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The economics of digital audit: Mapping the impact of emerging technologies on audit fee determination

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Abstract

This study examines the impact of technological advancements on audit fee determination, particularly in the context of digitalization and the integration of emerging technologies. Through a literature review, the study explores how artificial intelligence, big data analytics, automated accounting systems, cloud computing, and audit support systems influence audit fees. The findings suggest a complex relationship between technology and audit fees, characterized by both efficiency gains and increased complexity. Early stages of digital adoption lead to higher audit fees due to uncertainty and initial investments, while more mature technologies drive cost reductions through improved efficiency and reduced audit risk. The study highlights that technological developments act as both catalysts for efficiency and sources of new risks, such as cybersecurity threats and the need for specialized expertise. The paper contributes a conceptual framework for understanding these dynamics and identifies key moderating factors such as industry, regulatory context, and digital competencies of auditors. This work provides insights into how audit firms can adjust their fee structures in response to the evolving digital landscape.

Keyword: digitalization, audit fee, information technology

INTRODUCTION

The integration of information technology (IT) into the audit process has become an inevitable necessity in the digital age. Although technology presents opportunities for efficiency and increased audit coverage, this transformation also gives rise to a new spectrum of increasingly complex audit risks. In this article, the terms information technology and digitization are used interchangeably.

Audit firms and auditors are potentially impacted by advances in information technology, particularly in big data analysis, artificial intelligence (AI), and blockchain technology (Tiberius & Hirth, 2019). In addition, the proliferation of big data and the use of sophisticated analytical tools offer broader audit insights but paradoxically increase risks related to evidence validity, algorithmic bias, and transparency of analysis results (Eilifsen et al., 2020). Auditors must now be able to make professional judgments in critically designing and interpreting analytical procedures (Lehner et al., 2022). Cyber threats further reinforce the urgency of updating audit risk models, which must consider the potential for data and operational disruptions due to digital incidents (H. Li et al., 2020). Therefore, auditors need to improve their IT

competencies and collaborate with technology specialists to ensure that IT-based controls are effective (Fotoh & Lorentzon, 2021).

Prior studies suggest that the impact of technology on audit fees is inherently complex and often produces contradictory findings. While digital technologies can reduce audit effort, information asymmetry, and audit risk through enhanced transparency and automation, they may also increase audit fees by introducing new technological risks, greater system complexity, and additional demands for specialized expertise (Banker et al., 2020; Calderon & Gao, 2021; Hoffman et al., 2018). Moreover, empirical evidence indicates that the relationship between technological adoption and audit fees may be non-linear, with audit costs increasing during the initial stages of digital transformation before declining as technological systems become more mature and integrated into organizational processes (Xin et al., 2024; Zhou, 2023). Accordingly, this study addresses the following research questions is how does the role of information technology affect audit fees? (RQ1) and what are the opportunities for future research? (RQ2).

There are several objectives in this study, including the following. First, this study aims to review and confirm that the impact of technology on audit fees is ambivalent (Zhou, 2023; Banker et al., 2020). Technology can be a catalyst for efficiency but also increases risk exposure, which ultimately significantly affects the strategy for determining audit fees. Second, this literature study was conducted to get a comprehensive understanding of how technological evolutions affect the determination of audit fees in the context of modern auditing practices. Technological evolutions, including the use of big data, digitization of information systems, automation of accounting processes, use of cloud computing, and cybersecurity threats, have changed the risk structure, audit complexity, and auditor competency requirements. Third, this literature review seeks to identify patterns of empirical findings and knowledge gaps that remain unexplained through a critical analysis of previous research (Massaro et al., 2016). Articles were collected from reputable scientific databases such as Scopus, EBSCOhost, and Google Scholar, taking into account the relevance of the topic and the credibility of the publication.

This study provides significant theoretical and practical contributions to understanding the impact of digitization on audit fees in a global context. Technological evolutions have fundamentally transformed the audit process. These changes include how auditors collect evidence, analyze data, and manage risk, which ultimately impacts audit efficiency and costs (Maghakyan et al., 2025; Wang et al., 2025). In general, the adoption of digitalization is associated with a reduction in auditor workload (audit effort) and audit fees, without compromising audit quality (Wang et al., 2025). However, this study also reveals more complex dynamics: in some cases, high digital expertise among audit partners actually leads to higher rates due to the value-added services offered (Maghakyan et al., 2025) as well as increased risks and complexity in the early stages of digital transformation (Xin et al., 2024).

This study should provide useful insights for auditors, clients, and regulators in designing optimal digitization strategies and in establishing audit fee structures that are proportional to the risks and complexities involved. Thus, this synthesis not only addresses the literature gap but also unlocks opportunities for further research (Massaro et al., 2016) related to auditing in the emerging digital era.

This study is organized into interconnected sections. The first section is an introduction that describes the background of the research. The second section presents a comprehensive literature review that discusses fundamental concepts in auditing. The third section describes the research methodology used. The fourth section presents the empirical findings obtained from data analysis. The fifth section is an in-depth discussion of how technological developments and digitalization have an impact on determining audit fees. The sixth section identifies opportunities for future research. The final section summarizes all findings and limitations and presents the contributions of the study.

LITERATURE BACKGROUND

Modern auditing practices are now characterized by system automation, large-scale data analysis, and ever-evolving cyber threats. Automation speeds up the auditing process, but it creates black box risks, where the opacity of algorithmic processes can hide errors or manipulations that are not easily detected through conventional procedures (Zhong & Goel, 2024). High dependence on IT systems in financial reporting makes system integrity, data security, and consistency of automated controls key factors in maintaining audit effectiveness (Lehner et al., 2022). Audit firms and auditors are potentially impacted by advances in information technology, particularly in big data analysis, artificial intelligence (AI), and blockchain technology (Tiberius & Hirth, 2019).

In addition, the proliferation of big data and the use of sophisticated analytical tools offer broader audit insights but paradoxically increase risks related to evidence validity, algorithmic bias, and transparency of analysis results (Eilifsen et al., 2020). Auditors must now be able to make professional judgments in critically designing and interpreting analytical procedures (Lehner et al., 2022). Cyber threats further reinforce the urgency of updating audit risk models, which must consider the potential for data and operational disruptions due to digital incidents (H. Li et al., 2020). Therefore, auditors need to improve their IT competencies and collaborate with technology specialists to ensure that IT-based controls are effective (Fotoh & Lorentzon, 2021).

Several classical literature sources indicate that audit activities always involve inherent risks (Palmrose, 1989; Francis, 1984; Francis, 2004; Simunic, 1980). In modern audit practice, the relationship between audit risk and technological developments has direct implications for the structure of audit fees. The application of digital technology, automation, and advanced data analytics can indeed increase efficiency and expand the scope of examination, but at the same time also creates new complexities that increase inherent risk and control risk (Shih & Chu, 2024; Calderon & Gao, 2021; Rosati et al., 2019). Auditors need to invest additional resources to understand clients' IT-based systems, evaluate automated controls, and test the reliability of digital data (Bao Ngo & Tick, 2021).

These increased audit efforts have implications for higher audit fees as compensation for the additional risk and workload (Akinola & Olagunju, 2023; Maghakyan et al., 2025). The greater the risk and complexity of the audit, the higher the level of audit effort and costs required to maintain audit quality (Francis, 2004). Thus, in the digital era, audit fees are not only a reflection of labor costs but also a representation of auditors' ability to manage the technological risks inherent in modern financial audit processes.

The Technology–Audit Fee Relationship: Risk, Complexity, and Efficiency

The rapid diffusion of digital technologies has fundamentally altered the determinants of audit fees by reshaping the information environment, audit risk, audit effort, and technological capabilities required to provide assurance. Evidence from Big Data and Big Data Analytics (BDA), XBRL/iXBRL, information technology, digital transformation, FinTech, cybersecurity, artificial intelligence (AI), automated accounting systems (AAS), and cloud computing, however, does not support a uniform effect of technology on audit pricing. The literature shows a tension between efficiency and complexity. Digital technologies can reduce audit effort and risk premiums by improving information quality, transparency, and internal controls, but they can also increase audit fees through costs, uncertainty, cybersecurity exposure, and demand for expertise. The effect depends on technology maturity, conditions, organisation, and auditors' capabilities (Abdelwahed et al., 2025; Wu et al., 2024; Shan & Troshani, 2014; Shan et al., 2015; Shan & Troshani, 2016; Makni et al., 2018; Amin et al., 2018; Cheng et al., 2024)

The evidence on Big Data, BDA, XBRL (eXtensible Business Reporting Language), and iXBRL (interactive eXtensible Business Reporting Language) illustrates this tension particularly clearly. BDA can accelerate data processing, improve anomaly detection, enhance transparency, and support continuous auditing, potentially reducing audit effort. Yet implementation requires investment in infrastructure, analytical tools, system development, and auditor training, while integrating new analytical technologies with conventional procedures can initially increase audit complexity and fees (Abdelwahed et al., 2025). The importance of institutional context is evident in the contrasting experiences of Egypt and China. In Egypt, technological investment and methodological adjustments initially increased audit fees, whereas China's Golden Tax Project Phase III improved fiscal transparency and reduced substantive audit procedures, resulting in a reduction in audit fees (Wu et al., 2024). Similarly, XBRL and iXBRL can reduce audit effort by improving standardization, machine readability, and comparability (Makni et al., 2018 ; Shan & Troshani, 2014), but early adoption may increase fees because auditors must validate digital reporting systems and data tagging. Mandatory XBRL adoption in China increased audit fees through greater audit risk and scope (Shan & Troshani, 2016), while iXBRL generated risk premiums associated with potential misunderstanding of the assurance provided over digitally reported information (Cheng et al., 2024). Cross-country evidence further shows that mature reporting environments and lower litigation risk facilitate fee reductions, whereas stronger legal exposure encourages higher risk premiums (Shan et al., 2015). These findings indicate that technological adoption alone is insufficient to explain audit pricing; rather, its economic consequences depend on how effectively technology is embedded within the reporting and assurance environment.

The same efficiency–complexity tension characterizes information technology and broader digital transformation. Effective IT controls can reduce control risk, improve financial reporting reliability, and decrease substantive testing and audit fees (Daigle et al., 2008; Chen et al., 2014; Wang et al., 2025; Mazza & Azzali, 2018). Conversely, highly sophisticated IT environments require auditors to evaluate ERP systems, cybersecurity controls, and automated processes, increasing the demand for specialized expertise and audit effort (Hoffman et al., 2018). Digital transformation therefore produces a temporal effect. In early stages may increase audit fees because of system changes, technological uncertainty, auditor adaptation, and specialist requirements, whereas greater maturity can improve information symmetry and audit efficiency (L. Zhang & Balia, 2024) (Xin et al., 2024). This pattern is consistent with evidence of an inverted U-shaped relationship between digitalization and audit fees (Xin et al., 2024). Digital transformation may also generate interorganizational consequences. Integrated digital information can reduce duplicated audit procedures across supply chains, but inadequate data-sharing mechanisms can increase risk (L. Li et al., 2024; Wu et al., 2024). Meanwhile, demand for technologically capable auditors can increase auditor switching and pricing, particularly when clients require advanced digital expertise (Liang, 2024; Zhou, 2023).

FinTech and cybersecurity further demonstrate that digitalization simultaneously creates efficiency opportunities and new risk exposures. FinTech can improve transaction traceability, internal controls, and transparency, reducing information asymmetry and audit risk for digitally mature firms (Shih & Chu, 2024; Meng et al., 2025). However, integration of AI, blockchain, cloud computing, and Big Data also creates risks involving data security, digital transactions, and regulatory compliance, increasing the demand for interdisciplinary expertise and potentially raising audit fees (Shih & Chu, 2024). Cybersecurity represents an even more direct transformation of audit risk. Data breaches compromise information-system integrity and internal controls and increase auditors' professional, litigation, and reputational exposure (Smith et al., 2019; Y. Zhang & Smith, 2023; Xiong, 2025; Calderon & Gao, 2021; H. Li et al., 2020; H. Li et al., 2024; Rosati et al., 2019; Bao Ngo & Tick, 2021; Jiang, 2024; Karyani et al., 2023). Actual breaches increase audit fees through additional testing and risk premiums (Smith et al., 2019; H. Li et al., 2020), while cyber-risk disclosures can influence pricing even without an incident (Rosati et al., 2019; Karyani et al., 2023;

Jiang, 2024). Importantly, cyber risk can extend beyond the affected firm through supply-chain spillovers, requiring auditors to reassess the risks of interconnected firms (Y. Zhang & Smith, 2023). Thus, digitalization expands audit risk from firm-specific financial uncertainty toward interconnected technological and systemic exposures.

The effects of intelligent and automated accounting technologies further clarify why technological development cannot be treated as inherently cost-reducing. AI can lower audit fees by improving information quality, reducing information asymmetry, detecting anomalies, and lowering perceived audit risk, although these benefits depend on organizational characteristics and internal control maturity (Lai, 2025). By contrast, AAS is associated with higher audit fees because automation shifts audit effort toward evaluating ERP systems, automated controls, and technology-enabled processes (Akinola & Olagunju, 2023). Cloud computing similarly combines efficiency gains from automation, centralization, and digital audit trails with additional risks related to third-party providers, distributed data, security, and regulatory compliance; reliable SOC reports can mitigate these risks and reduce additional audit effort (Banker et al., 2020).

In auditor-level technologies, the literature identifies information accessibility, audit support systems, and auditor expertise as important determinants of the economic consequences of digitalization. Restricted access to credible external information increases audit effort, information asymmetry, and risk premiums, whereas alternative information sources can mitigate these effects (Zu, 2023). Structured audit support systems can reduce audit costs through automated tailoring, decision support, and integration, although their benefits are greater in standardized industries than in highly specialized sectors (Carson & Dowling, 2012). At the audit partner level, digital expertise generates specialization premiums because experience with highly digital clients produces scarce tacit knowledge and enhances the ability to address complex technological risks (Maghakyan et al., 2025). However, the decline in digital expertise premiums during 2019–2021 suggests that such expertise is gradually becoming a general rather than exclusively specialist competency (Maghakyan et al., 2025).

RESEARCH METHOD

This study aims to introduce, summarize, and analyze the scope of literature on audit fees, especially in the context of information technology evolution and digitization. The articles analyzed were obtained through a systematic search process that combined electronic and relevance approaches. The literature search was conducted using the Scopus database, supported by the Publish or Perish tool, with combination of keywords such as audit fees, digitalization, and audit pricing. This process resulted in a total of 860 articles, most of which were published in reputable international accounting, auditing, and technology journals, with publication periods between 2008-2025. To ensure rigor in methodology, this study employs a thorough literature review (Webster & Watson, 2002; Massaro et al., 2016). The review process, detailed in the PRISMA flowchart (Figure 2). Three main inclusion criteria were used to maintain the quality and validity of the findings. First, only articles published in journals indexed by Scopus were included, while working papers or unpublished articles were excluded. Second, articles had to be written in English and available in full access. Third, the time frame of the study was limited to the period from 2008 to 2025, reflecting the emergence of the phenomenon of audit digitization, which has been the main focus over the past two decades.

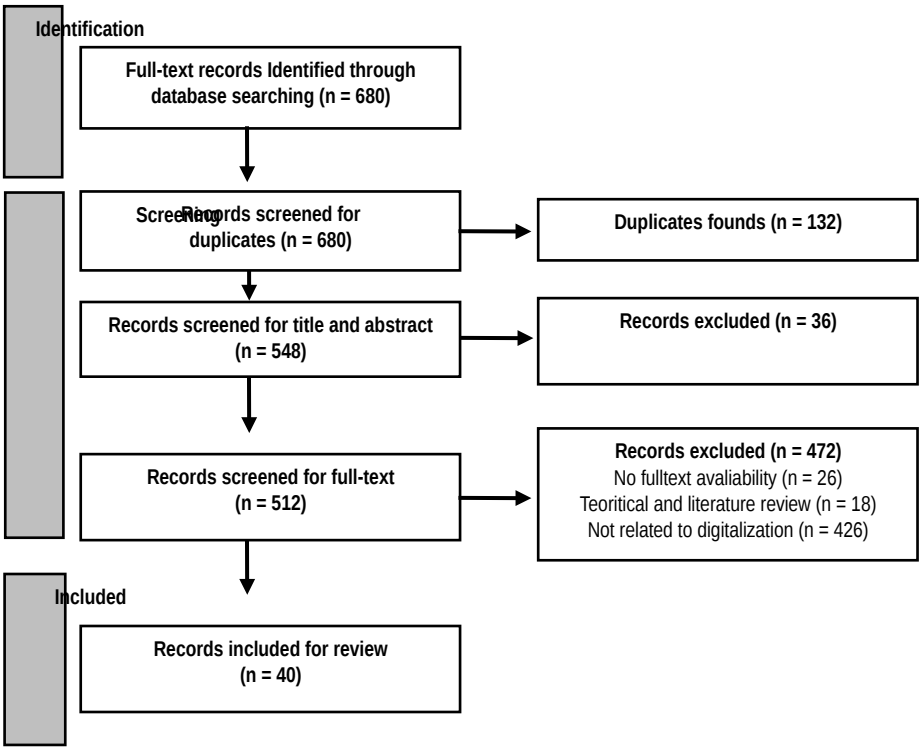


Figure 1. PRISMA chart

In combination with articles that focus directly on determining audit fees, several studies that discuss the application of information technology more broadly—such as research on audit report lag (Amin et al., 2018), audit risk (L. Zhang & Balia, 2024), and auditor switching (Liang, 2024)—are also included due to their relevant contributions to the empirical understanding of audit fees. Although these two studies do not explicitly focus on audit fees, their empirical results still provide important insights into the relationship between technological complexity and audit pricing dynamics. Therefore, this review provides a comprehensive and cross-disciplinary overview of the impact of digitalization on audit fee structures. Overall, this article is not limited by geographical or regional issues, as it is designed to provide a comprehensive understanding of the empirical literature on audit fee determination.

RESULTS

In overall, most studies employ an empirical regression-based approach, with the exception of Xiong (2025) study, which uses case studies. Table I shows the distribution of articles based on the years of studiess. An analysis of 40 academic publications covering the period from 2008 to 2025 reveals a concentrated yet diverse research landscape in fields related to accounting, finance and information systems.

Table 1. Trend Studies By Years

No	Authors	Year
1	Daigle et al	2008
2	Carson, Dowling	2012
3	Shan and Troshani; Chen et al	2014

No	Authors	Year
4	Shan et al	2015
5	Shan and Troshani	2016
6	Amin et al; Makni et al; Hoffman et al; Mazza and Azzali	2018
7	Rosati et al; Smith et al	2019
8	Calderon and Gao; H. Li et al; Banker at al	2020
9	Ngo and Tick	2021
10	Zhou; Karyani et al; Zhang and Smith; Akinola dan Olagunju; Zu	2023
11	Abdelwahed, et al; Wu et al; Cheng; Zhang and Sulong; Xin et al; H. Li et al; Liang; Wu; Lou and Zhou; Shih and Chu; Meng et al; L. Li et al; Jiang	2024
12	Abdelwahed, et al; Wang et al; Xiong; Xiong et all; Lai; Maghakyan et al	2025

Based on Table 1, research publication trends from 2008 to 2025 has a significant increase in research productivity can be observed. Starting with the pioneering publication by Daigle et al. (2008), followed by Carson & Dowling (2012), research activity began to show consistency in 2014 with contributions from Shan & Troshani (2014) and Chen et al. (2014). The 2018-2019 period signaled a phase of stable growth with four publications in 2018 and two publications in 2019. This signaled a growing interest in research on the impact of technology implementation on audit fees. The 2020-2021 period was highlighted by five publications. In 2023 with five publications and peaked in a highly productive 2024 with twelve publications from various authors. This trend not only indicates a mature field of research. This active trend continues into 2025 with six publications already identified, indicating that interest and research output in this field continue to experience rapid development, especially in the last three years.

Table 2. Trend Studies By Topics

No	Topic	N	No	Topic	N
1	Big Data and Analitic	3	8	Artificial Inteligent	1
2	XBRL and iXBRL	6	9	Automated Accounting System	1
3	Information Technology	5	10	Cloud	1
4	Digital Tranformation	8	11	Information Accessibility	1
5	Financial Technology	2	12	Audit Support Systems	1
6	Cyber Security and Risk	7	13	Audit Partner Digitalization Expertise	1
7	Data Breaches	3			
				Total	40

Table 2 shows various studies on the application of technology in audit practices have created complex dynamics in determining audit fees, with each category exerting a different influence through specific mechanisms. There are 13 topics discussing how technological evolution can determine the audit fees charged by auditors to their clients.

DISCUSSION

The literature reviewed reveals that technological development has fundamentally reshaped the economic structure of financial statement auditing by altering the mechanisms through which audit risk, audit effort, and audit fees are determined. Rather than exerting a uniformly positive or negative influence, emerging technologies generate a dynamic and non-linear relationship with audit pricing, reflecting the coexistence of efficiency gains and technological complexity (Banker et al., 2020; Zhou, 2023)

Empirical evidence supports an inverted U-shaped relationship between digitalization and audit fees, whereby audit costs initially increase before declining as technologies mature (Xin et al., 2024). In the early

stages, substantial investments in cloud computing, automated accounting systems, Big Data Analytics, AI, and other technologies, combined with auditors' unfamiliarity with new environments, can outweigh efficiency gains (Abdelwahed et al., 2025; Akinola & Olagunju, 2023). Incomplete system integration, evolving internal controls, and uncertain technology-related risks further increase financial reporting and audit uncertainty (Chen et al., 2014; Mazza & Azzali, 2018). Auditors therefore require additional effort to understand information systems, assess technology-enabled controls, validate digital evidence, and adapt audit methodologies (Abdelwahed et al., 2025; Banker et al., 2020). Cybersecurity threats and data governance challenges further increase perceived risk, requiring IT specialists, broader substantive testing, and additional procedures (Calderon & Gao, 2021; H. Li et al., 2020; Banker et al., 2020). At the same time, firms and auditors incur substantial investments in digital technologies, training, and analytical capabilities, while limited implementation experience increases judgment and litigation risks (Maghakyan et al., 2025; Zhou, 2023). Consequently, audit fees tend to rise during the implementation stage because technological complexity, investment costs, and heightened audit risk initially outweigh efficiency gains (Xin et al., 2024).

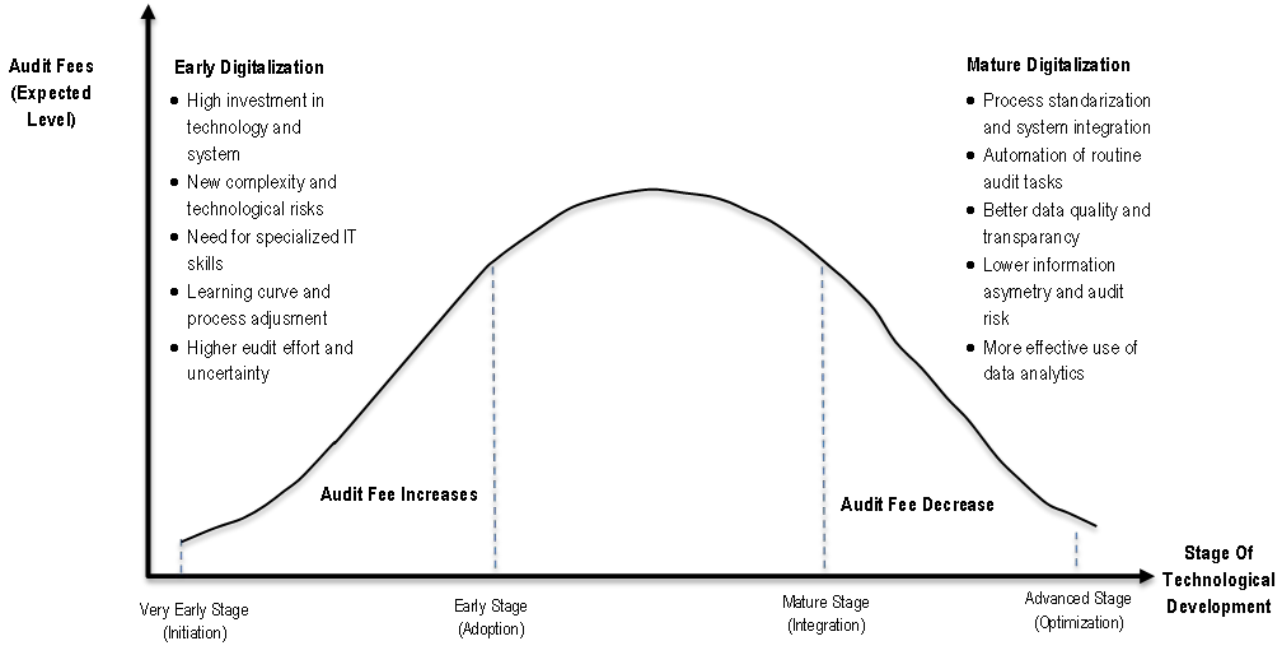


Figure 2: Conceptual Framework: The Inverted U-Relationship Between Technological Development and Audit Fees

In the transition toward digital maturity, the relationship between technological development and audit fees gradually shifts from increasing complexity to greater audit efficiency (Xin et al., 2024). As digital systems stabilize, organizational learning accumulates, and auditors gain experience, implementation costs and technological uncertainties diminish. This marks the turning point at which technological benefits begin to outweigh the additional audit effort required during implementation (Xin et al., 2024). Greater integration improves financial reporting quality through enhanced data accuracy, transparency, standardized processes, and stronger internal controls, thereby reducing information asymmetry between management and auditors (Chen et al., 2014; Lai, 2025; Mazza & Azzali, 2018; Wang et al., 2025). Auditors can consequently perceive lower audit risk, reduce substantive testing, and rely more on technology-assisted procedures and data analytics (Lai, 2025; Meng et al., 2025). Integrated audit support systems further reduce routine work

and audit hours (Carson & Dowling, 2012), while mature cloud environments supported by reliable SOC reports reduce uncertainty over third-party controls and associated risk premiums (Banker et al., 2020). Accordingly, audit fees begin to decline beyond the turning point as improvements in information quality, internal controls, technological reliability, and audit efficiency increasingly outweigh the complexities and risks of digital transformation, producing the downward slope of the inverted U-shaped relationship (Xin et al., 2024).

In the final stage, organizations progress from digital maturity toward optimization, where technological innovation becomes a strategic enabler of high-quality financial reporting and risk-based auditing. Fully integrated digital technologies allow auditors to leverage information systems, continuous auditing, and advanced analytics for more focused and timely procedures (Meng et al., 2025). Improved reporting quality, standardized processes, and stronger internal controls reduce information asymmetry and increase auditors' confidence in financial statement reliability (Chen et al., 2014; Lai, 2025; Mazza & Azzali, 2018; Wang et al., 2025). AI and advanced analytics further enhance audit effectiveness by automating routine procedures, detecting anomalies across entire populations, and directing attention toward high-risk transactions requiring professional judgment (Lai, 2025; Meng et al., 2025). Similarly, structured audit support systems and mature cloud environments reduce audit production costs through automation, standardized workflows, and reliable technology controls, including SOC reports (Banker et al., 2020; Carson & Dowling, 2012). As digital expertise becomes institutionalized within audit firms, the scarcity and premium associated with specialized digital skills also decline (Maghakyan et al., 2025). Consequently, at advanced levels of digital maturity, audit fees are increasingly shaped by sustained improvements in reporting quality, audit efficiency, and effectiveness rather than implementation complexity. This explains the downward trajectory of the inverted U-shaped relationship, as the cumulative benefits of technological maturity increasingly outweigh adoption costs and risks (Xin et al., 2024).

The previous studies consistently demonstrate that technological development influences audit fees, the underlying mechanisms through which the relationship occurs remain fragmented across the literature. Existing empirical evidence suggests that emerging technologies do not directly affect audit pricing. Rather, their influence operates through a series of interconnected changes in the audit environment and audit process (Banker et al., 2020; Chen et al., 2014; Calderon & Gao, 2021). Figure 2 illustrates the sequential process through which technological adoption influences audit fee determination.

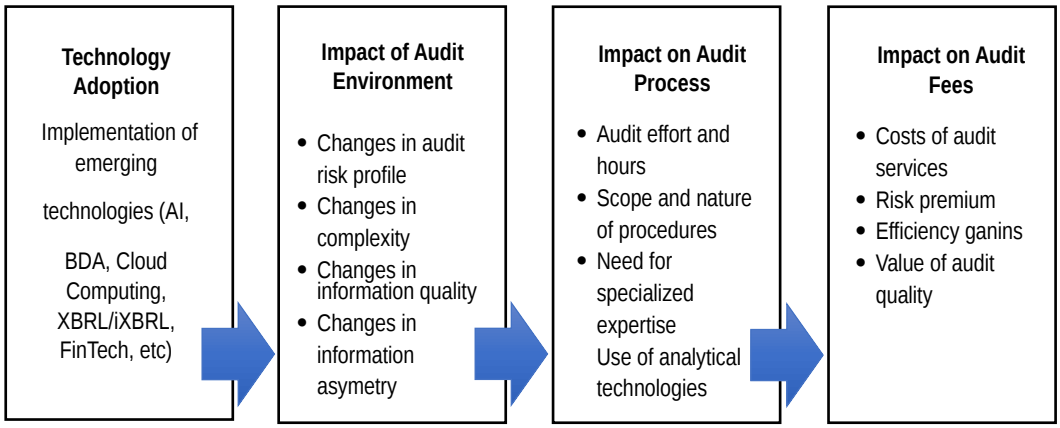


Figure 3: Mechanism How Technology Affects Audit Fee

The conceptual mechanism through which technological development influences audit fee determination is shown in Figure 3. The process begins with the adoption of emerging technologies, including artificial intelligence (AI), Big Data Analytics (BDA), cloud computing, XBRL/iXBRL, financial technology (FinTech), and other digital innovations that fundamentally transform organizations' financial reporting environments (Abdelwahed et al., 2025; Lai, 2025; Shan & Troshani, 2016; Xin et al., 2024). Rather than affecting audit fees directly, these technologies first reshape the audit environment by altering the client's audit risk profile, operational complexity, financial reporting quality, and information asymmetry. Improvements in information quality and internal control effectiveness generally reduce audit risk, whereas technological complexity and cybersecurity threats may temporarily increase uncertainty during technology implementation (Chen et al., 2014; Mazza & Azzali, 2018; Calderon & Gao, 2021; H. Li et al., 2020).

Changes in the audit environment subsequently reshape the audit process, influencing audit effort, hours, testing procedures, and the digital expertise required. Advanced technologies increase reliance on data analytics, continuous auditing, and technology-assisted procedures while raising demand for specialized digital competencies, particularly during implementation (Abdelwahed et al., 2025; Carson & Dowling, 2012; Maghakyan et al., 2025). Audit fees therefore reflect the combined effects of audit effort, complexity, and risk assessment. During early digital transformation, fees tend to increase as implementation costs, technological uncertainty, and risk premiums outweigh efficiency gains. As digital maturity develops, improved reporting quality, stronger internal controls, reduced information asymmetry, and more efficient procedures lower audit risk and effort, allowing fees to decline despite continued technological advancement (Banker et al., 2020; Lai, 2025; Xin et al., 2024). Thus, technological development affects audit fees through a sequential mechanism in which changes in the audit environment reshape audit processes and ultimately determine the economic value and pricing of audit services.

Technological evolution has shifted the paradigm of audit fee determination from the traditional model (labor-based effort) to a contemporary model that considers broader strategic factors. This new model includes an assessment of digital risk, premiums for rare technological expertise, investment costs in analytical tools, and the economic value of the efficiency generated by automated systems. Thus, technology is no longer merely a tool, but has become a key structural determinant shaping the economic landscape of audit services. Audit fees are now the result of a calculation between potential cost savings and exposure to new risks and complexities arising in the digital age.

FUTURE RESEARCH

Based on the various studies on the impact of technological evolution on audit fee determination, there are a number of future research opportunities that could enrich the literature in this field. The following are several research directions that are expected to develop academic understanding and practice regarding the mechanism of audit fee determination in the digital era.

Future research on the relationship between information technology and audit fees should adopt longitudinal designs to capture how technological effects evolve over time. Prior studies indicate that technology may initially increase audit fees through higher perceived risk and complexity but reduce them as digital maturity improves efficiency (Abdelwahed et al., 2025; Lou & Zhou, 2024; Shan et al., 2015; Shan & Troshani, 2014, 2016; Zhou, 2023). However, limited evidence tracks these changes within the same firms over time. Panel-data designs could test non-linear relationships, including the inverted U-curve, and examine whether technology–fee dynamics persist across institutional contexts (Meng et al., 2025). Longitudinal studies could also assess how technologies such as AI auditing tools and blockchain verification affect audit quality indicators, including audit delay, restatements, and internal control

effectiveness (Lou & Zhou, 2024). Furthermore, they could examine how industry characteristics, regulation, and digital infrastructure moderate technology adoption and risk maturation (Zhou, 2023). Such evidence would clarify when technological investment generates cost efficiencies, improved audit quality, and more effective risk management.

Second, future research should adopt a comparative cross-country and cross-sector approach because the effect of technology on audit fees varies across institutional contexts. Legal systems, regulatory frameworks, and institutional quality can moderate technology adoption and audit pricing (Shan et al., 2015), while differences in financial-system maturity and regulatory intensity also shape the relationship between cyber-risk disclosure and audit fees across ASEAN countries (Karyani et al., 2023). Greater attention is therefore needed to emerging economies, where constraints in digital infrastructure, regulation, data security, and audit capabilities may produce different outcomes from those observed in advanced economies (Akinola & Olagunju, 2023; Banker et al., 2020). Comparative research could also examine how digital expertise contributes to audit pricing inequality and whether digital competency standards developed by regulators and professional bodies can reduce capability gaps across audit firms (Maghakyan et al., 2025). Finally, differences in access to public information provide another important comparative dimension, as restricted information environments can increase audit risk and fees (Zu, 2023). Such research would clarify how institutional, technological, and informational contexts jointly shape the technology–audit fee relationship.

Third, future research should employ qualitative approaches, including case studies and in-depth interviews, to provide deeper insights into audit fee determination that quantitative methods may not fully capture. Such approaches can examine the organizational context, fee negotiation processes, and auditors' adaptation to technological change, including how professional identity, ethical responsibilities, and trust evolve in increasingly digital audit environments (Abdelwahed et al., 2025; Wu et al., 2024). They can also reveal how auditors and management communicate technology-related risks and how perceptions of cyber threats influence professional judgment, audit effort, and fee negotiations (Jiang, 2024; H. Li et al., 2024). Through interviews or observation, researchers can therefore examine how auditors interpret digital risks and how client interactions shape audit decisions and cost structures. This approach would extend future research on audit fees and efficiency by explaining how technology reshapes professional judgment, legitimacy, and the organization of audit services.

Fourth, future research should adopt behavioral approaches to examine how auditors' perceptions, competencies, and adaptability shape technology-related audit pricing and decision-making. Comparative research between Big 4 and non-Big 4 auditors, as well as between experienced and less-experienced auditors, could reveal differences in risk assessment, resource allocation, and pricing strategies. Technological transformation has also shifted audit practice from traditional sampling toward data analytics, requiring new competencies in programming, statistics, and algorithmic interpretation (Banker et al., 2020; Hoffman et al., 2018; Meng et al., 2025).

Further research should examine how audit support systems influence professional judgment, skepticism, and independence. Highly structured systems may create routinization bias, encouraging excessive reliance on system recommendations and potentially overlooking non-routine anomalies (Carson & Dowling, 2012). In AI-assisted auditing, researchers should therefore investigate how auditors balance algorithmic reliance with professional skepticism and how algorithmic bias affects judgment (Liang, 2024; Shih & Chu, 2024). Although AI can improve information efficiency and reduce audit costs, it remains unclear how auditors assess the reliability of AI-generated information (Lai, 2025). Experimental and behavioral studies could consequently examine auditors' perceptions of algorithmic risk, trust in intelligent systems, and the effects of digital expertise on audit judgment.

Finally, future research should adopt multidisciplinary approaches that integrate accounting with information systems, organizational theory, digital economics, risk management, information security, and digital ethics. Such integration is necessary because digital transformation affects not only audit techniques but also the broader economic, organizational, social, technical, and regulatory structures underlying audit services. A multidisciplinary perspective can therefore provide a more comprehensive explanation of phenomena such as digital expertise premiums (Maghakyan et al., 2025), increased risk perceptions following data breaches (Y. Zhang & Smith, 2023), and ethical challenges associated with algorithmic auditing (Lai, 2025). Broader theoretical perspectives, including legitimacy theory and institutional theory, can further explain how technologies such as XBRL influence relationships among auditors, firms, regulators, and users of financial information (Amin et al., 2018; Cheng et al., 2024; Makni et al., 2018). Information systems perspectives can explain technological complexity, behavioral accounting can examine changes in auditor decision-making, and organizational and institutional theories can illuminate how audit firms respond to digital disruption. Regulatory and ethical perspectives are likewise important for examining governance implications and accountability associated with emerging technologies. Such multidisciplinary research can move beyond the traditional economic view of audit fees and provide a more comprehensive understanding of how technological transformation reshapes the audit profession and its cost structures.

CONCLUSION

Various empirical studies show that technological evolution has a complex, multidimensional, and non-linear impact on audit fee determination. This impact is characterized by a duality between increased efficiency and increased complexity. This efficiency arises from the automation of routine tasks, faster and more reliable data access, and the standardization of audit processes that reduce working hours and the scope of testing.

The inverted U-shaped relationship shows how the impact of technological development on audit fees evolves according to the level of digital maturity. The synthesis of the reviewed studies indicates that technological adoption initially increases audit fees because implementation costs, technological complexity, cybersecurity risks, organizational learning, and the demand for specialized digital expertise exceed the efficiency benefits generated by emerging technologies. As organizations progress toward digital maturity, improvements in financial reporting quality, internal control effectiveness, information transparency, and auditors' technological capabilities gradually reduce information asymmetry, perceived audit risk, and audit effort, allowing the efficiency gains of digital technologies to outweigh their implementation costs. Consequently, audit fees begin to decline after the turning point as organizations realize the full benefits of integrated digital systems, automation, advanced data analytics, and technology-assisted auditing. Therefore, technological development should not be interpreted as a cost-increasing or cost-reducing factor in isolation. The economic consequences depend on the organization's digital maturity, with technological complexity and operational efficiency determining audit fee adjustments.

The synthesis of the literature demonstrates that technological development influences audit fees through an indirect and sequential mechanism rather than a direct causal relationship. The adoption of emerging technologies—including artificial intelligence, Big Data Analytics, cloud computing, XBRL/iXBRL, and other digital innovations—first transforms the audit environment by altering audit risk profiles, organizational complexity, financial reporting quality, and information asymmetry. These environmental changes subsequently reshape the audit process by affecting the extent of audit effort, the scope of audit procedures, the demand for specialized technological expertise, and the use of technology-assisted audit

techniques and data analytics. Consequently, audit fees represent the economic outcome of these cumulative adjustments, reflecting the balance between technological complexity, audit risk, efficiency gains, and the value created through higher-quality audit services. This mechanism explains why the same technological innovation may either increase or decrease audit fees depending on how it transforms the audit environment and influences auditors' risk assessments and audit processes, thereby providing an integrated explanation for the heterogeneous findings reported in prior empirical studies.

This review contributes to academic and practical understanding by mapping the non-linear relationship between technological development and audit fees through an inverted U-curve. Theoretically, it reconciles conflicting findings by showing that technology simultaneously enhances efficiency and creates complexity, with its effects depending on adoption maturity. It also highlights the shift from traditional time-based fee models toward strategic determinants, including cyber risk premiums (Calderon & Gao, 2021; H. Li et al., 2020), digital partner expertise (Maghakyan et al., 2025), and technology transition costs (Abdelwahed et al., 2025; Akinola & Olagunju, 2023). Practically, these findings provide strategic guidance for auditors, clients, and regulators. For auditors, the inverted U-curve highlights the need for continuous investment in digital competencies to manage initial adoption costs and realize efficiency gains at maturity. Higher fees during technological transition therefore reflect additional risk assessment, digital methodology development, and specialist expertise (Banker et al., 2020; Maghakyan et al., 2025). For regulators, the findings emphasize clearer guidance for auditing emerging technologies, such as cloud computing, to reduce uncertainty, risk premiums, and transition costs while accelerating efficiency across the audit ecosystem.

This study is not without limitations. First, this review relies heavily on secondary research dominated by quantitative approaches, resulting in a limited understanding of behavioral mechanisms and decision-making processes in determining audit fees in the digital era. Second, many of the studies analyzed focus on specific geographical and regulatory contexts—such as the US and Chinese markets—so generalizing the findings to emerging countries with different digital infrastructures and regulations needs to be done with caution. Finally, although this study has identified moderator roles such as auditor competence, the complex interactions between various contingency factors in the technology–audit fee relationship have not been explored in depth.

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CONFLICT OF INTEREST

The author declares no conflict of interest

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