

Analysis of problems in university maintenance and renovation project management

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Abstract: With the continuous expansion of university enrollment, the number and scale of university expansion and renovation projects have also increased annually. Some of the earlier-built universities in China, with their various infrastructure and supporting facilities having reached or even exceeded their reasonable lifespan, urgently require comprehensive refurbishment. As a result, university maintenance and renovation projects have emerged prominently among university engineering projects due to their substantial volume and complex categories of repairs. At the same time, various pressing issues in the management of university maintenance and renovation projects have become increasingly apparent. Facing these challenges requires collaborative efforts across various departments within the universities to explore and implement solutions. This paper analyzes the problems in the management of university maintenance and renovation projects and proposes corresponding countermeasures, providing constructive opinions and suggestions for the management of such projects.

1. Overview of University Maintenance and Renovation Projects

As socio-economic development progresses and the level of civilization increases, the nation's emphasis on and investment in education have continuously grown, leading to the vigorous development of higher education in China. Consequently, the expansion and renovation of universities have become critical components in maintaining and developing educational institutions.

University maintenance and renovation projects possess unique characteristics and complexities. Firstly, these projects are typically large in scale and diverse in type. University campuses, providing a relatively independent small social environment necessary for the basic life needs of faculty and students, feature comprehensive categories of infrastructure and support facilities. When various infrastructures and facilities require expansion and repair, it generally covers most types of maintenance and renovation projects, primarily involving medium and small-scale renovations including teaching buildings, laboratories, student apartments, venues, office spaces, road facilities, etc. Secondly, there are numerous maintenance and renovation projects, each with its complex types, involving wall painting, roof waterproofing, electrical and plumbing renovations, wall insulation, pipe network repairs, road restoration, and landscaping maintenance.

2. Overview of University Maintenance and Renovation Project Management

University maintenance and renovation projects are collaborative efforts involving various participants, including universities, design and cost estimation agencies, construction firms, supervisory agencies, and audit units. The university, as the primary entity in these projects, bears different management responsibilities at all stages of the project. During the project planning, design, and cost estimation stages, it manages the costs; during the construction stage, it oversees the progress and quality of the project; and during the completion stage, it manages the final quality control, and project audit and settlement.^[1]

2.1. Cost Management in University Maintenance and Renovation Projects

Funding for university maintenance and renovation projects typically comes from governmental funds. Universities need to plan comprehensively for maintenance and renovation projects for the following year and submit budget requests to higher authorities. Once the budget is approved, the university commences the tendering and procurement for the renovation projects. After project completion, the university collaborates with the audit unit to manage project audit and settlement. Throughout the construction process, dynamic cost control of the renovation projects is maintained.

2.2. Progress Management in University Maintenance and Renovation Projects

When developing the overall plan for university maintenance and renovation projects, the university collaborates with the engineering design firm to plan the project schedule. Due to the unique nature of universities and to ensure the safety of faculty and students, most renovation works are scheduled during summer and winter breaks, especially in the northern regions where they are mostly concentrated during the summer break. This results in relatively tight project timelines and a unique construction environment. Thus, planning and control of the overall and phased progress need to consider various factors. If discrepancies arise between the planned and actual construction progress, timely coordination with relevant units is necessary to ensure adherence to the project schedule.

2.3. Quality Management in University Maintenance and Renovation Projects

Initially, universities must set clear quality objectives for maintenance and renovation projects, collaborating with design and cost estimation units to discuss and analyze project plans to ensure that the budget and design proposals align with the project quality goals. During the tendering, procurement, and implementation stages, it is crucial to select high-quality construction firms and work closely with supervisory agencies to monitor the project, ensuring quality during construction. Finally, in conjunction with various university departments, supervisory, and audit units, the completed projects undergo acceptance checks and audits to guarantee the quality of the construction projects.^[2]

3. Current Status and Problem Analysis of University Maintenance and Renovation Project Management

3.1. Lack of Regulations and Integrated Planning in Project Initiation

Universities primarily focus on teaching and research, often neglecting the importance of logistical management services. This leads to a lack of regulations or incomplete systems in university

maintenance and renovation project management. With the expansion of universities due to increased enrollments, there is a growing number of maintenance and renovation projects, making the establishment of comprehensive regulations, including those for project management, an urgent need in university logistical reforms. Moreover, the insufficient emphasis on logistical management results in a shortage of skilled personnel in this area, lacking forward-thinking and systematic planning for various tasks.

3.2. Complex University Environment and Inaccurate Engineering Design and Costing

University maintenance and renovation projects often involve multiple buildings or locations. Some universities, built in earlier phases and continuously expanding with new constructions and facilities, exhibit significant variations in the usage, internal structure, and basic materials of different buildings and facilities, complicating the engineering design and costing processes. Sometimes, design and cost estimation firms, either unfamiliar with the university's specifics or aiming to reduce operational costs, overlook these differences, leading to inaccurate project designs and cost estimates. This inaccuracy hinders cost control and the management of progress and quality in university renovation projects. Contractors, following procurement documents set out by universities, often face difficulties in implementing construction plans smoothly, leading to increased construction costs, delays in project timelines, and discrepancies in expected project quality. Due to the complexity of university environments, it is common for design and cost estimation firms to miss or omit certain items during the design and costing phases, leading to necessary additions and modifications during construction. This can delay project timelines and significantly waste university resources.

3.3. Construction Concentrated During Holidays, Resulting in Tight Timelines

Universities primarily operate around teaching and research activities, servicing students and faculty. To avoid disrupting these activities and to ensure the safety of faculty and students, most university maintenance and renovation projects are scheduled during summer and winter breaks. In northern universities, construction is predominantly conducted during the summer due to weather and temperature requirements. With the typical summer and winter breaks lasting about three months, and approximately one month in northern universities, the construction timelines for university renovation projects are notably tight. Before starting a university renovation project, it is necessary for higher authorities and the university's finance department to confirm the project funds, which can delay the initiation of subsequent tendering and procurement processes. Sometimes, there is a discrepancy between the budgets allocated by higher authorities or the university for the year and the designs and cost estimates prepared by logistical management, necessitating replanning and redesigning, which further delays the project's start. Once the budget and designs are confirmed, logistical management needs to define procurement requirements, including tender control prices and bill of quantities. Since most university maintenance projects fall under government procurement with generally high thresholds, national and provincial regulations require public disclosure of intentions before starting the tendering process. Given the tight schedule for preliminary work, logistical management must promptly report procurement projects and collaborate with the procurement department to complete the tendering process. The extensive preliminary workload and tight construction schedules often prevent contractors from fully understanding and preparing for maintenance projects, potentially compromising the quality of the work.^[3]

3.4. Absence of Supervisory Bodies, Inadequate Supervision Before and During the Project

During the construction process of university maintenance and renovation projects, universities

often employ third-party agencies to supervise the projects, including the confirmation of main materials before construction, full-process supervision during construction, and quality acceptance after construction completion. Generally, the professional technical capabilities of the supervisory staff are higher than those of the university's logistical management personnel, enabling them to supervise quality and progress throughout the construction process, thereby ensuring the construction quality and progress of university maintenance and renovation projects to some extent. Throughout the construction process, some university logistical management personnel do not follow through entirely, fully transferring supervision responsibilities to the supervisory agency, resulting in a lack of oversight by the university over both the supervisory and construction firms. Due to the absence of the university as a supervising body overseeing both the supervisory agency and the construction firm, various problems can arise during the execution of their duties, severely affecting the project's cost control and quality. Moreover, only after the construction is completed do various internal university departments collaborate to conduct quality acceptance of the project, lacking joint supervision and management by university departments before and during the project.

4. Countermeasures for University Maintenance and Renovation Project Management

4.1. Establish Comprehensive Systems, and Plan University Maintenance and Renovation Projects Reasonably

Maintenance and renovation projects are critical parts of universities' annual construction initiatives. With university expansions and the aging of infrastructure and facilities, the number and cost of these projects are increasing yearly. Establishing and improving regulations for maintenance and renovation projects facilitates the implementation and execution of these projects. Firstly, organizational structures should be established to define the responsible entities for maintenance and renovation projects, clarify the division of responsibilities among departments and job responsibilities of staff, and ensure coordination and overall planning. Secondly, comprehensive regulations should be established to standardize aspects of university maintenance and renovation project management, including engineering design and cost standards, project budgeting, construction management, safety supervision, acceptance audit and settlement, and internal controls. Simultaneously, standardize the workflows for each stage of maintenance and renovation project management. For any emergencies that occur during the projects, develop related emergency management plans. Reasonable planning of maintenance and renovation projects is foundational. Following the principles of scientific, detailed, and standardized management, the requesting department should submit a written application for maintenance and renovation, explaining the reasons, contents, and quantities required, which is then forwarded to the logistical management department. Together with relevant departments, logistical management conducts assessments based on the maintenance cycle and actual operational conditions to compile the renovation plan and project estimate. Once approved by the university, the project is initiated, and following budget approval, the procurement plan is reported.^[4]

4.2. Strengthen Management, Enhance Precision in Engineering Design and Costing

Engineering design and costing are crucial early-stage components of maintenance and renovation projects, directly affecting cost control and construction quality. Due to the uniqueness and complexity of university maintenance projects, detailed management of engineering designs must meet national, industry, and local quality acceptance standards, encompassing multiple design aspects such as building renovation, fire safety, plumbing, and more. Regional factors like climate and weather conditions must also be considered. Detailed management of project costs involves optimizing resources across all project stages to ensure the university's financial benefits. This

includes rational planning during the decision-making stage to control costs effectively; during the design stage, ensuring precise budgeting to minimize omissions and avoid subsequent modifications that increase costs; during the tendering stage, purchasers must scientifically establish procurement needs and conduct thorough evaluations to ensure that the winning supplier meets all construction requirements of the university; during the construction stage, collaborate with supervisory agencies to control the quality and progress of the project, addressing any issues promptly to ensure progress and quality, thus strictly controlling costs; and during the completion stage, work with auditing units and university departments to perform acceptance checks and settle accounts, thereby finalizing control over project costs.

4.3. Relax Restrictions, Introduce Professional Technical Personnel for Engineering Supervision

Engineering supervision is a vital component of university maintenance and renovation project management, spanning the entire project. Early in the project, comprehensive understanding and grasp of the project are essential, including the usage conditions of university buildings, laboratories, student apartments, venues, offices, and road facilities, and having a thorough understanding of maintenance needs like wall painting, roof waterproofing, electrical and plumbing renovations. During the project, work closely with supervisory units to oversee the construction, supervising both the construction and supervisory firms. If there are delays in progress, issues with main materials, or inadequacies in construction quality and supervision, provide guidance and review to ensure project progress and quality. After construction, collaborate with university departments and supervisory units for final acceptance of the project, and complete settlements with auditing units. University engineering supervision requires professional qualifications and extensive experience in university projects, with familiarity with all university infrastructure and facilities. Due to stringent educational requirements in university hiring processes, often demanding at least a master's degree from a formal recruiting program, it can be challenging to recruit for logistical management roles, sometimes leading to prolonged vacancies. Thus, universities need to relax hiring restrictions for logistical management personnel, potentially lowering educational thresholds and employing professional technical assessments to hire qualified personnel with engineering supervision qualifications. Additionally, train internal logistical management staff to enhance their professional skills and levels, open channels for educational advancement, and actively participate in training to improve the technical skills of internal staff.

5. Joint Supervision and Comprehensive Oversight of University Maintenance and Renovation Projects

Universities, as the main bodies managing maintenance and renovation projects, should oversee the entire process of such projects. The logistical management service department should lead, coordinating with other departments to form a maintenance and renovation supervision team. The supervision involves three main control stages:

5.1. Pre-construction Control

As third-party engineering design and cost estimation units carry out project designs and cost evaluations, the maintenance and renovation supervision team must oversee these processes, promptly identifying and addressing any issues or deficiencies. After construction firms are selected for the project, the supervision team should review the contractors' response documents and main materials list, and verify on-site that the primary construction materials match those listed in the

response documents.

5.2. During Construction Control

Throughout the construction phase, the maintenance and renovation supervision team should regularly and irregularly join the supervisory agency in overseeing the project. They should also timely review the supervisory agency's logs and other documents to ensure the project's progress and quality. For concealed works, construction and supervisory units are required to provide video documentation of the construction process.

5.3. Post-construction Control

At the completion of the project, when the construction and supervisory agencies request acceptance, the supervision team organizes the inspection, rigorously checking the quality of the work and issuing acceptance reports. For projects that do not meet acceptance criteria, the team should promptly issue rectification notices requiring the construction firm to correct defects within a specified deadline. The supervision team should also participate in the auditing process to ensure comprehensive oversight throughout the project.

Management of university maintenance and renovation projects is a crucial aspect of university logistical management, representing a concentrated effort to utilize budgetary funds efficiently and enhance institutional governance capabilities. The construction of university infrastructure and facilities lays the foundation for future development. While focusing on teaching and research development, universities should also prioritize logistical management services, enhancing management quality and standards. It is essential to improve regulations related to university maintenance and renovation project management, introduce professional technical talents, and ensure inter-departmental collaboration within universities for detailed management and comprehensive supervision.

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