Systematic Review of the Use of Cloud-Based Auditing Systems

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Abstract—The rapid advancement of cloud technologies and their integration with auditing practices have redefined the landscape of assurance services. This systematic literature review (SLR) analyzes 15 peer-reviewed articles published between 2013 and 2025 to explore the development, implementation, and impact of cloud based auditing systems. The review identifies key dependent variables such as audit effectiveness, transparency, data integrity, and fraud detection, alongside technological enablers including artificial intelligence (AI), blockchain, in-memory analytics, and identity based verification schemes. The findings reveal that cloud auditing significantly enhances audit performance through real time access, automation, and secure data verification while also supporting wider digital transformation initiatives like ERP and IoT integration. Despite the observed benefits, challenges persist, particularly concerning data privacy, auditor readiness, and regulatory compliance. This study contributes to the scholarly discourse by mapping the technological and institutional dynamics of cloudbased audits and offers recommendations for future research focusing on sector specific adoption, legal frameworks, and long term impact assessments.

Keywords— Cloud Auditing, Artificial Intelligence, Blockchain, Data Integrity, Audit Automation.

I. INTRODUCTION

The advent of cloud computing has significantly transformed the landscape of information systems, including the domain of auditing. Cloud-based auditing, which refers to the utilization of cloud technologies to support, enhance, or automate audit processes, has emerged as a critical area of interest among researchers and practitioners. This paradigm shift allows for scalable, real-time, and data-intensive audit procedures, offering a level of efficiency and responsiveness previously unattainable in traditional on-premise systems.

The increasing complexity of organizational data, the adoption of digital business models, and the rise of cyber threats have collectively fueled the demand for more robust and adaptive auditing mechanisms. In response, researchers have explored how cloud infrastructures can not only host but also facilitate audit processes through automation, integration with artificial intelligence (AI), and seamless access to distributed data sources. Cloud-based auditing systems are also increasingly integrated with blockchain, IoT, and advanced analytics to enhance transparency, data integrity, fraud detection, and decision-making accuracy.

Recent studies affirm the strategic relevance of cloud-based audit systems in improving audit outcomes. For instance, Appelbaum and Nehmer, highlight that the integration of blockchain with cloud platforms increases audit transparency and traceability, especially in decentralized financial environments [1]. Similarly, Li et al., propose privacy-preserving public auditing protocols that ensure data integrity without compromising user confidentiality [2]. Meanwhile, Abu Huson et al., emphasize the mediating role of auditors in interpreting AI-generated results, suggesting that while automation enhances audit efficiency, human oversight remains essential for contextual judgment [3]. These findings illustrate that cloud-based audits are not merely a technological upgrade but a transformative force in redefining audit functions and expectations.

This paper presents a Systematic Literature Review (SLR) of 15 peer-reviewed articles published between 2013 and 2025, focusing on the adoption, impact, and challenges of cloud-based auditing. The review aims to answer the following research questions:

1. What are the key dependent and independent variables studied in cloud-based audit research?
2. How do technological innovations such as AI, blockchain, and in-memory systems influence audit quality and efficiency in cloud environments?

3. What are the observed benefits, limitations, and future directions of cloud-based auditing systems?

By systematically analyzing relevant academic publications, this review contributes to the consolidation of knowledge in the field, identifies research gaps, and offers insights for future investigation and practical application of cloud-based auditing systems in various sectors, including finance, healthcare, transportation, and government services.

II. LITERATUR RIVIEW

2.1 Cloud Computing: The Technological Foundation

Cloud computing is the backbone technology behind many innovations in modern information systems, offering scalable, on-demand computing resources via the internet. It eliminates the need for organizations to invest heavily in physical IT infrastructure by enabling access to shared pools of configurable resources—such as networks, servers, storage, applications, and services [4]. The characteristics of cloud computing, including elasticity, ubiquitous access, measured services, and rapid provisioning, make it an ideal platform for hosting complex and data-intensive operations, including audit functions.

From a service model perspective, cloud computing is typically categorized into Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS), each offering different levels of control and flexibility. These models enable organizations to shift their focus from hardware maintenance to strategic data management and analytics, including those required for audit practices [5].

2.2 Audit: Principles and Digital Transformation

Auditing, at its core, is the process of examining financial and non-financial records to ensure compliance, accuracy, and integrity of an organization's operations. Traditionally, audits are conducted manually or with the help of limited software tools that support sampling, documentation, and basic analytics. However, the volume, velocity, and variety of modern data have demanded a transformation in audit practices.

Digital auditing involves the use of technology to enhance the audit process. This includes data analytics, continuous monitoring, and automated testing to improve both the efficiency and quality of audits. Wang and Kogan, assert that the evolution of audit practices must align with digital ecosystems that require continuous data evaluation rather than retrospective, sample-based reviews [6].

2.3 Audit Systems and Their Digital Evolution

An audit system refers to the integrated set of processes, tools, and policies used to carry out audit functions. Traditional audit systems typically include audit planning tools, risk assessment modules, documentation platforms, and reporting mechanisms. With digital transformation, these systems have evolved to include advanced analytics, artificial intelligence (AI), and machine learning to facilitate real-time risk analysis and fraud detection [1].

More recently, cloud-based audit systems have emerged as platforms that allow auditors to perform their duties remotely, access data from multiple sources in real time, and leverage advanced computing capabilities without being constrained by local infrastructure. The shift from local audit tools to cloud-enabled audit platforms marks a fundamental change in how assurance services are conducted and delivered.

2.4 Cloud-Based Audit Systems: Integration and Innovation

Cloud-based auditing represents a fusion between cloud computing and auditing systems, offering an environment where audit data and tools are accessible anytime and anywhere. The adoption of cloud-based audit systems has been driven by several factors, including the need for real-time data access, scalability, collaborative auditing, and cost efficiency.

Appelbaum and Nehmer, emphasize that cloud platforms enhance the integrity of audit trails when integrated with blockchain technology, providing immutable and verifiable records [1]. Similarly, Li et al., [2] introduce privacy-preserving auditing protocols for cloud-based medical systems, demonstrating that confidentiality and security can be maintained even in third-party environments.

Advanced cloud audit frameworks often incorporate artificial intelligence to assist auditors in detecting anomalies, predicting risks, and generating automated reports [3]. The role of AI in audit systems is not only limited to efficiency gains but also includes the transformation of auditor responsibilities—where human judgment is required to interpret machine-generated outputs.

Studies have also explored sector-specific implementations. Kumari et al., propose blockchain-based auditing schemes for digital healthcare systems [7], while Ullah et al., focus on secure cloud auditing in IoT environments [8]. These applications reflect the flexibility and potential of cloud-based audit systems to be tailored across industries.

Finally, perceptions and behavioral acceptance of cloud-based audit technologies are gaining attention. Limba et al., found that auditors increasingly view cloud-based audits as reliable and effective, especially as data assurance and transparency improve [9]. Ala'Rabie et al., [10] also showed how cloud auditing mediates the adoption of blockchain in ERP systems, thus playing a strategic role in enterprise digital transformation..

2.5. Systematic Literature Review

A research synthesis technique called the Systematic Literature Review (SLR) aims to clearly, methodically, and reproducibly synthesize and evaluate the empirical data related to a certain topic. SLR differs from a narrative review due to the use of strict data collection methods, inclusion and exclusion criteria, and search algorithms [11].

Among the advantages of SLR include avoiding selection bias in literature, enhancing methodological transparency, and producing a comprehensive knowledge map. SLR enables the analysis of trends and gaps in the taxation environment as well as the identification of best practices from other nations.

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, which provides systematic guidance for preparing and presenting review findings, including the phases of eligibility, identification, screening, and final synthesis, will be used in this study's SLR methodology [12].

III. Methodology

This study adopts the Systematic Literature Review (SLR) methodology to identify, evaluate, and synthesize existing research on cloud-based auditing. The SLR approach ensures a transparent, reproducible, and comprehensive assessment of prior scholarly work, which is essential for consolidating knowledge and identifying gaps in emerging research areas such as cloud-enabled assurance services.

The methodology of this SLR follows the guidelines established by Kitchenham & Charters and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [13]. The review process was conducted in several structured stages:

3.1.1. Planning the Review

Research Objectives:

To explore how cloud technologies are transforming audit systems and to identify technological components, audit variables, and outcomes commonly investigated in the literature.

Research Questions (RQs):

a. What are the key dependent and independent variables studied in cloud-based audit research?

b. What technological innovations (e.g., AI, blockchain, ERP) are used to enhance cloud-based audit systems?

c. What impacts and challenges are reported in the implementation of cloud-based auditing?

3.1.2. Search Strategy

Databases Used:

Scopus, IEEE Xplore, SpringerLink, ScienceDirect, and Google Scholar were used to retrieve academic journal articles and conference proceedings.

Search Keywords:

Keywords included: "cloud-based auditing", "cloud audit systems", "blockchain audit", "AI in audit", "cloud computing for assurance", and "audit automation in cloud environment".

3.1.3. Inclusion and Exclusion Criteria

Inclusion Criteria   Exclusion Criteria

Articles published between 2013–2025 Non-peer-reviewed publications

Written in English   Studies without clear reference to auditing systems Focused on cloud computing in auditing contexts Studies only discussing IT or cloud services without audit relevance

3.1.4. Article Selection Process

The initial search yielded 317 articles. After screening titles and abstracts, 45 articles were retained for full-text review. Based on the inclusion criteria and quality appraisal, 15 articles were finalized for synthesis.

3.1.5. Quality Assessment

Each article was assessed for methodological rigor, relevance to cloud-based auditing, clarity of

objectives, and reported findings. Articles that did not provide empirical, conceptual, or technical contributions were excluded.

3.2. Data Items

Data items extracted from each article were summarized as follows: year of publication, authors, country and research setting, type of data and methodological approach, key research variables, determinants of AI-based audit, Fraud detection, Risk assessment, Audit automation, Machine learning. The stages of the systematic literature review are comprehensively illustrated in Figure 1.

Keywords : "Cloud Auditing", "Cloud-Based Auditing Systems"
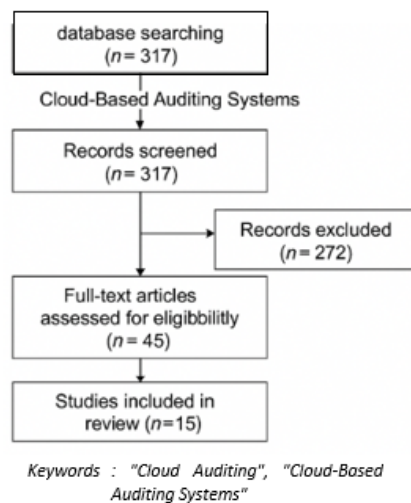
IV. DISCUSSION

The systematic analysis of 15 selected journal articles reveals a multidimensional understanding of how cloud computing is integrated into modern auditing practices. The qualitative synthesis focuses on identifying common research themes, variables, technologies, and implications derived from each study. The findings are grouped thematically to reflect major contributions to the field of cloud-based auditing.

1) Dominant Research Themes and Variable Patterns

The review identifies six dominant themes based on dependent variables observed in the literature: audit performance, audit security and privacy, audit transparency and reporting, data integrity, fraud detection, and auditor perception and technology adoption.

a. Audit performance (n=3) is the most frequently examined outcome, with studies showing how cloud-based systems—especially those incorporating AI and in-memory databases—enhance the accuracy, efficiency, and responsiveness of audit processes, [1], [6].

b. Audit security and privacy (n=4) also receive significant attention. Several studies employ privacy-preserving audit protocols and blockchain-based verification to address concerns of unauthorized access and data manipulation, [2], [14], [8].

c. Audit transparency and reporting (n=2) focuses on how AI and cloud integration improve the traceability and clarity of audit findings [3], [7].

d. Data integrity (n=1) is supported by identity-based schemes that validate records in cloud environments, particularly in transportation and logistics contexts [2].

e. Fraud detection (n=1) is addressed in financial sectors where cloud-based audit systems enable proactive monitoring and fraud risk identification [15].

f. Auditor perception and adoption (n=2) highlight behavioral and institutional perspectives, suggesting growing trust in cloud auditing and its strategic role in digital transformation [9], [10].

2) Technological Innovations and Integration

The synthesis shows that cloud-based auditing is rarely implemented in isolation; instead, it is deeply intertwined with other emerging technologies:

a. Blockchain is utilized in six of the studies to ensure audit traceability, tamper-proof records, and trustless verification [1], [7].

b. Artificial Intelligence (AI) plays a crucial role in risk assessment, automated reporting, and anomaly detection, especially when combined with cloud infrastructure [3].

c. Public auditing protocols and identity-based schemes are employed to protect data privacy while enabling third-party audits [2], [14].

d. IoT environments and ERP systems are also identified as domains where cloud auditing is applied, indicating the versatility of its adoption across industries [8], [10].

3) Sectoral Application and Use Cases

The reviewed studies span multiple industries, including:

a. Finance [15], [10]
b. Healthcare [2], [10]
c. Maritime logistics [2]
d. Public administration and governance [4]

This diversity of application suggests that cloud-based auditing is not confined to a specific sector but is adaptable to varied organizational needs, provided proper frameworks and privacy controls are in place.

4) Identified Research Gaps

Despite the encouraging findings, several gaps remain:

a. A lack of large-scale empirical studies measuring performance before and after cloud adoption.
b. Limited research on legal, regulatory, and ethical implications of automated audit systems.
c. Few longitudinal studies that examine long-term effects of cloud-based audit deployment on organizational compliance behavior.

These findings are further structured in the PRISMA flow diagram (Figure 1) and expanded upon in the following subsections.

Number of Journal Publications by Year (Cloud-Based Auditing Review)
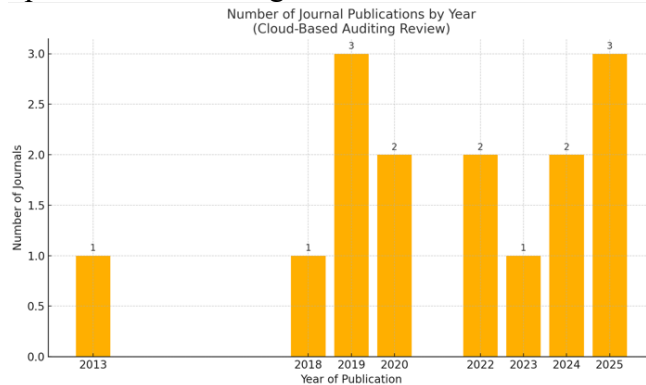
In addition, the 15 chosen papers underwent a qualitative synthesis, as indicated in Table 1.

No	Year	Author	Title	Country & Sample	Purpose
1	2020	Deniz Appelbaum & Robert A. Nehmer	Auditing Cloud-Based Blockchain Accounting Systems	United States; conceptual design of permissioned blockchain in cloud environments (B2B/B2C scenarios)	To propose an audit framework and examine the reliability, data security, and transparency of cloud-based blockchain accounting systems.
2	2022	Xiong Li, Shanpeng Liu, Rongxing Lu, Muhammad Khurram Khan, Ke Gu, Xiaosong Zhang	An Efficient Privacy-Preserving Public Auditing Protocol for Cloud-Based Medical Storage	China; cloud-based medical storage systems (simulated/testbed environment)	To design and evaluate a privacy-preserving public auditing protocol supporting batch auditing and dynamic data updates, aimed at ensuring integrity
			System		of outsourced medical data while reducing computational and communication costs.
3	2025	Yazan Abu Huson; Laura Sierra García; María Antonia García Benau; Nader Mohammad Alja warneh	Cloud-based Artificial Intelligence and Audit Report: The Mediating Role of the Auditor	Jordan; 322 external auditors from various audit offices (partners, assistants, certified)	To explore how cloud-based AI (CBAI) impacts audit reports and the extent to which auditors mediate this relationship, focusing on CBAI's effects on cost efficiency, process streamlining, and audit quality
4	2014	Jungwoo Ryoo, Syed S. Rizvi, William Aiken, John Kissell	Cloud Security Auditing: Challenges and Emerging Approaches	United States; expert interviews with professional cloud auditors, conceptual discussion on IaaS, SaaS, PaaS systems	To identify and elaborate on the unique challenges of cloud security auditing compared to traditional IT audits, and propose emerging approaches to address issues of transparency, encryption, colocation, and scalability.
5	2019	Jingting Xue, Chunxiang Xu, Jining Zhao, Jianfeng Ma	Identity-based Public Auditing for Cloud Storage Systems Against Malicious Auditors via Blockchain	China & USA; Conceptual framework tested using simulated cloud storage environments	To propose a blockchain-supported, identity-based public auditing (IBPA) scheme to ensure data integrity, resist malicious auditors, and eliminate certificate management, leveraging blockchain nonces for transparent audit trails.
6	2023	Xiong Li, Shuai Shang, Shanpeng Liu, Ke Gu, Mian Ahmad Jan, Xiaosong Zhang, Fazlullah Khan	An Identity-Based Data Integrity Auditing Scheme for Cloud-Based Maritime Transportation Systems	China & IoT-enabled Maritime Transportation Systems; simulated/testbed environment	To propose an identity-based dynamic data integrity auditing scheme for CMTS that reduces key-management overhead, supports batch and dynamic data operations, ensures storage correctness, and resists common attacks.
7	2025	Fasee Ullah; Chi-Man Pun; Muhammad Ismail Mohmand; Rakesh Kumar Mahendran; Arfat Ahmad Khan; Sarah M. Alhammad; Joel J. P. C. Rodrigues; Ahmed Farouk	Privacy-Aware Secure Data Auditing for Cloud-Based Intelligence of Things Environment	Multiple countries (Malaysia, China, Pakistan, Saudi Arabia, Brazil, etc.); testbed/simulated cluster-head IoT system in CIoT	To design and evaluate PASDA, a privacy-conserving, homomorphic auditing framework implemented at IoT cluster heads—supporting automated integrity checks, real-time tamper alerts, dynamic data versioning, and secure user revocation
8	2018	Mohammad Moghadasi; Seyed M. Mousavi; Gábor Fazekas	Cloud Computing Auditing	Global context; conceptual review of auditing processes, methods, standards in cloud environments	To provide a comprehensive overview of cloud auditing practices, including techniques, standards/frameworks, and governance strategies for evaluating cloud-based services
9	2019	Suryadipta Majumdar, Taous Madi, Yosr Jarraya, Makan Pourzandi,	Cloud Security Auditing: Major Approaches and Existing	Canada; systematic review of 47 frameworks, protocols, and models across	To comprehensively review and classify cloud security auditing approaches, compare their strengths and

No	Year	Authors	Title	Context	Objective
		Lingyu Wang, Mourad Debbabi	Challenges	academia and industry	limitations, and identify open research challenges in ensuring trust, accountability, and transparency in cloud computing.
10	2020	Xiong Li, Ke Gu, Xiaosong Zhang, Fulei Chu, Muhammad Khurram Khan	Identity-Based Proxy-Oriented Outsourcing with Public Auditing for Cloud Storage System	China, Saudi Arabia; applied model to simulated cloud storage scenarios with third-party audit setting	To propose a novel identity-based proxy-oriented outsourcing (IBPO) scheme enabling delegated and publicly verifiable auditing of cloud storage systems while preserving data privacy and auditability.
11	2024	Cyprian Okey Okoro, Festus Ndubuisi Nkwo, Ijeoma Thelma Edeh	Innovative Approaches to Combating Fraud: A Comparative Analysis of Cloud-Based Audit Solutions of Deposit Money Banks in Nigeria	Nigeria; mixed-methods study with audit professionals, IT staff, and risk managers from multiple deposit money banks	To examine how cloud-based audit solutions compare to traditional auditing in enhancing fraud detection and prevention, examining technological capabilities, implementation challenges, and stakeholders' perceptions.
12	2023	O. A. M. A. Ala'Rabie; H. Al-Rawashdeh; H. Rabie	The impact of cloud-based enterprise resource planning system on blockchain adoption, with the presence of cloud auditing as an intermediary variable in Jordanian commercial banks	Jordan; all 12 commercial banks listed on the Amman Stock Exchange as of end-2022; survey of bank staff	To examine how cloud-based ERP adoption influences blockchain adoption through the mediator of cloud auditing, assessing direct and indirect effects within Jordanian banking context
13	2025	Franco Benony Limba; Shella Gilby Sapulette; Theresia Febiengry Sitanala	Auditor Perception of Cloud Technology-Based Audits	Indonesia; auditors (survey/interview participants) from various audit firms in Indonesia	To explore auditors' perceptions regarding the benefits, challenges, and professional implications of adopting cloud-based audit technology, focusing on efficiency, data access, security concerns, and organizational readiness
14	2024	Deepika Kumari; Pankaj Kumar; Sunil Prajapat	A Blockchain Assisted Public Auditing Scheme for Cloud-Based Digital Twin Healthcare Services	India; simulated cloud-based digital twin healthcare network integrating blockchain, certificateless cryptography, and public auditors	To design and evaluate a certificateless, blockchain-enabled auditing protocol that ensures data integrity, privacy, public verifiability, and low computational overhead in cloud-hosted digital twin healthcare systems
15	2020	Yunsen Wang; Alexander Kogan	Cloud-Based In-Memory Columnar Database Architecture for Continuous Audit Analytics	USA; prototype implemented on a cloud-hosted in-memory columnar database, evaluated through simulation tests	To introduce and evaluate a cloud-hosted, in-memory columnar database architecture, designed to support high-speed continuous audit analytics, and to compare its performance against

traditional ERP systems.

Summary of the Impact

Here is the table with a summary of the impact of independent variables (IV) on dependent variables (DV).

No	Dependent Variable Group	Dependent Variable (DV)	Independent Variables (IV)	Summary of Impact
1	Audit Performance	Audit effectiveness, Cloud auditing effectiveness, Continuous audit analytics performance	Cloud-based blockchain systems, Security auditing approaches, In-memory columnar database architecture	Cloud technologies improve audit effectiveness, enable continuous analytics, and optimize auditing strategies for performance gains.
2	Audit Security & Privacy	Privacy preservation in cloud auditing, Security auditing outcomes, Audit integrity, Privacy and security in cloud auditing	Public auditing protocols, Cloud security frameworks, Blockchain protocols, IoT secure auditing methods	These technologies strengthen data privacy, improve trust in auditing outcomes, and mitigate risks of unauthorized access.
3	Audit Reporting & Transparency	Audit report quality, Audit transparency	Cloud-based artificial intelligence, Blockchain in digital twin systems	AI and blockchain improve transparency and enrich audit reporting with intelligent analysis and traceability.
4	Data Integrity	Data integrity	Identity-based auditing schemes	Ensures robust verification of data across maritime and cloud storage environments, reducing risk of tampering.
5	Audit Delegation & Outsourcing	Outsourced data auditability	Identity-based proxy outsourcing	Provides secure external audit mechanisms while preserving data ownership and privacy.
6	Fraud Detection	Fraud detection effectiveness	Cloud-based audit solutions	Strengthens fraud detection capability through proactive cloud monitoring and audit automation.
7	Blockchain Adoption	Blockchain adoption	Cloud-based ERP systems, Cloud auditing	Drives adoption of blockchain by integrating it with ERP and cloud audit practices for better enterprise transparency.
8	Perception & Acceptance	Auditor perception	Cloud technology-based audits	Indicates growing auditor confidence in cloud systems, supporting adoption of modern audit platforms.

The integration of cloud computing into auditing practices has led to significant improvements in audit performance, particularly in terms of efficiency, effectiveness, and

continuous audit capabilities. Technologies such as blockchain and in-memory databases enable real-time processing, automation, and scalable analytics that reduce manual intervention and enhance audit reliability. These capabilities are essential in dynamic environments where data volume and complexity demand faster and more intelligent audit mechanisms.

In the area of security, privacy, and data integrity, cloud-based auditing systems have demonstrated strong potential. Public auditing protocols, identity-based verification schemes, and blockchain ensure secure, tamper-resistant audit processes. Such frameworks enhance transparency, prevent unauthorized access, and maintain the consistency of data across distributed networks. Moreover, these systems support fraud detection by enabling continuous monitoring and anomaly detection, allowing organizations to identify irregularities proactively.

The review also highlights that cloud-based audit solutions facilitate wider adoption of emerging technologies such as blockchain and AI, particularly when integrated with enterprise systems like ERP. In addition, auditor perception has become increasingly positive, driven by the benefits of accessibility, traceability, and improved reporting. As a result, cloud-based auditing is not only transforming technical aspects of audit functions but also influencing institutional readiness and trust toward modern assurance practices.

V. CONCLUSSION

This study conducted a Systematic Literature Review (SLR) to examine the development and implementation of cloud-based auditing systems. By reviewing 15 selected journal articles from 2013 to 2025, this review provides a synthesized understanding of the core variables, technological advancements, and reported impacts associated with cloud-based audit frameworks.

The analysis identified that cloud-based auditing studies consistently investigate dependent variables such as audit effectiveness, audit transparency, data integrity, fraud detection, and auditor perception. These are influenced by independent variables including blockchain integration, artificial intelligence, public auditing protocols, cloud infrastructures, and identity-based verification schemes. The relationship between these variables highlights a research focus on improving audit quality, security, and efficiency through digital tools.

Several technological innovations were found to enhance cloud-based audit systems. The most dominant are blockchain, which ensures data immutability and audit trail integrity; artificial intelligence, which supports automation, anomaly detection, and predictive analysis; and cloud-based ERP integration, which enables cross-functional data visibility and real-time processing. Identity-based encryption, proxy auditing mechanisms, and in-memory analytics also appear as technical enablers that support secure and scalable auditing operations.

Answering the third research question, the review shows that the implementation of cloud-based auditing delivers positive impacts such as increased audit performance, enhanced transparency, and improved fraud risk management. However, several challenges remain, particularly related to privacy concerns, auditor competency in handling AI systems, lack of standardized frameworks, and resistance to technological change. These issues suggest the need for future research that explores regulatory readiness, long-term organizational impact, and sector-specific adoption models for cloud auditing.

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