

Optimization Strategies for Hospital Infrastructure Project Management

Lu Jialiang

Children's Hospital in Wujiang District, Suzhou, Jiangsu, China

Abstract: This paper aims to explore optimization strategies for hospital infrastructure project management, with the goal of enhancing construction efficiency and quality, and ensuring a safe and comfortable hospital environment. By analyzing the current status of hospital infrastructure project management, the paper identifies the main existing issues and proposes targeted optimization measures, providing a reference for the scientific management of hospital infrastructure projects.

Keywords: Hospital Infrastructure Projects; Quality of Medical Services; Patient Experience; Operational Efficiency

1. Introduction

Hospital infrastructure projects are crucial for improving the quality of medical services, enhancing patient experience, and enhancing the operational efficiency of hospitals. The research background lies in the rapid development of hospital infrastructure under the "Healthy China" strategy to meet the health needs of the people. The purpose is to explore how infrastructure can promote the development of hospitals, and the significance lies in guiding future infrastructure practices. The research content includes the specific impacts of infrastructure on medical quality, patient experience, and operational efficiency.

2. Current Status of Hospital Infrastructure Project Management

2.1 Common Practices

Before initiating a hospital infrastructure project, thorough planning is conducted, which includes deep demand analysis, careful site selection consideration, and scientific design plan formulation, aiming to ensure that the project is closely connected to the hospital's development needs and strategic planning. In terms of fund allocation, hospitals will formulate detailed fund

budgets based on the actual scale and specific needs of the project, and implement strict fund control and allocation measures throughout the project execution process to ensure the rational use of funds. The construction management process is also rigorous, with hospitals conducting strict schedule control, quality supervision, and safety management to ensure that the project is completed on time and with quality, while also ensuring the normal operation of the hospital during construction. In terms of quality control, hospitals have extremely high requirements for infrastructure projects and will conduct multiple rounds of quality inspections and acceptance work to ensure that the project fully complies with relevant standards and regulations and meets the hospital's usage needs.

2.2 Development Trends

In recent years, the development trends of hospital infrastructure projects have exhibited characteristics of intelligence, greenness, and modularization. With the continuous advancement of technology, hospitals are increasingly focusing on the intelligent construction of infrastructure projects. By introducing smart medical equipment and establishing intelligent information systems, the aim is to improve the service efficiency and management level of hospitals, providing patients with more convenient and efficient medical services ^[1]. At the same time, the enhancement of environmental awareness has also made hospitals increasingly emphasize green construction in infrastructure projects, adopting measures such as using environmentally friendly materials and optimizing energy utilization to reduce hospital operating costs and environmental impact, achieving sustainable development.

3. Main Issues Faced in Hospital Infrastructure Project Management

3.1 Lack of Forward-looking Planning and

Design

In the management practice of hospital infrastructure projects, a significant issue is the lack of forward-looking planning and design. At the early stage of project initiation, due to inadequate planning depth and incomplete design considerations, frequent changes often occur during project execution. These changes not only increase project costs but also prolong the project timeline, causing unnecessary disruptions to the overall operation of the hospital. Specifically, the lack of forward-looking planning and design often fails to fully consider the strategic needs of the hospital's long-term development and the actual demands of medical services, leading to issues such as mismatched functions and unreasonable layouts in the subsequent use of infrastructure projects. This not only affects the quality of hospital services but may also negatively impact patients' medical experience. Therefore, hospital infrastructure projects need to consider various factors more scientifically and comprehensively during the planning and design phase to ensure the smooth implementation of the project and the effectiveness of its later use. This is also an important challenge currently faced in hospital infrastructure project management.

3.2 Ineffective Fund Management and Cost Control

Ineffective fund management and cost control is another pressing issue that needs to be addressed. This is manifested in widespread budget overruns and low fund utilization efficiency. The root cause of this problem lies in the often-lacking effective control and supervision mechanisms in fund management for hospital infrastructure projects, leading to waste and misuse of funds during the utilization process. At the same time, due to ineffective cost control, actual project expenditures often far exceed budgets, posing significant financial pressure on hospitals. Furthermore, low fund utilization efficiency also means that the hospital's investment in infrastructure projects is not fully rewarded, which is a significant waste of hospital resources. Therefore, how to strengthen fund management and cost control, and improve fund utilization efficiency, has become an important issue that urgently needs to be addressed in hospital infrastructure project management. This requires hospitals to establish more scientific and standardized systems in fund

management and strengthen supervision and auditing of the fund utilization process to ensure that every penny is used effectively, providing strong support for the smooth implementation and later operation of hospital infrastructure projects.

3.3 Difficulties in Construction Safety and Quality Control

Due to the unique nature of the hospital environment, it is essential to ensure that normal medical order is not disturbed during construction, which poses significant challenges to construction safety and quality control. On the one hand, construction sites are often closely connected to medical areas, and the movement of construction personnel, equipment, materials, etc., may impact medical activities, increasing the risk of safety accidents. On the other hand, hospitals have extremely high quality requirements for infrastructure projects, and any construction defects may pose threats to the provision of medical services and patient safety. However, in actual construction processes, due to factors such as tight schedules and complex construction conditions, quality control often fails to reach the ideal state, leading to frequent engineering quality issues. Therefore, how to ensure construction safety and quality control while maintaining normal medical order has become a major challenge in hospital infrastructure project management. This requires hospitals to conduct thorough planning and preparation before construction, develop detailed safety and quality control plans, and implement strict supervision and management during the construction process to ensure that infrastructure projects can be completed smoothly, safely, and with high quality^[2].

3.4 Lack of Information Management

Currently, many hospitals still have a low level of information management in infrastructure project management, which leads to poor information sharing and subsequently affects the efficiency of decision-making. Specifically, due to the lack of information management, key information such as project progress, fund utilization, and construction quality cannot be transmitted to relevant decision-makers in real-time and accurately, making them lack necessary data support when making decisions. This information asymmetry not only increases the difficulty of decision-making but may also

lead to decision-making errors, causing unnecessary risks and losses to hospital infrastructure projects. Furthermore, inadequate information management may also result in increased communication costs during project execution and poor coordination between departments, further affecting the overall progress and efficiency of the project. Therefore, enhancing the level of information management in hospital infrastructure project management, achieving real-time information updates and sharing, and improving management efficiency are urgent issues to be addressed in current hospital infrastructure project management.

4. Optimization Strategies for Hospital Infrastructure Project Management

4.1 Strengthening the Scientific Nature of Preliminary Planning and Design

To optimize hospital infrastructure project management, the primary strategy is to strengthen the scientific nature of preliminary planning and design. Hospitals should introduce an expert consultation mechanism, inviting

experts from various fields such as medical, architectural, and financial to participate in project planning and design together, ensuring the scientific and practical nature of the plan. At the same time, BIM (Building Information Modeling) technology should be adopted for three-dimensional modeling, integrating various data of the hospital infrastructure project into one model to achieve visual simulation and analysis, thereby improving the accuracy of planning. With BIM technology, hospitals can more intuitively understand the spatial layout, equipment configuration, construction processes, and other information of the infrastructure project, providing strong support for subsequent decision-making and construction. Furthermore, hospitals should establish a review mechanism for planning and design, conducting multiple rounds of review and modification of the plan to ensure that it not only meets the long-term development needs of the hospital but also possesses sufficient flexibility and scalability to adapt to future changes and developments in medical services [3], as detailed in Table 1.

Table 1. Management Planning

No.	Strategy Measures	Detailed Content
1	Introduce an Expert Consultation Mechanism	The list of experts should cover key areas such as hospital management, clinical medical care, architectural design, and financial management. Regularly organize expert meetings to ensure smooth communication and timely problem-solving. Integrate expert opinions to form a comprehensive report to guide scheme optimization.
2	Utilize BIM Technology for Three-Dimensional Modeling	Data collection should include existing hospital facilities, future needs, building codes, etc. BIM modeling should cover all disciplines including architecture, structure, electromechanical, and decoration. Visual simulation is used for space layout verification, equipment configuration optimization, construction process preview, etc.
3	Establish a Review Mechanism for Planning and Design	Review criteria include medical functionality, building quality, cost control, sustainability, etc. Review meetings should invite participation from hospital management, clinical departments, architectural design institutes, financial departments, etc. Form modification suggestions based on review comments to ensure continuous optimization of the scheme and meet the long-term development needs of the hospital.

4.2 Implementing Strict Cost Control and Financial Management

The hospital should establish a dynamic cost control system that covers various stages such as project initiation, planning, execution, and closure, ensuring the comprehensiveness and real-time nature of cost control. At the same time, big data analysis technology should be utilized to conduct deep mining and analysis of various cost data related to the infrastructure project, in

order to identify potential risks of cost overrun and take timely measures to address them. Through big data analysis, hospitals can also optimize fund allocation more scientifically, ensuring the rational allocation and effective utilization of funds in each stage. Furthermore, hospitals should enhance the transparency and standardization of financial management, establish a sound financial audit and supervision mechanism, and ensure the legal and compliant use of funds for infrastructure projects^[4].

Through these specific and feasible measures and methods, hospitals can effectively address issues of inadequate fund management and cost control in infrastructure project management,

improve fund utilization efficiency, and provide strong support for the smooth implementation of infrastructure projects and the long-term development of the hospital.

Table 2. Cost Control and Financial Management Optimization

No.	Strategy Measures	Detailed Content
1	Establish a Dynamic Cost Control System	Cost control standards and processes should cover all aspects of infrastructure projects, ensuring comprehensiveness and accuracy. Cost control specialists should have extensive experience in cost control, enabling them to promptly identify and respond to cost changes. Conduct regular (e.g., monthly or quarterly) cost analyses and produce detailed cost reports to provide a basis for decision-making.
2	Utilize Big Data Analysis Techniques for Cost Data Mining and Analysis	Collect data on material costs, labor costs, equipment costs, indirect expenses, etc. Use big data analysis techniques to identify potential risks of cost overruns and irrational fund allocation. Adjust cost control strategies and fund allocation plans in a timely manner based on analysis results to ensure the smooth progress of infrastructure projects.
3	Enhance Transparency and Standardization in Financial Management, Establish Financial Audit and Oversight Mechanisms	Financial management systems and processes should clearly define procedures for fund usage, reimbursement, approval, etc., ensuring standardization in financial management. Regularly train financial personnel to enhance their professional quality and ethical standards. Establish a comprehensive financial audit and oversight mechanism to ensure legal and compliant use of infrastructure project funds, promptly identifying and correcting issues.

ensure harmonious coexistence between the two.

4.3 Strengthening the Construction Safety and Quality Management System

To ensure the smooth progress of hospital infrastructure projects while maintaining normal medical activities, it is crucial to strengthen the construction safety and quality management system. A detailed safety construction plan needs to be formulated, clearly delineating the separation between construction areas and medical areas to ensure that construction activities do not contaminate or disrupt the medical environment. The plan should include emergency response measures to deal with possible contingencies. Implement full-process quality monitoring, with strict control over every stage from material procurement, construction techniques, to project acceptance. Third-party quality testing agencies can be introduced for regular or irregular quality spot checks to ensure that the project quality meets the standards [5]. Furthermore, to ensure that construction and medical activities do not interfere with each other, an effective communication and coordination mechanism needs to be established. The construction unit should maintain close contact with the hospital management department, promptly understand the arrangement of medical activities, and reasonably adjust the construction schedule to

4.4 Enhancing the Level of Informationization in Project Management

Establishing a project management information system is particularly important. This system should cover multiple dimensions such as project progress, cost, quality, and safety, enabling real-time data updates and sharing. Through information technology, project management personnel can more easily grasp the overall status of the project and promptly identify and resolve potential issues. Specifically, technologies such as cloud computing and big data can be utilized to integrate various types of project-related data into a unified platform, achieving seamless information integration. At the same time, permission management should be set up to ensure that personnel with different roles can only access data within their authorized scope, thus safeguarding information security. Furthermore, the project management information system should also possess data analysis and prediction capabilities. By mining historical data, it can provide strong support for project decision-making. The system can also generate various reports and charts to help management personnel understand project progress more intuitively.

Table 3. Strengthening of Construction Safety and Quality Management System

No.	Strategy Measures	Detailed Content
1	Develop a Detailed Safety Construction Plan	Implement physical separation between construction areas and medical areas, such as fences and isolation barriers, to ensure construction activities do not impact the medical area. Include environmental protection measures such as noise control, dust control, waste management, etc., to ensure construction activities do not pollute the medical environment. Outline possible emergencies such as fires, collapses, etc., in the emergency response plan, and clearly define handling procedures, responsible personnel, and contact information to ensure swift response in case of emergencies.
2	Implement Full-Process Quality Control	Establish a supplier evaluation mechanism for material procurement, conduct qualification reviews and quality assessments of suppliers to ensure procured materials meet quality standards. Establish an on-site inspection system for construction process monitoring to conduct real-time monitoring of construction to ensure it meets design requirements. Establish strict acceptance standards and procedures for project acceptance, conduct a comprehensive inspection of project quality to ensure it meets standards. Introduce third-party quality inspection agencies to conduct random quality inspections to objectively and impartially assess project quality.
3	Establish an Effective Communication and Coordination Mechanism	Clearly define meeting times, locations, participants, etc., in the regular meeting system to ensure timely communication between the construction unit and hospital management. Implement an information sharing platform to provide real-time updates and sharing of construction progress and medical activity information to ensure both parties have a clear understanding of construction progress and medical activity arrangements. Include emergency contact persons and contact information in the emergency communication channels to ensure timely communication and adjustments can be made in emergency situations to avoid impacting medical activities.

Table 4. Strategies for Improving the Informatization Level

No.	Strategy Measures	Detailed Content
1	Establish a Project Management Information System	Cover multiple dimensions such as project progress, cost, quality, safety, etc., to ensure comprehensiveness and accuracy of data. Enable real-time data updates and sharing to improve timeliness and transparency of information.
2	Integrate Data Using Advanced Technologies	Utilize cloud computing technology to achieve centralized storage and efficient access to project data. Apply big data technology to integrate and analyze various types of project-related data to extract valuable information.
3	Strengthen Information Security Measures	Implement permission management to ensure that personnel with different roles can only access data within their authorized scope, preventing information leakage. Adopt encryption technology to ensure the security of data transmission and storage.
4	Achieve Data Analysis and Prediction Functions	Analyze historical data through data mining techniques to identify potential issues and risks. Utilize data analysis results to provide strong support for project decision-making, enhancing the scientific nature and accuracy of decisions.
5	Generate Reports and Charts to Assist Management	The system should be able to automatically generate various reports, such as project progress reports, cost analysis reports, etc., for easy viewing by management personnel. Provide chart display functions, such as Gantt charts, cost curves, etc., to help management personnel better understand project progress and overall status visually.

5. Conclusion

The optimization of hospital infrastructure project management is a systematic engineering

that requires comprehensive consideration from multiple dimensions such as planning, funding, construction, and informatization. By implementing the above strategies, the

management level of hospital infrastructure projects can be effectively improved, ensuring project quality while reducing construction costs, and providing a safer, more efficient, and comfortable service environment for the hospital. In the future, with the continuous advancement of technology and the updating of management concepts, hospital infrastructure project management will further develop in the direction of intelligence and refinement.

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