Original Research Article

Optimization and efficiency improvement paths for construction engineering audit processes under the background of smart auditing

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Abstract: With the rapid iteration of digital technologies such as big data, artificial intelligence, and BIM, smart auditing has become a core direction for the transformation and upgrading of the construction engineering auditing field, effectively addressing the pain points of traditional construction engineering audit processes, such as cumbersome processes, low efficiency, and weak risk control. Based on the technical characteristics and core connotations of smart auditing, this paper systematically analyzes the problems existing in current construction engineering audit processes, such as process disconnect, data silos, insufficient technology application, and mismatched personnel qualifications. Combining the audit needs of the entire life cycle of construction projects, it constructs an optimization architecture for construction engineering audit processes from the perspective of smart auditing, proposes targeted efficiency improvement paths, and uses case studies to demonstrate the feasibility of the optimization solutions, providing theoretical support and practical reference for the digital transformation of the construction engineering auditing industry.

Keywords: smart auditing; construction engineering; auditing process; efficiency improvement; process optimization

1. Introduction

Construction project auditing, as a crucial link in ensuring project quality, controlling project costs, and preventing corruption risks, spans the entire lifecycle of a project, from project initiation and design to construction and final settlement. The scientific nature and efficiency of its process directly impact the quality and effectiveness of the audit work. In recent years, Chinese construction industry has developed rapidly, with projects continuously expanding in scale and increasing in technological complexity [1]. Traditional auditing models, primarily based on manual verification, paper archiving, and post-audit, suffer from prominent problems such as long audit cycles, cumbersome data verification, and delayed risk identification, making them inadequate for the refined management needs of modern construction projects. Smart auditing, supported by digital technologies such as big data, artificial intelligence, blockchain, and BIM, achieves automated data collection, intelligent analysis, and precise early warning, breaking down the time and space limitations and process barriers of traditional auditing [2]. Against this backdrop, how to optimize the audit process and improve efficiency of construction engineering projects by leveraging intelligent auditing technology has become a crucial issue that the industry urgently needs to address. This article, based on industry practice, delves into relevant optimization strategies and improvement paths, providing a reference for the industry's digital transformation.

2. Current status and problems of construction project audit processes under the background of smart auditing

2.1. Current status of audit processes

Currently, construction project auditing in China is in a transitional phase from traditional models to smart auditing. The overall application level is still in its early stages, exhibiting a hybrid model of "traditional processes + technology assistance." While some large enterprises have introduced technologies such as BIM and big data, most enterprises still rely primarily on manual review, resulting in fragmented and uneven application of technology. At the project initiation stage, a few projects utilize big data to

verify feasibility study reports, but the degree of automation is low. At the design and bidding stages, the application scope of BIM technology and blockchain evidence storage is limited, and the identification of violations is lagging. At the construction stage, although smart monitoring and AI recognition are applied, data integration among multiple parties is poor, making real-time supervision difficult [3].

2.2. Core problems in the audit process

Based on the current industry situation, the current audit process faces four core problems that hinder the improvement of audit efficiency and quality. First, there is a serious disconnect in processes, insufficient collaboration throughout the entire lifecycle, independent audits at each stage, and an inability to share data across stages, resulting in duplication of work. Multiple stakeholders lack collaborative mechanisms, and data transmission is untimely. Second, technology application is not in-depth, and technology is not sufficiently integrated with processes. Most companies only use intelligent technologies to assist in single-stage audits, without integrating them into core processes.

3. Construction of an optimized audit process architecture for building

Engineering under the Background of Smart Auditing Based on the characteristics of smart auditing technology and the auditing needs of the entire lifecycle of engineering projects, and addressing current issues, an optimized architecture of "one core, four modules, and three supports" is constructed to achieve standardized, intelligent, and collaborative auditing processes [4]. The "one core" is data-driven, integrating data from the entire lifecycle to achieve integrated management and efficient utilization; the "four modules" correspond to the four audit stages, incorporating smart technologies to achieve process optimization and seamless integration; the "three supports" are technology, systems, and talent support to ensure the architecture's implementation (**Figure 1**).

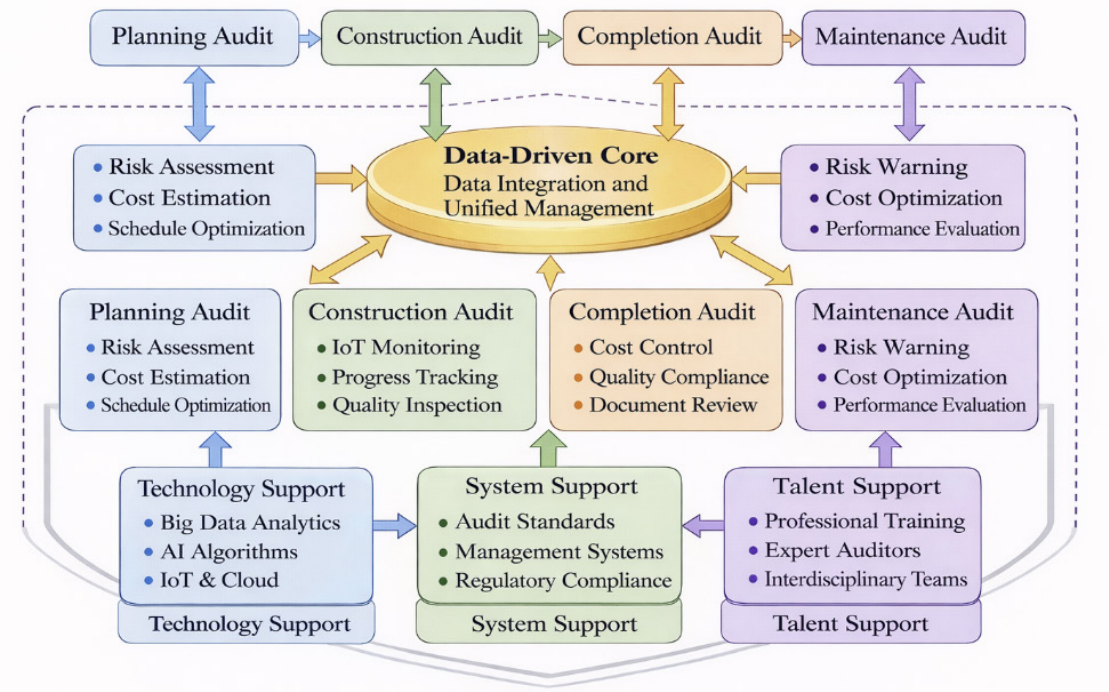

Figure 1. Optimized architecture of construction project audit process under the background of smart auditing.

4. Pathways to improve audit efficiency in construction engineering under the background of smart auditing

4.1. Optimizing the full lifecycle audit process to achieve collaborative auditing

Addressing the issue of process disconnect, a collaborative auditing model is built based on smart technologies. First, a cross-stage data sharing mechanism is established to integrate core data from each stage, enabling one-time collection and multiple uses, reducing redundant verification, and shortening the audit cycle. Second, a cloud-based collaborative platform is built to achieve real-time collaboration among

auditing, construction, engineering, and supervision parties, transmitting audit information and breaking down departmental barriers [5]. Third, process nodes are optimized, redundant steps are eliminated, and core tasks and time nodes for each stage are clarified to achieve process standardization and improve audit collaboration efficiency.

4.2. Building a unified data management platform to solve the data silo problem

Data is the foundation of smart auditing, and a unified platform is needed to solve the data silo problem. First, a unified data management platform for engineering auditing is built to integrate data throughout the entire lifecycle, formulate unified standards, promote the digitization of paper data, and improve collection efficiency. Second, blockchain technology is used to achieve data storage and traceability, ensuring data authenticity and security, and providing reliable support for smart auditing. Third, establish intelligent data analysis models to automatically identify audit discrepancies, verify data, and issue early warnings of risks, thereby improving data utilization efficiency and reducing manual intervention [6-7].

5. Conclusion

This study demonstrates that intelligent auditing technology can effectively address pain points in traditional construction engineering auditing, such as disconnected processes and data silos, driving the transformation of auditing models towards "data-driven" and "full-process control." The optimized architecture constructed in this paper, consisting of "one core, four modules, and three supports," along with the proposed improvement paths including full-process optimization, data platform construction, and in-depth technology application, has been verified as feasible and effective through case studies. It can significantly improve audit efficiency and quality, providing support for the industry's digital transformation.

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