built Environment, 13: 100107.

[8] Zhang L, Wu H, Wang X, et al., 2024, Investigation of Rates of Demolition Waste Generated in Decoration and Renovation Projects: An Empirical Study. Buildings, 14(4): 908.

[9] Wang J, Teng Y, Chen Z, et al., 2021, Assessment of Carbon Emissions of Building Interior Decoration and Renovation Waste Disposal in the Fast-Growing Greater Bay Area, China. Science of the Total Environment, 798: 149158.

[10] Kou L, 2022, Application of Environmental Protection and Energy Saving Technology in Building Decoration Engineering. Journal of Physics: Conference Series, 2152(1): 012042.

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