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Enhancing Engineering Audit Practices in Higher Education

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Abstract: Engineering auditing in colleges and universities serves as a core supervisory mechanism for standardizing campus construction processes and enhancing the utilization efficiency of fiscal funds. It plays a pivotal role in optimizing the allocation of higher education resources. Using the annual operational practices of the engineering auditing department at a specific university as a case study, this paper systematically examines the implementation framework and practical outcomes of engineering auditing in higher education institutions. It conducts an in-depth analysis of the core challenges and their underlying causes within audit operations and proposes improvement pathways, such as deepening collaborative mechanisms and strengthening technological empowerment. The aim is to provide practical references for the standardized and scientific development of engineering auditing in colleges and universities.

Keywords: Engineering auditing in colleges and universities, Problem-oriented approach, Collaborative mechanism, Quality control, Optimization pathways.

INTRODUCTION

With the diversified and large-scale advancement of infrastructure construction and renovation projects in colleges and universities, the supervisory context of engineering auditing has become increasingly complex, placing higher demands on audit accuracy, efficiency, and full-process coverage [1,2,3]. Engineering auditing in higher education not only bears the responsibility of conserving fiscal funds and standardizing management practices but also plays an indispensable role in mitigating risks within engineering projects and ensuring construction quality [2,4]. Drawing on the annual operational practices of a university's engineering auditing department as a sample, this paper focuses on practical challenges in audit work, constructs an optimization framework for engineering auditing in colleges and universities, and provides insights for similar institutions seeking to enhance the quality and efficiency of their auditing functions.

DILEMMAS IN ENGINEERING AUDITING AT COLLEGES AND UNIVERSITIES

Deficiencies in the Audit Management System

Shortcomings within the audit management system constitute a core factor contributing to numerous operational challenges. In terms of process standardization, there is an absence of standardized audit data submission checklists and clearly defined timelines. Operational departments need to enhance their attention to the completeness and standardization of audit data. Instances frequently occur where data submissions are incomplete or non-compliant in format, necessitating repeated supplementation and correction, which directly impedes audit finalization efficiency [5,6].

For small-scale projects, specialized audit management processes and supervision mechanisms have not been established. Audit resources are disproportionately allocated toward large-scale projects, resulting in a supervisory pattern that "emphasizes major projects while neglecting minor ones" [5,7,8]. Consequently, management loopholes in small-scale projects often remain undetected and unaddressed in a timely manner. Regarding resource allocation, audit manpower has not been scientifically distributed according to the characteristics and demands of different audit stages. This leads to an imbalance in supervisory intensity between final accounts auditing and bid evaluation control price auditing, reflected in significant disparities in audit reduction rates [9,10]. Simultaneously, the division of labor and cooperation mechanisms for audit tasks lack clarity, failing to fully leverage the professional advantages of internal auditing and thereby affecting overall audit efficiency.

Ambiguities in Collaborative Mechanisms and Responsibility Delineation

The root cause of inadequate inter-departmental collaboration lies in the lack of institutional design for the "integration of business and audit functions"[3,5]. Universities have not established regular joint meeting mechanisms to facilitate communication between audit departments and operational departments such as construction, logistics, and infrastructure. All departments need to heighten their awareness of proactive communication. There is a tendency to perceive audit work solely as the independent responsibility of the audit department, with operational departments often adopting a passive, cooperative stance. This fails to foster a "process-collaborative" operational model, leading to delayed and fragmented information transmission.

Moreover, responsibility delineation requires clarification. For behaviors that hinder audit progress, such as delayed data submission and lagging information synchronization, corresponding responsible entities and specific assessment criteria have not been clearly defined[3,5,10]. This makes it difficult to establish an effective constraint mechanism, allowing recurring issues to persist without fundamental resolution. Furthermore, inter-departmental barriers have not been fully dismantled, and a unified organizational coordination mechanism is absent. This creates numerous obstacles in data sharing and workflow connectivity, adversely affecting the smooth progression of audit work.

Shortcomings in Audit Management and Quality Control Mechanisms

Deficiencies in the audit management mechanism directly lead to inconsistencies in audit quality. In the implementation phase, some auditors require improvement in professional competency [5,10]. Their grasp of engineering audit standards, processes, and key focal points is sometimes inadequate. The application of quotas and fee collection standards for similar projects lacks consistency, resulting in a lack of uniformity and accuracy in audit outcomes.

Within the quality control segment, there is an absence of a dynamic supervision mechanism covering the entire audit process. Quality control over key stages—such as audit plan execution, audit evidence collection, and audit report preparation—requires stricter enforcement. This has led to issues in some audit tasks, such as non-compliant processes or insufficient evidence. Additionally, universities lack a scientific, systematic, and

quantitative assessment and evaluation system for audit work, which often relies on subjective judgment. This makes it challenging to form effective constraints and incentives regarding audit quality, efficiency, and service attitude, ultimately impairing the effective utilization of audit resources.

Lagging Informatization Development and Insufficient Talent Cultivation

The primary reason for the lag in informatization development is that universities have not integrated engineering audit informatization into their overall digital campus construction plans [5,8]. A lack of dedicated funding and technical support results in significant difficulties in data integration and delays in system development, hindering the establishment of a unified engineering audit data platform. Concurrently, auditors' proficiency in utilizing informatization tools requires enhancement. The scarcity of relevant training and practical application further restricts the promotion and adoption of informatization technologies within audit operations.

Regarding talent cultivation, a systematic training plan is lacking. Professional training predominantly focuses on policy and regulation interpretation, while coverage of practical content—such as engineering technology, project costing, and the application of informatization tools—remains insufficient. This makes it difficult to meet the demand for interdisciplinary talent capable of handling complex audit scenarios. Furthermore, an effective mechanism for building a talent echelon is absent. Young auditors lack clear guidance for their professional development and growth paths, resulting in an audit team whose professional structure and competency levels struggle to meet the requirements for the high-quality development of audit work.

ANALYSIS OF CURRENT DILEMMAS IN ENGINEERING AUDITING AT COLLEGES AND UNIVERSITIES

Quantitative Table of Core Audit Business Data

Data Type	Specific Indicators	Value/Proportion	Reference Standard/Comparison
Audit Reduction Rate	Final Accounts Audit Reduction Rate	1.91%	Lower than the average level of 3%-5% at comparable universities
Audit Reduction Rate	Bid Evaluation Control Price Audit Reduction Rate	4.32%	Higher than the final accounts audit reduction rate; a gap of 2.41 percentage points exists between the two
Finalization Efficiency	Proportion of Final Accounts Audit Projects Completed Beyond Time Limit	17.07%	—
Issues in Small-scale Projects	Proportion Requiring Procurement Process Standardization	35%	A core problem area in small-scale projects

Issues in Small-scale Projects	Proportion Requiring Contract Management Improvement	28%	A core problem area in small-scale projects
Issues in Small-scale Projects	Proportion Requiring File Retention Completeness Improvement	42%	The most prominent problem in small-scale projects

Specific Content of Dilemma Analysis

Evident Shortcomings in Audit Control Efficiency

From a data perspective, the final accounts audit reduction rate is only 1.91%, significantly lower than the 3%-5% average observed at comparable universities. This indicates that the depth of audit work needs expansion, and the identification of certain hidden issues—such as unauthorized charges and misreported project quantities—remains insufficient. Consequently, the potential for fund conservation is not fully realized. In contrast, the bid evaluation control price audit reduction rate reaches 4.32%. The gap of 2.41 percentage points between these two audit functions clearly indicates an imbalance in the supervisory intensity across different audit stages, reflecting evident deviations in resource allocation and supervisory focus.

Simultaneously, 17.07% of final accounts audit projects experience delayed finalization. This proportion directly reflects inefficiencies within the audit process, primarily attributable to factors such as untimely data submission and the need for repeated supplementation of materials. Such delays not only hinder the audit timeline but also disrupt project fund turnover and subsequent management activities. Furthermore, supervision of small-scale projects is particularly problematic. Special audit survey data reveals that 42% of small-scale projects require improved file retention completeness, 35% require standardized procurement processes, and 28% require enhanced contract management. The high prevalence of these three core issues renders small-scale projects a "weak link" in audit supervision, harboring significant compliance risks.

Inadequate Inter-departmental Collaboration and Information Sharing Mechanisms

A regular collaborative communication mechanism between audit departments and operational departments (e.g., construction, logistics, infrastructure) is lacking. Information transmission is characterized by lag and fragmentation. Critical information—such as key change negotiations and construction adjustments during project implementation—often fails to reach the audit department in a timely manner. This creates a "time lag" in audit supervision, making dynamic control over the entire project lifecycle difficult to achieve.

Additionally, relevant data from various operational departments are scattered across disparate systems or platforms, lacking a unified information-sharing medium. When performing their duties, auditors must obtain pre-project data, construction process data, etc., through multi-channel communication. This not only increases the time cost of data

acquisition but may also compromise the accuracy of audit judgments due to untimely or incomplete data transmission, thereby reducing overall audit efficiency.

Need for Enhancement in the Refinement of Audit Management and Quality Control

Audit quality directly impacts overall audit effectiveness. In practice, however, inconsistencies in audit standards across certain audit stages are observed. The application of quotas and fee collection standards for similar projects lacks uniformity, leading to disparate audit results. Moreover, the depth of scrutiny applied by some auditors to project details requires strengthening, and the accuracy in identifying highly specialized issues needs improvement. This makes it difficult to promptly detect certain latent risks, resulting in variable quality across audit outcomes.

Furthermore, universities lack a scientific and comprehensive quantitative indicator system for assessing and evaluating audit work. Heavy reliance on subjective judgment makes it challenging to establish effective constraints and incentives pertaining to audit quality, efficiency, and service attitude, ultimately affecting the efficacy of audit resource utilization.

Weak Informatization Support and Need for Strengthened Team Professional Capability

Currently, audit work still relies heavily on traditional manual verification methods. The scope and depth of informatization tool application have not reached an ideal state. Universities have not established a unified engineering audit data platform, making it difficult to achieve efficient audit data processing and rapid risk identification through advanced technical means such as big data analysis and visual comparison. Consequently, audit work efficiency and accuracy are constrained.

Simultaneously, audit work encompasses interdisciplinary knowledge across fields such as engineering technology, project costing, and laws/regulations, imposing higher demands on auditors' comprehensive competencies. Presently, when dealing with complex audit scenarios, the professional capabilities and innovative thinking of the audit team require further refinement. There remains room for improvement, particularly in the application of informatization tools and the exploration of novel audit methodologies.

OPTIMIZATION PATHWAYS FOR HIGH-QUALITY DEVELOPMENT OF ENGINEERING AUDITING IN COLLEGES AND UNIVERSITIES

Improve the Audit Management System and Enhance Full-Process Control Efficiency

Optimize Audit Processes and Standards

Formulate standardized audit data submission checklists, specifying requirements and deadlines for various data types. Incorporate data completeness and timeliness into the performance evaluation indicators of operational departments to promote greater accountability and attention to data submission. Implement classified management and control for projects based on scale and type. For large-scale projects, strengthen full-process tracking and detailed auditing. For small-scale projects, establish a specialized

audit model of "centralized procurement + simplified process + traceable retention," streamlining unnecessary audit steps while reinforcing supervision over key nodes such as procurement processes, contract management, and file retention to address the supervision gap for minor projects.

Balance Audit Intensity Across Stages

Adjust the allocation of audit resources by strengthening the depth and breadth of final accounts auditing. Increase the frequency of on-site inspections, focusing on verifying the authenticity of project quantities and the accuracy of quota application, particularly for concealed works and change negotiations. Enhance the capability to identify hidden issues, striving to raise the final accounts audit reduction rate to the average level of peer institutions. Maintain the preemptive advantage of bid evaluation control price auditing while partially transferring its mature audit standards and methods to construction process auditing. Narrow the gap in audit reduction rates between different stages to achieve balanced supervisory intensity.

Establish a Project Finalization Supervision Mechanism

Implement list-based management for audit projects, clarifying audit milestones, responsible personnel, and completion deadlines for each project. Institute a regular notification system. For projects experiencing delays, promptly investigate causes and supervise operational departments to rectify issues (e.g., untimely data supplementation) within stipulated timeframes. For complex challenges arising during audits, mobilize specialized personnel for focused research and resolution to ensure timely project finalization and improve overall audit process efficiency.

Deepen Inter-Departmental Collaboration and Establish an Information Sharing Mechanism

Establish a Normalized "Integration of Business and Audit" Mechanism

Conduct regular monthly joint meetings between audit and operational departments to synchronize project progress, change information, and existing issues, enabling proactive risk prediction and fostering a collaborative work environment. Grant audit departments appropriate access permissions within the project management system to enable real-time acquisition and viewing of project lifecycle data—including pre-project approval, construction processes, and completion acceptance—thereby breaking down information silos and eliminating the audit supervision "time lag."

Build a Unified Data Sharing Platform

Integrate engineering-related data from various operational departments to construct a unified data-sharing platform encompassing the entire project lifecycle (approval, bidding, construction, final accounts). Enable centralized management, one-click retrieval, and cross-departmental comparison of audit data. Clearly define responsible entities and timelines for data entry and updates to ensure the timeliness, accuracy, and completeness

of platform data. This will improve the efficiency of audit data acquisition and provide robust data support for audit analysis and judgment.

Optimize the Audit Management Model and Strengthen Quality Control

Construct a Full-Process Audit Management System

Enhance the entry and implementation standards for audit work by clarifying professional qualification requirements and work norms for auditors. Elevate the team's professional quality through systematic training. Establish a tripartite quantitative assessment and evaluation system based on "Quality + Efficiency + Service." Define specific evaluation indicators across dimensions such as problem identification accuracy, reasonableness of audit reductions, finalization timeliness, and service response speed. Conduct regular assessments of audit work and link results to rewards, penalties, and promotions, forming an effective incentive and constraint mechanism.

Strengthen Quality Control Throughout the Audit Process

Regularly organize audit business training and exchange sessions to standardize core requirements, including audit standards, quota application rules, and key risk foci, thereby enhancing the pertinence and consistency of audit work. Implement an audit result review mechanism, conducting secondary reviews for projects with abnormally high or low audit reduction rates or incomplete audit reports to ensure output quality. Simultaneously, strengthen dynamic supervision over the entire audit process, standardizing procedures for each stage—including audit plan formulation, evidence collection, working paper preparation, and report issuance—to ensure audit work is conducted in a compliant and orderly manner.

Advance Informatization Construction and Strengthen Team Professional Support

Build an Intelligent Audit Platform

Integrate engineering audit informatization into the university's overall digital construction plan. Increase dedicated funding to build an intelligent audit platform incorporating data collection, analysis, early warning, and archiving functionalities. Introduce advanced technical tools such as big data analysis, BIM technology, and visual comparison. Through features like data modeling and trend analysis, automatically identify risk points—such as abnormal quantity changes, duplicate charges, and incorrect quota applications—facilitating the transition of audit work from "manual verification" to "intelligent auditing" and improving both efficiency and accuracy.

Strengthen Audit Team Development

Formulate a systematic talent cultivation plan, building a tripartite training system encompassing "Policy + Technology + Practice." Regularly organize auditors to participate in training related to engineering technology, project costing, laws/regulations, and the application of informatization tools to enhance the team's comprehensive competency.

Encourage auditors to engage in industry exchanges, practical research, and professional title evaluations, learning from the audit experiences and methodologies of leading institutions to broaden their professional horizons. Establish a talent echelon cultivation mechanism, clarifying mentorship and growth pathways for young auditors. Through methods such as "senior guidance" and on-the-job training, improve the practical abilities of junior staff, optimize the team's professional structure, and provide talent assurance for the high-quality development of audit work.

CONCLUSION

The challenges confronting engineering auditing in colleges and universities—such as inadequate control efficiency, poor collaboration, insufficient refinement in audit management, and weak informatization support—are rooted in deficiencies within the management system, unscientific mechanism design, and irrational resource allocation. By implementing targeted measures—including improving the audit management system, deepening inter-departmental collaboration, optimizing audit controls, promoting informatization, and empowering the workforce—these current dilemmas can be effectively addressed. This will facilitate the transformation of engineering auditing from "post-event supervision" to a comprehensive chain of "pre-event prevention, in-process control, and post-event evaluation." Universities must adopt a problem-oriented approach, continuously refine audit 工作机制, and enhance audit accuracy and efficiency. This will provide a robust guarantee for the high-quality development of campus infrastructure projects and the efficient utilization of fiscal funds.

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