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Audit technology as a catalyst for improving non-financial performance in Ethiopian audit firms

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ABSTRACT

Adopting computer-assisted audit techniques (CAATs) is transforming the auditing profession globally. As technological advancements continue to shape the audit landscape, understanding how CAATs influence non-financial performance outcomes is essential. However, little is known about their impact on non-financial performance in audit firms, particularly in developing countries like Ethiopia. This study investigates how CAATs influence non-financial performance metrics, including client relationships, employee engagement, and operational efficiency. A quantitative approach was adopted to analyze survey data collected from 122 audit professionals across Ethiopian audit firms in 2023. The findings reveal that the adoption of CAATs significantly correlates with client relationships, employee engagement, and operational efficiency, while its impact on operational efficiency is moderated by organizational readiness. The study highlights the need for strategic technological investments to enhance non-financial performance outcomes. This study offers original empirical evidence on the non-financial impacts of CAATs in the context of Ethiopian audit firms, filling a notable gap in the existing literature.

1. Introduction

Technology integration into auditing, particularly through Computer-Assisted Audit Techniques (CAATs), reshapes audit practices worldwide. CAATs involve applying software tools and automated procedures to perform audit tasks more efficiently and accurately (Janvrin et al., 2008; Vu et al., 2019). These tools enhance audit quality by reducing manual errors, increasing data coverage, and improving analytical capabilities.

Although the financial benefits of adopting CAATs have been well documented (Abdulaziz and Adebayo, 2021), their non-financial implications remain unexplored, especially in developing countries like Ethiopia. Understanding these non-financial outcomes is critical, as they contribute significantly to audit firms' overall effectiveness and sustainability. Non-financial performance in this context refers to performance indicators that do not directly relate to financial measures but are vital to an audit firm's long-term success. Based on industry standards and best practices from professional bodies such as the American Institute of Certified Public Accountants (AICPA, 2017) and the International Federation of Accountants, good metrics for the

non-financial performance of firms include the strength of client relationships, levels of employee engagement, and operational efficiency. These dimensions reflect how well an audit firm manages its internal capabilities and external service quality.

A key factor influencing the success of technology adoption is organizational readiness, which denotes how a firm is equipped structurally, financially, and culturally to embrace and implement technological innovations. It includes having sufficient budget, supportive leadership, skilled personnel, and appropriate infrastructure (Al-Omiri and Drury, 2021).

Despite global technological advances, Ethiopian audit firms have experienced a relatively slow pace of CAAT adoption, often due to limited resources and institutional constraints (Wassie and Lakatos, 2024). However, with growing interest in digital transformation across various sectors in the country, it is timely to investigate how CAAT implementation affects non-financial outcomes in this setting. Therefore, this study examines the impact of CAAT use on non-financial performance in Ethiopian audit firms, explicitly focusing on client relationships, employee engagement, and operational efficiency. Hence, the central research question guiding this inquiry is: How does using

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CAATs influence non-financial performance metrics in Ethiopian audit firms?

2. Literature review and hypothesis

CAATs include various tools and techniques, such as data analytics, continuous auditing systems, and automated audit software that enhance audit procedures (Li and Wang, 2024; Edison, et al., 2018). These tools help auditors perform data mining, sampling, and risk assessment more efficiently. They also improve audit processes by enhancing data analysis and decision-making. Internationally, studies have shown that CAATs improve audit quality by enabling more thorough and accurate evaluations (Omonuk and Oni, 2015). It has also been found that technologies enhance financial parameters such as profit margins, return on investment, and cash flows, which provide valuable quantitative insights into an organization's performance (Ahmed and Fakhr, 2022; Bigliardi et al., 2020). However, exclusive reliance on these metrics has several limitations. Firstly, they often overlook non-financial factors like customer satisfaction, employee engagement, and brand reputation, which are critical to long-term success. Secondly, financial indicators are backward-looking and may not fully capture future risks or growth opportunities. Additionally, accounting practices and short-term management decisions can influence these parameters to improve appearances rather than substance. Finally, focusing only on financial data may lead to ethical oversights, such as ignoring environmental or social impacts that do not immediately affect the bottom line but are essential for sustainable operations (Okoye and Nwoye, 2019).

Future technological advancements will likely significantly enhance non-financial performance in audit firms by improving the quality of client relationships, employee engagement, and operational efficiency. According to Financial Times (FT, 2025), emerging tools such as artificial intelligence, blockchain, and advanced data analytics will enable auditors to deliver faster, more accurate, and more customized services, fostering greater client trust and satisfaction. These innovations can also reduce repetitive tasks, allowing auditors to focus on complex, value-added work, increasing job satisfaction and reducing turnover (Chimweta and Matiza, 2020; Linäker and Wnuk, 2022). Additionally, automation and smarter audit platforms will streamline workflows, leading to better time management and resource utilization. As technology evolves, firms that adapt effectively are expected to experience stronger organizational cohesion, improved stakeholder communication, and greater agility in meeting regulatory and market demands (Musau and Muathe, 2020).

Non-financial performance is typically assessed through factors such as operational efficiency, employee performance, customer satisfaction, and organizational culture (Kourtzidis and Tzeremes, 2019). According to Wang et al. (2022), in audit firms, these metrics are critical for long-term sustainability and growth. Prior research has shown that adopting new technologies, including CAATs, can improve these areas by reducing time spent on manual tasks, enhancing employee morale, and increasing client satisfaction (Said, 2014; Pedrosa et al., 2015; Deloitte, 2022). Non-financial performance indicators such as client relationships, employee engagement, and operational efficiency contribute to long-term organizational sustainability and competitive advantage. The firm's organizational readiness to adopt advanced technologies was also considered a vital element in the firm's non-financial performance (Selvam et al., 2016; Singh et al., 2022). According to the Technology-Organization-Environment (TOE) framework and Contingency Theory (CT), organizations that successfully align CAATs with their unique needs (e.g., operational complexity, industry regulations) may see improvements in process compliance and data quality (Al-Omiri and Drury, 2021). Enhanced data quality through CAATs can lead to better decision-making, client retention, and employee satisfaction due to reduced errors and redundancies (Li et al., 2018; Al-Okaily et al., 2022). In addition to organizational readiness,

several other variables could moderate the relationship between innovation adoption and its outcomes. One such variable is leadership support, as top management's commitment and active involvement can significantly influence the effectiveness of innovation implementation (Dube and Ndlovu, 2021). Another important moderator is organizational culture, particularly the extent to which a culture supports risk-taking, learning, and open communication (Hassan and Mwangi, 2023). Besides, employee engagement and attitudes toward change could moderate outcomes, as a workforce that is motivated and receptive to innovation may be more likely to contribute to its success (Nasrah et al., 2023).

While extensive research exists on CAATs in developed countries, there is limited evidence of their impact in developing economies like Ethiopia. A study by Habtamu (2016) and Wassie (2024) highlighted the slow adoption of audit technology in Ethiopian firms due to resource constraints, limited technical know-how, and regulatory barriers. However, the growing trend towards technological adoption in various sectors in Ethiopia suggests a potential for positive changes in audit practices as well (Tesfaye, 2014). Ethiopian audit firms face several key barriers that hinder the full adoption of Computer-Assisted Audit Techniques (CAATs). A primary challenge is the limited availability of financial resources, which restricts investment in necessary software and hardware (Wassie and Lakatos, 2024). Their study also shows that many firms struggle with a shortage of technically skilled personnel, making implementing and maintaining advanced audit tools challenging. Regulatory and institutional constraints also play a role, as existing frameworks have slowly adapted to digital auditing standards (Habtamu, 2016). Furthermore, practitioners often lack awareness and resistance to change, particularly in smaller or older firms that rely heavily on traditional audit practices (Tesfaye, 2014). These combined factors contribute to the slow and uneven integration of CAATs across the sector.

Focusing on Ethiopia as the context for this study is both timely and strategically important. As one of Africa's fastest-growing economies, Ethiopia is undergoing a gradual but notable digital transformation across multiple sectors, including finance and public administration. However, the auditing profession in the country still faces significant structural and technological challenges. These include limited access to modern audit tools, a shortage of adequately trained professionals, and regulatory frameworks that have only recently begun to adapt to international standards (Wassie and Lakatos, 2024). Despite these constraints, there is increasing recognition among policymakers and professional bodies in Ethiopia of the need to modernize audit practices to ensure transparency, accountability, and efficiency in both public and private institutions. This transitional landscape presents a unique opportunity to study how adopting audit technologies like CAATs can influence non-financial performance metrics in a setting marked by resource constraints, institutional reforms, and growing technological aspirations. The study addresses a critical gap in the literature by focusing on Ethiopia. It provides contextually relevant insights that could inform audit modernization efforts in other developing economies facing similar challenges.

2.1. Hypothesis development

The theories employed in this study—Contingency Theory (CT), the Resource-Based View (RBV), the Technology Acceptance Model (TAM), and the Technology-Organization-Environment (TOE) framework—were selected for their relevance in explaining how audit firms respond to technological change under varying internal and external conditions. Contingency Theory is well-suited for understanding how the alignment between CAATs and organizational context can influence outcomes like client satisfaction (Hussin et al., 2023). The RBV highlights how leveraging internal capabilities, such as skilled personnel and digital infrastructure, can reduce employee turnover by enhancing job satisfaction (Nguyễn and Nguyễn, 2023). TAM provides insight into how

perceptions of technology usability and usefulness drive operational improvements (Atta et al., 2024), while TOE emphasizes the role of organizational readiness in shaping successful implementation (Fülöp et al., 2024). Alternative frameworks such as Institutional Theory or Diffusion of Innovations Theory could also be applied, focusing respectively on how regulatory pressures or social influence affect technology adoption, or how innovations spread over time within professional communities (Ghani et al., 2024). However, the chosen theories offer a more nuanced explanation of firm-level behavior and performance, making them particularly appropriate for a study in a developing country context with diverse organizational capacities and technological constraints. Accordingly, considering the selected theories, the following hypotheses were developed to examine the relationships.

From the lens of Contingency Theory, organizations that adapt their technological infrastructure to fit external demands and client expectations are more likely to maintain competitive advantages. CAATs enable auditors to deliver more accurate and timely services, increasing client trust and satisfaction (Jayasena et al., 2024). When audit results are delivered with improved reliability and speed, clients are more inclined to maintain long-term professional relationships, thereby improving retention rates. Hence, CAATs are expected to strengthen client relationships by enhancing audit credibility and responsiveness. Hence, the first hypothesis was proposed as follows.

2.1.1. *H₁: CAAT use significantly impacts the client retention rate in audit firms*

Besides, the Resource-Based View (RBV) theory posits that firms gain sustained advantage by effectively deploying internal resources, including human capital (Senan, 2024). CAATs can reduce repetitive, low-value tasks and allow auditors to focus on higher-order analytical and judgmental activities, which are more fulfilling and intellectually stimulating. This shift in task quality contributes to job satisfaction and retention, lowering turnover rates. Employees who perceive their work as meaningful and supported by technology are likelier to stay, particularly in firms that invest in upskilling and digital readiness. Hence, the second hypothesis was proposed as follows.

2.1.2. *H₂: CAAT use significantly impacts the employee turnover rate in audit firms*

Furthermore, under the Technology Acceptance Theory, adopting new technologies increases efficiency when users perceive the technology as helpful and easy to integrate into their workflow (Abdulaziz and Adebayo, 2021). CAATs streamline audit procedures by automating data collection, risk assessment, and documentation processes. This automation reduces the time and cost associated with audits, improving the firm's overall operational efficiency. As firms increasingly rely on digital tools to manage complex tasks, CAATs are positioned to be key enablers of timely and cost-effective audit delivery. Hence, the third hypothesis was proposed as follows.

2.1.3. *H₃: CAAT use significantly impacts operational efficiency in audit firms*

Moreover, the moderating role of organizational readiness can be understood through the Technology-Organization-Environment (TOE) framework, which emphasizes the importance of internal preparedness—such as infrastructure, financial resources, and managerial support—for successful technology adoption (Salleh et al., 2012; Chimweta and Matiza, 2020). Even when CAATs are available, their effectiveness depends heavily on whether firms have the capacity and willingness to implement them. Without adequate readiness, the benefits of technology may be delayed or unrealized. Thus, organizational readiness is expected to strengthen the positive effects of CAATs on non-financial outcomes, particularly operational efficiency. Hence, the final hypothesis was proposed as follows.

2.1.4. *H₄: Organizational readiness moderates the relationship between CAAT use and non-financial performance in audit firms*

Finally, industry-specific factors such as audit firm age and size can influence the impact of Computer-Assisted Audit Techniques (CAATs) on non-financial performance. While older firms may have more experience and established processes that support technology integration, and larger firms may have more resources to invest in audit tools (Yang and Gabrielsson, 2017; Coad et al., 2013; Nasrah et al., 2023; Kee et al., 2013; Siew et al., 2020). It suggests that these characteristics may shape a firm's capacity to adopt technology. Hence, this study included these factors and controlled their effects.

3. Research methodology

3.1. Research design

A quantitative research design was adopted for this study, utilizing a cross-sectional survey method to collect data from Ethiopian audit firms. This design was chosen because it allows for measuring the relationship between CAAT adoption and non-financial performance in Ethiopian audit firms. A cross-sectional survey was chosen because it allows researchers to collect data simultaneously. It is suitable for assessing the current state of CAAT adoption and its relationship with non-financial performance across a sample of audit firms. This method is cost-effective and time-efficient, especially in contexts like Ethiopia, where longitudinal data may be complex to obtain due to limited resources, inconsistent record-keeping, or organizational instability (Kothari, 2004). Additionally, the goal of the study was to examine associations, not to track changes over time, making a cross-sectional design more appropriate for capturing a snapshot of how CAAT use correlates with client relationships, employee engagement, and operational efficiency at the present moment.

3.2. Sample of the study and data collection

The study targeted all registered audit firms in Ethiopia, and according to the Accounting and Auditing Board of Ethiopia (AABE, 2022), there are 172 registered certified audit firms in the country. In this study, the formula provided by Yamane (1967) was used to determine the sample size from the finite population (homogeneous, i.e., registered audit firms) by taking the acceptable magnitude of error (e) of 5 % and confidence level (Z) of 95 %. Where *n* is the Sample size, *N* is the Population size, *Z* is the confidence level, and *e* is the level of precision.

$$\frac{N}{1 + \frac{N}{N(e)^2}} = \frac{172}{1 + \frac{172}{(0.05)^2}} = 120$$

Considering the minimum sample size, a structured questionnaire based on validated formulas and scales from previous studies was developed and distributed to 150 audit firms. Data were collected over four months, from September to December 2023, and the questionnaire was distributed electronically through Email. The survey instrument included measures for CAAT usage, client relationship retention, employee turnover, operational efficiency, organizational readiness, and demographic and control variables. Out of 150 distributed questionnaires, 122 valid responses were collected, resulting in a high response rate of 81 %. This broad coverage and strong participation suggest that the sample reflects the characteristics and diversity of the audit industry in Ethiopia, enhancing the generalizability of the findings. Survey responses can be subject to several biases, including social desirability bias, where respondents may overstate positive behaviors (Kothari, 2004), like the extent of CAAT use, to present their firm in a favorable light. Response bias may also occur if participants misinterpret questions or provide inaccurate answers due to a lack of knowledge or attention (Kothari, 2004). To minimize these biases, the study used validated survey instruments from previous research to ensure clarity

and reliability. It also assured anonymity and confidentiality to reduce the pressure on respondents to provide socially desirable answers. Additionally, a high response rate (81 %) and structured, standardized questions helped improve the accuracy and consistency of the data collected.

3.3. Variable measurements

The key variables of interest include the dependent variable, non-financial performance proxied by various metrics such as client relationship (CRR, measured by client retention rate), employee engagement (ERR, measured by employee turnover rate), and operational efficiency (OPE, measured by the percentage of the number of audits completed on time) (Errero et al., 2013). Each non-financial performance metric in the study was operationalized using measurable, quantifiable indicators and calculated (Kourtzidis and Tzeremes, 2019) as follows:

Client Retention Rate (CRR) was used to represent client relationships and was calculated as the percentage of clients retained over a specific period, reflecting client loyalty and satisfaction.

$$CRR = \frac{\text{Number of clients at the end of the period} - \text{New clients acquired during the period}}{\text{Number of clients at the start of the period}} \times 100$$

Employee Turnover Rate (ERR) measures employee engagement, calculated as the proportion of employees who left the firm within a specific time frame, indicating job satisfaction and organizational commitment levels.

$$ERR = \frac{\text{Number of employees who left during the period}}{\text{Average number of employees during the same period}} \times 100$$

Operational Efficiency (OPE) was defined by the percentage of audits completed on time, which directly indicates the firm’s productivity, planning, and process effectiveness.

$$OPE = \frac{\text{Number of audits completed on time during the period}}{\text{Total number of audits during the same period}} \times 100$$

The independent variable was the extent of CAAT use (CTU, measured by a 5-point Likert scale (see Appendix I)). Organizational readiness was considered a moderation variable (OGR, measured by the budget availability for audit technology adoption: 1 = yes or 0 = no) (Salleh et al., 2012; Li et al., 2018). In addition, the study included audit firm age (FIG, number of years from establishment) and audit firm size (FIZ, small, medium, large) as control variables (see Appendix I). The survey instrument was validated through a multi-step process to ensure reliability and relevance. Initially, the items were developed based on a thorough review of prior literature and theoretical frameworks pertinent to the measured constructs. To enhance content validity, the draft instrument was reviewed by subject matter experts in accounting and auditing, who provided feedback on item clarity, relevance, and completeness. Their input led to several refinements in wording and structure. A pilot test was conducted with a small sample from the target population to assess the instrument’s clarity and internal consistency. Feedback from the pilot participants helped identify and correct ambiguous or confusing items. Finally, statistical analyses were conducted to confirm the reliability of the survey scales, with Cronbach’s alpha values ranging from 0.82 to 0.91, indicating strong internal consistency.

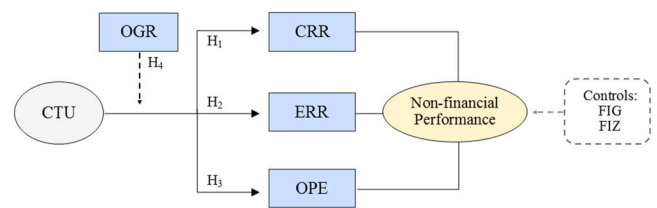


Fig. 1. The research model.

3.4. Analysis method

The collected data were analyzed through descriptive statistics to summarize the extent of CAAT use and non-financial performance. As shown in Figure 1, regression analysis was also conducted to assess the relationships between CAAT use and non-financial performance metrics. Regression analysis was the best choice for this study because it allows for examining the strength and direction of relationships between CAAT use and multiple non-financial performance metrics while controlling for other variables like firm age and size. It also enables testing

moderating effects, such as organizational readiness, clearly showing how different factors influence outcomes. Hence, regression is a suitable and powerful tool for analyzing complex, multivariable relationships in a quantitative study. All models included audit firm age (FIG, number of years from establishment) and audit firm size (FIZ, small, medium, large) as control variables.

4. Analysis and results

The mean score for CAAT use was 3.4 (68 %), indicating moderate use of technology in the auditing process. For non-financial performance, the mean scores for client retention rate (72 %), employee turnover rate (21 %), and operational efficiency (84 %) suggest generally favourable outcomes. In addition, 55 % of audit firms have an available budget for audit technology adoption. The study’s results were robust, and the data met all key assumptions required for regression analysis. Normality was assessed through visual inspections of histograms and the Shapiro-Wilk test, which produced a p-value of 0.072, indicating that the data did not significantly deviate from a normal

Table 1
Multivariate regression outcome.

| Model | Model 1 | Model 2 | Model 3 |
|--------------------|------------------|-------------------|------------------|
| Dependent variable | CRR | ERR | OPE |
| CTU | 1.311*** (0.031) | -0.966*** (0.029) | 0.780*** (0.019) |
| OGR | 0.763(0.003) | -0.004 (0.003) | 0.005** (0.002) |
| FIG | 0.005** (0.002) | -0.003(0.002) | 0.000(0.002) |
| FIZ | -0.003 (0.003) | 0.003 (0.003) | -0.002 (0.002) |
| Observations | 122 | 122 | 122 |
| R-squared | 95.1 | 92.8 | 95.1 |
| F-Statistics | 583.429*** | 389.744*** | 583.804*** |
| Model VIF | 1.311 | 1.311 | 1.311 |
| Tolerance | 0.763 | 0.763 | 0.763 |

Notes
*p-values <0.10
** p-values <0.05
*** p-values <0.01

distribution. Scale reliability was confirmed through Cronbach’s alpha, with all constructs scoring above 0.70, demonstrating acceptable internal consistency. Multicollinearity was assessed using Variance Inflation Factor (VIF), with all model values scoring 1.311, far below the threshold of concern, and tolerance values well above 0.10, confirming no multicollinearity issues. The Breusch-Pagan test for heteroskedasticity returned a p-value of 0.241, suggesting that the assumption of homoscedasticity was met. Collectively, these diagnostic checks affirm the robustness and suitability of the data for subsequent regression analysis.

The multiple regression analysis in Table 1 revealed a significant relationship between CAAT use and improvements in non-financial performance indicators. Specifically, the results showed that CAAT adoption explained 95.1 % of the variance in client retention (Model 1), 92.8 % of the variance in employee turnover (Model 2), and 95.1 % of the variance in operational efficiency (Model 3).

In this study, significance levels were set using conventional thresholds to determine the statistical validity of the findings. A p-value of less than 0.05 was used as the standard cutoff for identifying statistically significant relationships, indicating a less than 5 % probability that the observed results occurred by chance (Kothari, 2004). In cases where p-values were below this threshold, the results were interpreted as providing sufficient evidence to reject the null hypothesis and support the existence of a meaningful effect or association. For more robust confidence, results with p-values below 0.01 were considered highly significant (Kothari, 2004). These thresholds guided the interpretation of the data, helping to assess the strength and reliability of the relationships between variables in the context of CAAT adoption.

Accordingly, CAAT use (CTU) significantly predicts client retention (CRR) ($\beta = 1.311, p \leq 0.01$), employee turnover (ERR) ($\beta = -0.966, p \leq 0.01$), and operational efficiency (OPE) ($\beta = 0.780, p \leq 0.01$) (supported H₁, H₂, and H₃). Organizational readiness (ORG) emerged as a significant moderator only for the relationship between CAAT use and operational efficiency in Model 3 ($\beta = 0.005, p \leq 0.05$) (supported H₄). The interaction effect presented in Figure 2 shows that OGR strengthens the positive relationship between CTU and OPE. Firms with higher levels of organizational readiness were more likely to use CAATs, increasing their operational efficiency effectively. In addition, the control variable audit firm age (FIG) was found to be significant ($\beta = 0.005, p \leq 0.05$) in Model 1. However, both control variables (FIG and FIZ) were insignificant in almost all models.

4.1. Main findings of the study

The study yielded clear evidence that Computer-Assisted Audit Tools (CAATs) are pivotal in enhancing key outcomes within audit firms. Specifically, CAAT use significantly predicted three critical organizational outcomes: client retention, employee turnover, and operational efficiency. Firms that integrated CAATs more extensively tended to retain clients at a higher rate and experienced lower employee turnover. Moreover, these tools contributed positively to improvements in

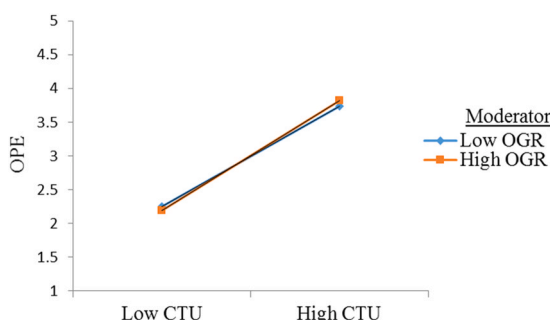


Fig. 2. The interaction effect of OGR on OPE.

operational processes, making day-to-day functions more streamlined and effective.

Another notable finding was the moderating effect of organizational readiness on the link between CAAT use and operational efficiency. While organizational readiness did not significantly influence all relationships, it played a crucial role in strengthening the connection between CAAT adoption and operational gains. Better prepared firms—in terms of infrastructure and internal capacity—were more successful in translating CAAT use into tangible efficiency improvements. Among the control variables examined, audit firm age emerged as a significant factor in one model, suggesting that more established firms might have structural advantages when implementing CAATs. However, overall, the control variables had limited influence across most models, reinforcing the central role of CAAT use and organizational readiness in shaping performance outcomes. These findings underscore the importance of technological adoption and organizational preparedness in achieving operational excellence in the audit sector.

5. Discussion

This study highlights the limitations of relying exclusively on financial indicators for assessing organizational performance. It emphasizes the importance of incorporating non-financial metrics to understand value creation and sustainability better. The findings suggest that while financial parameters remain essential for short-term decision-making and accountability, they should be complemented with qualitative assessments, such as stakeholder engagement, innovation capacity, and long-term strategic positioning. By integrating financial and non-financial perspectives, organizations can achieve more balanced and forward-looking evaluations supporting sustained success.

The findings of this study support the hypothesis that CAAT use positively influences non-financial performance in Ethiopian audit firms. The significant positive relationship between CAAT use and client retention rate suggests that clients benefit from more accurate and timely audits, which could lead to improved trust and loyalty. The result indicates a healthy client relationship and satisfaction, which is critical to an audit firm’s long-term success (Rosli et al., 2013). Similarly, the significant negative relationship between CAAT use and employee retention rate suggests that improvements in employee turnover rate are attributed to the reduction in manual tasks, allowing employees to focus on more complex and value-added activities. It shows that more experienced employees remain, contributing to consistent quality and service delivery (Said, 2014). Finally, the significant positive relationship between CAATs use and operational efficiency suggests that operational efficiency was enhanced as CAATs streamlined audit procedures, reducing time and resource expenditures (Wang et al., 2022). It shows that there are efforts to make good planning, resource management, and effective execution. However, organizational readiness regarding resources to support the use of CAAT is essential to achieve the firm’s operational efficiency. It highlights the need for firms to invest in complementary resources, such as training and infrastructure, to leverage technological advancements fully.

The findings align with global studies emphasizing the benefits of CAATs for employee engagement and client relationships. For instance, studies by Selvam et al. (2016) found that CAATs improve audit quality and non-financial outcomes in firms. The findings also align with the views of Ethiopian auditors, who have highlighted the potential benefits of CAATs for improving audit practices and performance (Wassie, 2024). Besides, the study’s findings align with existing research from other developing countries, particularly in highlighting the critical role of organizational readiness and technological infrastructure in adopting CAATs. Similar to prior studies (Abdulaziz and Adebayo, 2021; Senan, 2024; Jayasena et al., 2024), the results suggest that limited resources, lack of technical expertise, and insufficient management support are common barriers in developing contexts.

Additionally, the study reinforces the notion found in previous

research (Okoye and Nwoye, 2019; Jayasena et al., 2024; Dube and Ndlovu, 2021; Atta et al., 2024) that auditors in these regions often face cultural and institutional challenges, such as resistance to change and minimal regulatory enforcement, which can impede technology adoption. However, the findings also support the literature by emphasizing the positive impact of individual-level factors, such as perceived usefulness and ease of use, echoing the relevance of models like TAM in these environments (Hassan and Mwangi, 2023; Fülöp et al., 2024; Nasrah et al., 2023; Ghani et al., 2024). The study supports and extends existing knowledge by confirming that while structural and systemic constraints persist across developing countries, individual and organizational enablers can still significantly influence CAAT adoption.

6. Conclusion and implications

This study provides empirical evidence that CAAT use positively impacts non-financial performance in Ethiopian audit firms. The findings underscore the importance of technological adoption in improving client relationships, employee engagement, and operational efficiency. However, the impact on operational efficiency depends on organizational readiness. This study makes a valuable theoretical contribution by linking the adoption of computer-assisted audit techniques (CAATs) to non-financial performance outcomes—a relatively underexplored area in audit technology literature, especially within the context of developing economies like Ethiopia. By empirically examining how CAATs affect client relationships, employee engagement, and operational efficiency, the research broadens the conventional focus of audit technology studies, which often center on financial or compliance-related outcomes.

Furthermore, the study introduces organizational readiness as a moderating variable, adding depth to existing technology adoption models by illustrating how internal preparedness shapes the effectiveness of CAATs. This insight is particularly relevant for developing economies, where infrastructure, skills, and policy support disparities can significantly influence technology outcomes. The study refines and extends current theoretical frameworks by contextualizing these variables within the Ethiopian audit landscape, suggesting that non-financial benefits are key motivators and outcomes of technology adoption. This perspective encourages a more holistic understanding of audit technology's role in organizational development, offering a theoretical basis for future studies in similar settings.

Based on the study's findings, the following practical implications are posed for policymakers, audit firms, and regulators. Policymakers should prioritize investments in digital infrastructure and provide targeted support, such as training subsidies or tax incentives, to encourage the adoption of CAATs across the auditing sector. Audit firms are encouraged to assess their internal capabilities and invest in staff training and organizational readiness to fully leverage the benefits of CAATs, particularly in improving employee engagement and client service. Regulators should establish clear guidelines and frameworks that support the integration of audit technologies while ensuring that quality and compliance standards are upheld. Together, these actions can create an enabling environment for sustainable technological advancement in the audit profession within developing economies.

The findings of this study offer a foundation for future research beyond Ethiopian audit firms by highlighting the broader relevance of non-financial performance outcomes, such as client relationships, employee engagement, and operational efficiency, as key indicators of successful audit technology adoption. Future studies in other developing or emerging economies can build on this model to explore how cultural attitudes toward technology, varying levels of regulatory enforcement, and differences in organizational readiness shape these outcomes. Additionally, comparative research across countries or regions could deepen understanding of how local conditions mediate the relationship between CAAT adoption and firm performance, thereby refining global

theories of audit technology implementation.

While this study highlights the role of CAAT adoption in enhancing non-financial performance, it is important to recognize that other factors could also improve client relationships, employee engagement, and operational efficiency. For instance, strong leadership and strategic management practices can drive better internal communication and employee motivation, independent of technology use. Similarly, ongoing professional development and training programs may enhance staff performance and client satisfaction regardless of the audit tools employed. Organizational culture, including openness to innovation and change, could foster a more engaged and productive workforce. External influences, such as market competition or regulatory pressure, might also push firms to improve service quality and operational processes. Therefore, while CAATs play a significant role, internal and external factors likely contribute to non-financial performance gains. Hence, the study paved the way for future research to consider those factors.

This study has some limitations that should be acknowledged. First, data availability posed a constraint, as the research relied on self-reported survey responses, which may be subject to bias or inaccuracies due to limited access to objective performance metrics. Second, the generalizability of the findings is limited, given that the data were collected solely from audit firms in Ethiopia; thus, the results may not fully reflect conditions in other developing economies with different regulatory, technological, or cultural contexts. Third, while the study focused on key variables like CAAT adoption and organizational readiness, potential omitted variables—such as leadership support, firm culture, or external competitive pressures—may influence non-financial performance outcomes but were not included in the analysis. Lastly, the study's exclusive reliance on a quantitative survey approach is another limitation, which may not fully capture the depth and complexity of auditors' experiences with CAAT adoption. While the survey provided valuable insights into patterns and relationships among key variables, it limited the exploration of contextual and subjective factors. A qualitative method, such as interviews with auditors, could have offered richer, more detailed perspectives on the practical challenges, organizational influences, and personal attitudes affecting CAAT usage. These limitations allow for more comprehensive future research to provide a more holistic view of adoption behavior.

Ethical Statement

No studies involving human participants or animals were conducted by the authors for this research, and therefore ethical approval and informed consent were not required.

CRediT authorship contribution statement

Fekadu Agmas Wassie: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lakatos László Péter:** Writing – review & editing, Validation, Supervision, Funding acquisition, Conceptualization, Resources.

Declaration of Competing Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. The authors have no relevant financial or non-financial interests to disclose.

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Appendix I

| Variable | Measurement | Source |
|---------------------------------------|---|---|
| Dependent Variables: | | |
| Client Retention Rate (CRR) | Calculated as the percentage of clients retained over the specific period. | Kourtzidis and Tzeremes, (2019); Errore et al., (2013) |
| Employee Turnover Rate (ERR) | Calculated as the proportion of employees who left the firm within a specific time frame. | Kourtzidis and Tzeremes, (2019); Errore et al., (2013) |
| Operational Efficiency (OPE) | Calculated as the percentage of audits completed on time | Kourtzidis and Tzeremes, (2019); Errore et al., (2013) |
| Independent Variable: | | |
| CAATs Use (CTU)(Single item variable) | The overall score for CAAT usage is derived from the average of individual application scores. Each application's score reflects the degree to which specific audit tasks are performed using various tools, including: (i) generalized audit software, (ii) SQL database search and retrieval, (iii) electronic audit working papers or audit automation software, (iv) embedded audit modules, (v) parallel simulation, and (vi) test data. Usage is rated on a 5-point scale, where one indicates 'never used' and five signifies 'extensive use.' | Siew et al., (2020); Al-Okaily et.al., 2022; Wassie and Lakatos, (2024) |
| Moderating Variable: | | |
| Organizational Readiness (OGR) | Dummy variable: the availability of budget for audit technology adoption (1 = yes, 0 = no) | Salleh et al., (2012); Li et al., (2018) |
| Control Variables: | | |
| Firm Age (FIG) | Number of years from establishment | Yang and Gabrielsson, (2017); Coad et al., (2013) |
| Audit Firm Size (FIZ) | Number of external auditors (1–9, 10–18, and more than 18) in the audit firm scaled from 1 to 3 (1 = small, 2 = medium, 3 = large) | Kee et al. (2013); Siew et al., (2020); Wassie and Lakatos, (2024) |

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