

Research on Risk Indicators of Project Procurement in Higher Education Institutions

Lele Chan¹, Changyuan Wang^{2*}

¹International College Krirk University, Bangkok, Thailand

²School of Computer Science and Technology, Yibin University, Yibin 644000, Sichuan, China

*Corresponding author: Changyuan Wang, chywang128@163.com

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Abstract: This paper focuses on the procurement of construction projects in universities, conducting research on the influencing factors of procurement risks in such projects. By combining questionnaire surveys with expert interviews, numerous factors affecting procurement are analyzed. Subsequently, these factors are refined and summarized to construct a procurement risk evaluation index system for construction projects, which includes three first-level indicators, such as process management risk and ethical/legal risk, and is further subdivided into 13 second-level indicators.

Keywords: Risk evaluation indicators; Project procurement; University construction projects; Procurement management

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1. Introduction

With the accelerated advancement of the country's modernization process, major infrastructure construction is booming nationwide on an unprecedented scale. As lifeline projects underpinning economic and social development, their quality not only concerns the safety of people's lives and property but also serves as a strategic cornerstone for achieving long-term stability and sustainable development of the nation. Against the backdrop of the continuous emergence of iconic projects such as super high-rise buildings, cross-sea bridges, and smart city clusters, the complexity of engineering systems has increased exponentially. The application of innovative technologies such as ultra-deep foundation treatment, large-span spatial structures, and intelligent construction techniques poses unprecedented challenges to the management of the entire construction process. It is noteworthy that in the pursuit of construction speed and technological innovation, quality control risks have multiplied in multiple dimensions. An analysis of typical cases in the engineering field in recent years reveals that approximately 68% of the root causes of major quality accidents can be traced back to the loss of control in the material procurement phase ^[1]. Faced with the complexities of engineering construction in the new era, it is urgent to establish a comprehensive risk prevention and control system. As the first line of defense

for engineering quality control, procurement management shoulders the strategic mission of source control. By establishing and improving a compliant procurement mechanism, not only can the influx of substandard building materials onto construction sites be blocked at the source, but also a “prevention-monitoring-emergency response” trinity quality firewall can be constructed through measures such as standardizing the bidding process, strengthening supplier qualification reviews, and implementing full-lifecycle quality traceability ^[2].

2. Identification of procurement risk evaluation indicators

By extensively reviewing relevant references ^[3–17] on procurement in university construction projects, the factors influencing procurement risks in such projects were summarized and distilled to form an initial list of risk factors through keyword-based data filtering. Questionnaires were distributed anonymously to relevant experts via QQ and face-to-face interviews to screen the original indicators, remove those of low frequency, and optimize the original risk list. Key factors affecting procurement risks were identified to refine other factors.

3. Indicator screening

The cost of procurement activities accounts for a significant proportion of the total project investment, making their importance self-evident. The quality of procured products and their delivery on time will determine or influence the quality and completion time of the project, potentially even doubling the overall project cost. Scientific project procurement management, employing modern analytical methods, optimizes the procurement management process, ensuring project quality within controllable construction costs and advancing project progress as planned, which is the inevitable choice for high-quality procurement management. Project procurement is a complex activity susceptible to various uncertainties. Thoroughly analyzing and distilling potential risks, based on the characteristics of procurement risks, questionnaires were conducted via modern means such as QQ and WeChat to consult with experts in the engineering construction field, staff from relevant research institutes, and engineering construction companies. Procurement risk data were collected and analyzed to form preliminary risk evaluation indicators, which were further refined by combining research findings from relevant references to optimize the risk evaluation indicators.

4. Indicator system

The procurement risk indicator system for university construction projects constructed in this paper consists of three first-level risk indicators and 13 second-level risk indicators. Specifically, the process management risk, ethical and legal risk, and external and decision-making risk are the three first-level risk indicators. Process management risk includes improper process risk, demand change risk, delay in publicizing review results risk, and approval delay risk. Ethical and legal risk includes supplier non-compliance with qualification risk, improper agency behavior risk, improper on-campus procurement management risk, and improper bid evaluation standard risk. External and decision-making risk includes data leakage risk, decision-making error risk, policy and market risk, and fund disbursement risk.

4.1. Process management risk

4.1.1. Improper process risk

Not following the procurement process stipulated by the competent authority or not adhering to relevant laws

and regulations on project procurement bidding, tendering, and bid evaluation, such as collusive bidding or private arrangements, leads to unfair competition, potentially causing resource waste and even affecting the quality and schedule of the construction project. Therefore, the procurement process must be scientific, reasonable, legal, and compliant.

4.1.2. Demand change risk

Market developments, changes in educational philosophy, advancements in engineering construction technology, and changes in enrollment scale can all cause changes in established client demands. Procurement projects already initiated may not meet new demands, leading to secondary or even tertiary procurements, skyrocketing procurement costs, and severe resource waste. Before substantial project procurement activities, universities must convene professionals to conduct in-depth and extensive demand analysis, gain a deep understanding of the school's long-term development plans, and formulate scientific procurement plans for construction projects to avoid potential risks arising from demand changes.

4.1.3. Delay in publicizing review results risk

Due to improper transactions, reluctance of relevant parties to bear legal liabilities for potential risks, etc., there may be delays in publicizing review results. In severe cases, this will affect the progress of construction projects, extend the construction period, and increase construction costs. Universities must strictly follow the process to publicize procurement review results, ensuring fairness and justice to advance procurement work with high quality.

4.1.4. Approval delay risk

Multiple project management departments, inadequate staffing, complex approval processes, cumbersome procedures, poor technical skills of office staff, incomplete procurement plans, or hidden errors in documents will lead to delays in approving procurement review results, or even delays in the entire project, increasing construction costs.

4.2. Ethical and legal risk

4.2.1. Improper bid evaluation standard risk

Problems with bid evaluation standards themselves, non-compliance by bid evaluation experts with established standards, improper transactions between bid evaluation experts, participants, and tenderers, or conceptual deviations among bid evaluation experts and participants will make bid evaluation standards improper, affecting the fairness and justice of bid evaluation results, the quality of procured engineering materials, and even the quality of engineering construction. In summary, universities must supervise bidding, tendering, and bid evaluation links adequately and severely crack down on any improper behavior affecting these links.

4.2.2. Improper on-campus procurement management risk

Due to the continuous expansion of university scale, numerous management departments, cluttered management, and disordered conditions, different departments have varying needs for construction projects, with a lack of communication between departments and repeated construction phenomena, leading to repeated procurements and resource waste. Universities need to establish a comprehensive procurement management mechanism, ensuring effective monitoring and punishment, standardized and transparent procurement processes, smooth communication between departments, and real-time review of procurement processes to promptly

correct deviations and trace the source to eliminate hidden dangers arising from improper management.

4.2.3. Improper agency behavior risk

Risks arising from exceeding authority, abusing power, violating integrity principles, or failing to fulfill reasonable duty of care in the procurement process of construction projects will undermine the fairness and justice of project procurement and affect the interests of relevant parties in the project. Universities need to conduct strict assessments of integrity and professional ethics aspects to select agencies, clarify agency authority, strengthen agent supervision, improve contract terms, and enhance legal awareness to prevent risks.

4.2.4. Supplier non-compliance with qualification risk

Suppliers not possessing statutory or agreed-upon qualification conditions lead to invalid contracts, insufficient performance capabilities, product quality defects, and difficulties in meeting universities' strict engineering construction quality standards. This risk has a significant impact and occurs frequently in actual engineering construction, affecting construction quality and even causing serious safety issues. Universities need to prevent risks through standardized reviews, dynamic checks, and contractual constraints, and take timely legal remedial measures when qualification issues are discovered to avoid expanding losses.

4.3. External and decision-making risk

4.3.1. Decision-making error risk

In university construction project procurement, during the procurement of equipment, materials, etc., due to insufficient information, improper selection, execution deviations, or changes in the external environment, decision-making errors lead to procurement results failing to meet project needs, causing increased costs, inefficient use of resources, project delays, quality defects, and even legal disputes. Such risks pervade the entire procurement process and require prevention and control through systematic management. Universities must establish a scientific decision-making system, use digital procurement platforms to achieve transparent management of the entire process, entrust professional procurement agencies, adopt expert opinions, ensure every procurement decision is well-considered, enhance decision-making scientificity, and avoid unnecessary economic losses.

4.3.2. Data leakage risk

Currently, with the rapid development of information technology, various departments in universities have strengthened information management. Technical vulnerabilities, management defects, and human errors in on-campus information facilities may lead to sensitive data leakage during construction project procurement, or attackers may exploit procurement processes to breach information security defenses, potentially causing leakage of important school data such as academic achievements, financial information, and student grades, or leakage of teachers' and students' personal privacy, which may lead to legal liabilities, reputation damage, and academic misconduct. Universities need to introduce data security governance platforms or entrust professional security agencies for regular assessments and reinforcements. A rigorous data protection mechanism should be established to construct a defense system from multiple dimensions of technology, management, and law.

4.3.3. Fund disbursement risk

During the execution of university construction projects, multiple links from the disbursers to contractors or suppliers may trigger risks due to management, operational, or external factors. Universities need to prevent

and control risks through multiple dimensions of systems, contracts, technology, and personnel. The key lies in establishing a full-process, full-element risk management system to ensure safe, compliant, and efficient fund circulation.

4.3.4. Policy and market risk

During the promotion of university construction projects, policy adjustments by national or local governments directly affect project compliance, financing capabilities, and market demand. Uncertainties in the market environment, such as demand fluctuations, increased competition, and price changes, directly affect project procurement costs. Universities need to establish a policy dynamic monitoring mechanism to assess the impact of policy changes on projects in advance, strengthen legal compliance reviews in the early stages of projects to ensure compliance with current policy requirements, and set policy adjustment clauses in contracts to clarify risk-sharing mechanisms. Meanwhile, through tools such as big data analysis and industry reports, accurately grasp market trends; adopt centralized procurement and long-term contracts to lock in prices, reducing the risks of fluctuations in raw material costs.

Disclosure statement

The authors declare no conflict of interest.

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