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DIGITAL COMPETENCE IN CLOUD ACCOUNTING AND HOSPITAL AUDITOR EFFECTIVENESS

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ABSTRAK

Penelitian ini bertujuan menguji peran kecakapan digital auditor internal dalam hubungan antara penerapan akuntansi berbasis cloud dan efektivitas auditor internal pada rumah sakit tipe A dan B di Kota Makassar. Menggunakan desain hipotetis-deduktif dengan purposive sampling, data diperoleh dari 78 kuesioner auditor internal dan dianalisis menggunakan model struktural. Hasil menunjukkan bahwa penerapan akuntansi berbasis cloud berpengaruh signifikan terhadap efektivitas dan kecakapan digital auditor internal. Namun, kecakapan digital tidak berpengaruh terhadap efektivitas auditor internal serta tidak berperan sebagai mediator maupun moderator. Temuan ini memberikan kontribusi pada literatur dan implikasi praktis bagi peningkatan praktik audit internal berbasis cloud di rumah sakit.

Kata Kunci: akuntansi berbasis cloud, kecakapan digital, efektivitas auditor internal.

ABSTRACT

This study examines the effectiveness of internal auditors in hospitals and examines the influence of internal auditor digital skills on the relationship between cloud-based accounting implementation and auditor effectiveness in Type A and B hospitals in Makassar City. Using a hypothetical-deductive approach and purposive sampling, 78 valid responses from hospital internal auditors were analyzed using a structural model. The results show that cloud-based accounting implementation significantly enhances both internal auditor effectiveness and digital skills. However, digital skills neither directly improve auditor effectiveness nor significantly mediate or moderate the relationship between cloud-based accounting and effectiveness. These findings contribute to the literature by offering new insights, improving professional practice, and guiding policymakers in adopting cloud-based accounting for hospital audit functions.

Keywords: cloud-based accounting; digital efficiency; internal auditor effectiveness

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1. Introduction

The rapid growth of the hospital industry has increased the competition among institutions to provide excellent quality and more comprehensive healthcare services. Improvement to the service quality and patient safety are factors that determine the hospital accreditation status (Type D to C, C to B, or B to A). On the other side, some financial issues occurred to hospital management, requiring stronger transparency, an accurate and reliable information system to support effective decision-making processes (Alqudah, Lutfi, et al., 2023).

Hospital's managerial practices and the ability to select the most appropriate strategies are important for hospitals (Dai, 2022), where proper control mechanisms that support strategic planning and rational financial decision-making are needed. The internal audit should promote effective managerial processes and enhance organizational performance (Abdullah & Smith, 2018; Alqudah, Afza, et al., 2023; Alqudah et al., 2019).

The role of internal audit has undergone a significant transformation due to the growing demand for its services beyond merely a tool for detecting errors and fraud, becoming a strategic administrative function aimed at enhancing organizational performance and ensuring the credibility of information (Alqudah et al., 2019). In the hospital context, internal audit supports the implementation of the centralized management of various units that face challenges(Alqudah, Lutfi, et al., 2023; Antoh et al., 2024). The role of internal audit has expanded to compliance evaluation with procedures for optimal use of resources, both in the healthcare sector and organizations in general (Abdullah & Smith, 2018; Alqudah et al., 2019). Therefore, internal audit provides a performance evaluation system that provides accurate and relevant data across all managerial levels (Alqudah, Mansour, Rawashdeh, et al., 2024). Internal auditors are responsible for safeguarding assets and ensuring adherence to regulations, policies, and procedures established and agreed upon by the organization (Ma et al., 2024). However, the rapid advancement of technology, including cloud-based accounting, offers a breakthrough to the internal audit.

Traditional computing in the accounting sector limits the performance and operational efficiency of internal audits (Alqudah, Mansour, Rawashdeh, et al., 2024). To address this issue, cloud-based accounting systems offer simplified financial processes through automated data input and provide direct access to relevant financial information (Bello et al., 2021), which improves the effectiveness of internal audits by facilitating data accessibility, accelerating the analysis and evaluation of financial trends, and supporting more efficient report preparation. The implementation of such a system allows internal auditors to shift their focus to more strategic activities, such as risk assessment, evaluation of internal control systems, and policy recommendation (Appiah et al., 2024). The real-time data access in cloud accounting enables flexible access regardless of time and place. The system allows auditors to continuously monitor transactions, speed up the detection of potential irregularities, and minimize the risk of fraud or non-compliance (Lutfi & Alqudah, 2023). The system has also been proven effective in supporting business processes through cost efficiency, enhanced technological capabilities, and flexibility to adapt to changing business environments (Alqudah, Mansour, Rawashdeh, et al., 2024). A significant relationship between the adoption of cloud-based accounting and the

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effectiveness of internal audit functions has been noticed by several researchers (Alqudah, Mansour, Rawashdeh, et al., 2024; Moudud-Ul-Huq et al., 2020; Saad et al., 2022; Yau-Yeung et al., 2020).

In practice, the hospital industry faces challenges in measuring the actual impact of cloud-based accounting on internal auditors' efficiency, as well as understanding the interaction between digital efficiency and the influence of cloud-based accounting on auditor effectiveness. As found in this research, type A and B hospitals have gained benefits from the adoption of cloud-based accounting systems for cost efficiency. Hospital management can significantly lower its expenditures on information technology infrastructure, as maintenance and system updates are less complex. In addition, cloud-based accounting enhances data accessibility and the availability of financial services across the hospital sector, where hospital staff can access accounting information from any location with an internet connection. The features of cloud-based accounting have positively influenced internal audit performance within hospitals (Altin & Yilmaz, 2022).

In recent years, the determinants of internal auditor effectiveness have been identified, but most of this research has focused primarily on financial service firms (Alqudah, Lutfi, et al., 2023), small and medium enterprises (SMEs) (Al-Okaily et al., 2023), and the manufacturing sector (Alqudah, Mansour, Rawashdeh, et al., 2024). There is a gap **re**garding the link between cloud-based accounting and the effectiveness of internal auditors in hospitals due to unmatching field data from real-world observations and the theoretical frameworks or concepts. The gap has encouraged researchers to collect new data while also validating existing theories. Previous literature lack of solid theoretical or conceptual foundation in explaining the current management practices, such as using the Technology-Organization-Environment (TOE) model or the Technology Acceptance Model (TAM) (Al-Okaily et al., 2023; Alqudah, Lutfi, et al., 2023; Alqudah, Mansour, Salem, et al., 2024; Lutfi & Alqudah, 2023).

This research advances the existing literature by examining the dynamics and challenges encountered by internal auditors within complex public service institutions such as hospitals. It introduces a conceptual model that explains how digital competence and cloud-based accounting systems interact to improve auditor effectiveness. The proposed model can be further tested in other sectors or geographical contexts, including Type A and B hospitals, to validate its broader applicability.

From a practical perspective, this research provides empirical evidence on the importance of digital proficiency in enhancing internal audit performance amid the ongoing transformation of accounting information systems. These findings highlight the necessity of continuous digital literacy programs to strengthen the adaptability and quality of internal auditing in healthcare institutions. At the policy level, this research offers an empirical basis for regulatory bodies to design initiatives that promote digital competence among internal auditors in hospitals. Such initiatives are expected to support wider objectives of improving transparency and accountability within the healthcare sector.

The primary objective of this research is to develop a model that examines the relationship between the implementation of cloud-based accounting systems and the effectiveness of internal auditors, with digital efficiency serving as both a mediating and moderating variable. The conceptual model is designed to achieve three main goals. First,

it investigates whether the adoption of cloud-based accounting systems affects the efficiency of internal auditors in hospitals, particularly in Type A and B hospitals in Makassar City. To the best of our knowledge, this represents the first research in Indonesia to analyze this relationship using a distinct model-based approach. Second, it evaluates the extent to which digital efficiency influences the relationship between cloud-based accounting adoption and auditor effectiveness. Third, the research employs the Technology–Organization–Environment (TOE) framework as its theoretical foundation, differing from previous research that has commonly used the Technology Acceptance Model (TAM) as in Cheng (2021a). The TOE framework is selected because it provides a comprehensive analytical approach to understanding the adoption of technological innovations and is widely recognized as a relevant model for analyzing cloud-based system implementation (Hiran & Henten, 2020; Mujalli et al., 2024). Therefore, the TOE framework is considered the most suitable for explaining the relationship between cloud-based accounting systems and internal auditor effectiveness, particularly in light of the growing significance of digital proficiency within hospital environments.

2. Literature Review and Hypothesis Development

Internal auditor effectiveness reflects the extent to which the internal audit function achieves its objectives in providing assurance, enhancing governance, managing risks, and strengthening internal controls in public organizations such as hospitals. Rooted in the value-added paradigm, internal auditors are viewed not merely as compliance officers but as strategic partners in achieving organizational goals. Independence and objectivity are therefore fundamental. Independence safeguards auditors from management influence and conflicts of interest, while objectivity ensures unbiased and reliable reporting. These principles align with the Technology–Organization–Environment (TOE) framework, which emphasizes how technological, organizational, and environmental factors jointly shape organizational practices.

The TOE framework views that innovation adoption is influenced by three contextual dimensions: technology, organization, and environment. The technological context encompasses internal and external technologies relevant to an organization's operations. The organizational context involves internal attributes such as size, managerial structure, operational scope, and available resources. The environmental context includes external pressures such as industry dynamics, market competition, and regulatory frameworks (Mujalli et al., 2024). As a comprehensive model, TOE integrates all factors affecting technology adoption, highlighting the interdependence of technological and organizational resources in determining the success of IT initiatives across both private and public sectors (Al-Sharafi et al., 2023; Hiran & Henten, 2020; Putri et al., 2025; Rawashdeh et al., 2023).

In public sector settings, including hospitals, the internal audit function serves as a strategic mechanism to ensure the effectiveness of internal control systems (Abdulmunim, 2018; Lutfi & Alqudah, 2023). Over time, internal auditing has evolved into a key managerial tool for safeguarding assets, protecting organizational property, and ensuring operational efficiency (Nkansa, 2024; Zheng & Evans, 2019). However, variations in legal, cultural, and institutional contexts can influence audit implementation and effectiveness (Lutfi & Alqudah, 2023). Consequently, hospitals and other public institutions increasingly

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prioritize capacity-building strategies to empower internal auditors. One notable innovation is the adoption of cloud-based accounting technologies, which enhance control effectiveness and financial integrity (Appiah et al., 2024). The adaptability of internal audits to institutional environments remains a critical determinant of their overall effectiveness (Hazaea et al., 2023).

Cloud-based accounting platforms integrate key components: applications, clients, infrastructure, platforms, and services, that collectively transform the internal audit process. By enabling remote access to financial data through internet connectivity, these systems improve audit efficiency and reduce the time and resources required for data collection and analysis (Lutfi & Alqudah, 2023). Real-time data updates further allow auditors to access current financial information, supporting timely and accurate assessments. Empirical evidence indicates that the adoption of cloud-based accounting technology positively correlates with improvements in internal auditor effectiveness (Alqudah, Mansour, Rawashdeh, et al., 2024; Moudud-Ul-Huq et al., 2020; Saad et al., 2022; Yau-Yeung et al., 2020). Based on this theoretical and empirical foundation, the following hypothesis is proposed:

H_1: Cloud-based accounting affects the effectiveness of internal auditors.

Digital literacy refers to the ability to effectively use and navigate digital technologies, including computers, software applications, and online platforms (Alqudah, Mansour, Rawashdeh, et al., 2024). In hospitals where technology plays an increasingly vital role, digital proficiency enables auditors to access information, communicate efficiently, and perform tasks effectively (Lois et al., 2020; Matta & Chamoun, 2025). The success of cloud-based accounting adoption in internal audits largely depends on auditors' digital competence, which supports the optimal use of technology in audit processes (Anderson et al., 2024).

Auditors with higher digital skills adapt more easily to technological changes (Broekhuizen et al., 2021), utilize cloud systems more accurately, and comply better with audit standards, reducing errors and improving reliability (Lutfi & Alqudah, 2023). Hence, developing auditors' digital capabilities through training and adequate resources is crucial for maximizing the benefits of cloud-based accounting. Empirical research confirms that adopting cloud-based technologies enhances auditors' digital literacy and performance (Altin & Yilmaz, 2022; Huy & Phuc, 2025; Saad et al., 2022). Based on these considerations, this research proposes the second hypothesis as follows:

H_2: The utilization of cloud-based accounting affects the digital literacy of internal auditors.

In the hospital sector, digital literacy encompasses qualities such as openness, creativity, and self-development, all of which enhance internal auditor performance (Broekhuizen et al., 2021; Manita et al., 2020). The openness dimension encourages awareness of the strategic importance of internal auditing and promotes collaboration in strengthening audit functions (Ochoa Pacheco & Coello-Montecel, 2023). Although hospitals often have limited capital investment in Information and Communication Technology (ICT), auditors can still effectively leverage digital networks for information sharing, reducing asymmetry, and improving audit quality. The creativity aspect enables

auditors to address challenges related to high learning costs and low operational efficiency. Digitally literate auditors utilize various platforms to exchange knowledge, update expertise, and assess audit inputs critically. Empirical research confirms a strong relationship between digital proficiency and internal audit effectiveness (Almagrashi et al., 2023; Volodina et al., 2022). Regarding the idea, the following hypothesis is proposed.

H_3: Digital efficiency affects the effectiveness of internal auditors

In the hospital industry, digital proficiency, often referred to as digital literacy, comprises the ability to navigate, evaluate, and generate information across digital platforms. In today's technology-driven environment, these skills are essential in both personal and professional contexts, including internal auditing (Yalnız, Dilcen et al., 2025). Digital proficiency integrates three key dimensions: technical skills, such as managing files and operating software; cognitive skills, including the ability to evaluate the credibility of digital information; and socio-emotional skills, which involve communicating ethically and securely within digital environments. This combination of skills is crucial for internal auditors to effectively utilize cloud-based accounting systems in hospitals (Perera et al., 2025). Ahmed et al. (2024) further emphasize that digital proficiency extends beyond technical ability to include designing, implementing, and evaluating practical solutions. It requires the integration of knowledge, skills, attitudes, and professional ethics. Therefore, digital literacy is a fundamental competency that supports technology adoption and internal audit success in the healthcare sector.

In the public accounting context, particularly in hospitals, creativity also plays an important role in developing digital literacy. Previous researchers (Alqudah, Mansour, Salem, et al., 2024), Budiman & Syafrony (2023), and Nikou et al. (2022) have shown that auditors' digital competencies influence how cloud-based accounting systems improve audit performance. This research argues that auditors' digital efficiency functions as both a mediating and moderating factor in the relationship between cloud accounting adoption and internal audit effectiveness. The effectiveness of cloud-based accounting implementation is therefore highly dependent on auditors' levels of digital proficiency. Two additional hypotheses are added to this research.

H_4: Digital efficiency mediates the relationship between the adoption of cloud-based accounting and the effectiveness of internal auditors

H_5: Digital efficiency moderates the relationship between the adoption of cloud-based accounting and the effectiveness of internal auditors

3. Research Method

This quantitative research employed a hypothetical-deductive approach in examining the influence of cloud-based accounting on internal auditor effectiveness and to assess the mediating and moderating roles of digital efficiency in Type A and B hospitals in Makassar City. Data were collected from purposively selected samples that comprised employees in accounting units or departments with an adequate understanding or interest in cloud-based accounting systems. The sample consisted of three Type A hospitals, each contributing five respondents, and seventeen Type B hospitals, each contributing four respondents, resulting in a total of 83 participants. After data screening, 78 valid responses

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were retained for analysis. The inclusion criteria required participants to be employed in Type A or B hospitals in Makassar City and to possess sufficient knowledge of cloud accounting concepts and practices, as summarized in Table 1.

Table 1. Sample List According to Selection Criteria

Description of Sample Criteria	Hospital Type	Total Hospitals	Special Considerations by Type	Sample Size
Employees/staff in the accounting department who have knowledge of or interest in cloud accounting	A	3	5	15
	B	17	4	68
Total sample				83
Samples eligible for analysis				78

Summary: Constructed by the author

Participation in this research was voluntary, and the questionnaire was distributed online through communication platforms such as WhatsApp between late January and early April 2025. The hypotheses and conceptual model were tested using a structured questionnaire developed based on an extensive literature review and relevant theoretical frameworks. All construct items were included to represent the variables within the proposed research model.

Five experts, who included practitioners and academics specializing in cloud-based and cloud accounting services, evaluated each item for clarity and contextual relevance during the pre-testing phase. Based on their feedback, several questions were revised to improve simplicity, adequacy, and precision. The final questionnaire contained 39 items across 13 indicators, covering all constructs in the research. Responses were measured using a 5-point Likert scale, where 1 indicated strong disagreement, and 5 indicated strong agreement.

The primary variables were measured using specific indicators. Cloud-based Accounting (CBA) was represented by four indicators: (a) service application model, (b) service platform model, (c) client model, and (d) service infrastructure model. Digital Efficiency (DE) was measured through four indicators: (a) access to information, (b) navigation of digital systems and data, (c) ability to manage diverse information challenges, and (d) effective digital communication. Effectiveness of Internal Auditors (EIA) was assessed using five indicators: (a) verification of financial report accuracy and reliability, (b) compliance with applicable policies, plans, and regulations, (c) evaluation and enhancement of risk management, (d) assessment of resource economy, efficiency, and effectiveness, and (e) provision of timely and comprehensive follow-up actions for improvement. The measurement indicators are summarized in Table 2.

Table 2. Variable Measurements

Variables	Indicators	References
Cloud-based accounting (CBA)	(a) service application model, (b) service platform model, (c) client model, and (d) service infrastructure model.	(Al-Okaily et al., 2023; Wang et al., 2022)

Variables	Indicators	References
Digital efficiency (DG)	(a) accessing information, (b) navigating digital systems and data, (c) overcoming challenges related to diverse information, and (d) communicating effectively using digital data.	(Liu et al., 2025; Yang et al., 2024)
Effectiveness of internal auditors (EIA)	(a) examining the accuracy and reliability of financial reports, (b) ensuring compliance with applicable policies, plans, procedures, and regulations, (c) assessing and improving risk management effectiveness, (d) evaluating the economical, effective, and efficient utilization of resources, and (e) providing thorough and timely follow-up actions for necessary improvements effectively.	(Alqudah, Afza, et al., 2023; Alqudah, Mansour, Salem, et al., 2024; Alqudah et al., 2019)

Summary: Constructed by the author

Partial Least Squares–Structural Equation Modeling (PLS-SEM) was used in primary data analysis since the sample size was relatively small. PLS-SEM tests complex models that include both mediation and moderation effects. The measurement model was evaluated through three main stages: reliability testing, assessment of convergent validity, and evaluation of discriminant validity. Statistical significance was determined using established threshold values to verify the strength of the relationships among constructs (Hair et al., 2019). The structural model evaluation followed the procedures recommended by Hair et al. (2020), emphasizing the coefficient of determination (R^2) as the main indicator for assessing the model's explanatory power regarding the variability of the dependent variables.

$$\eta j = \sum_{i=1}^{n} \beta_{ji}. \xi_i + \zeta_i$$

Explanation

η_j = Endogenous latent construct (affected variable)
ξ_i = Exogenous latent construct (influencing variable)
β_{ji} = Path coefficient from ξ_i to η_j
ζ_j = Structural error (residual error)

4. Results and Discussion

This section presents the demographic profile of the respondents, covering gender, age, education, and auditing experience. The research variables were assessed using a five-point Likert scale aligned with the research framework. As shown in Table 3, most respondents were male (77.1%), while females constituted 22.9%. In terms of education, 89.2% held a bachelor's degree and 10.8% a master's degree. All respondents were members of hospital finance units responsible for financial management, accounting, and reporting. The majority were aged 45–55 years (78.3%), followed by those aged 30–45 years (21.7%). Most participants (67.4%) had 5–8 years of auditing experience, while 32.6% had 3–5 years.

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Table 3. Respondent Profile

Demographics	Frequency	Percentage
Male	60	76.9
Female	18	23.1
Bachelor's Degree	70	89.7
Master's Degree	8	10.3
Age >30–45 years	17	21.7
Age >45–55 years	61	78.3
Experience >3–5 years	25	32.0
Experience >5–8 years	53	67.4

PLS-SEM method ensures that each item is examined for potential collinearity issues. As seen in Table 1, the Variance Inflation Factor (VIF) values for all items within the structural model ranged from 1.115 to 3.033 below the recommended maximum threshold of 5.0 (Hair et al., 2019). Hence, no significant collinearity issues were found within the research model, and the collinearity assumption was fulfilled.

Table 4: Reliability, Validity, VIF, and Quality of The Measurement Model

Constructs	Items	Loadings	CA	rho_A	CR	AVE	VIF
Cloud-based accounting	CBA1	0.987	0.987	0.987	0.990	0.963	1.115
	CBA2	0.975					1.232
	CBA3	0.984					2.456
	CBA4	0.978					1.134
Digital efficiency	DE1	0.985	0.988	0.988	0.990	0.954	2.095
	DE2	0.991					2.232
	DE3	0.949					3.033
	DE4	0.963					2.276
Effectiveness of internal auditors	EIA1	0.986	0.981	0.982	0.986	0.945	1.298
	EIA2	0.959					1.557
	EIA3	0.980					2.116
	EIA4	0.980					1.193
	EIA5	0.979					2.985

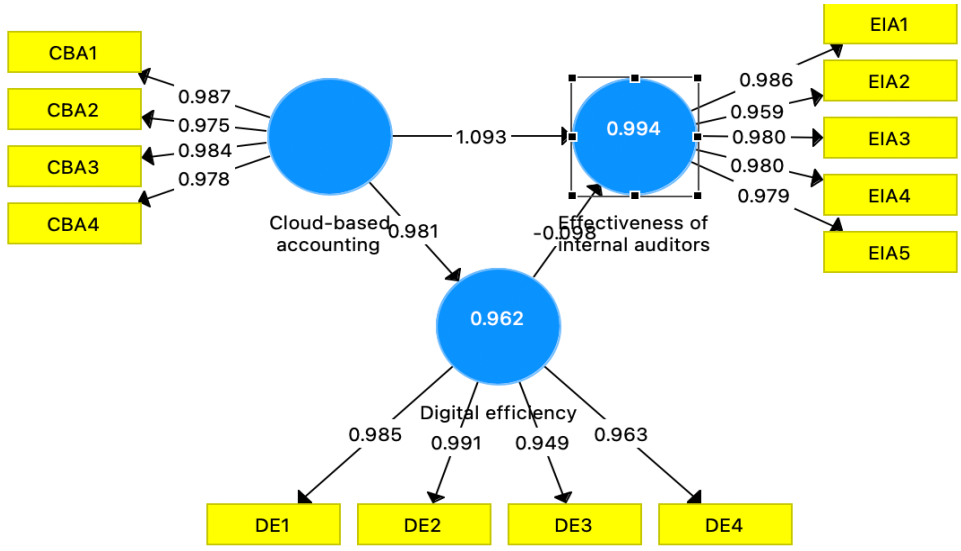

Figure 1. Factor Loading Result Model

Table 4 and Figure 1 present the reflective measurement model used to assess nomological validity. This validity was established by comparing the observed correlations among constructs with theoretical expectations derived from the literature and research hypotheses. Each indicator was tested for its significance in representing the construct, with loadings of at least 0.7 considered acceptable (Hair et al., 2020). Table 4 summarizes the constructs and their representative indicators. The reliability of the reflective measurement model was examined using Cronbach's Alpha, Composite Reliability (CR), and rho-A to ensure internal consistency. Convergent validity was evaluated through the Average Variance Extracted (AVE), which should exceed 0.5 (Hair et al., 2019). As shown in Table 4, all constructs achieved AVE values above this threshold, confirming adequate communality.

Discriminant validity was assessed using the Fornell-Larcker criterion, which compares the square root of each construct's AVE with its correlations to other constructs (Fornell & Larcker, 1981; Hair et al., 2019). The results in Table 5 indicate that all constructs exhibit higher AVE square roots than their inter-construct correlations, thereby confirming discriminant validity within the proposed model.

Table 5. Comparative Validity Metrics for Constructs Fornell-Larcker Criterion

	Cloud-based accounting	Digital efficiency	Effectiveness of internal auditors
Cloud-based accounting	0.981		
Digital efficiency	0.681	0.972	
Effectiveness of internal auditors	0.797	0.674	0.977

Source: PLS output, 2025

The predictive power of the model was evaluated using the coefficient of determination (R^2), which indicates the proportion of variance in the dependent variable explained by its predictors. According to Cohen (1988), R^2 values of 0.2, 0.5, and 0.8 represent small, medium, and large effect sizes, respectively. As shown in Table 6, the first model on internal auditor effectiveness recorded an R^2 and Adjusted R^2 of 0.590, indicating that Cloud-Based Accounting and Digital Efficiency together explain 59.0% of the variance in auditor effectiveness. The second model on digital efficiency produced an R^2 of 0.568 and an Adjusted R^2 of 0.567, showing that Cloud-Based Accounting accounts for 56.8% of the variance in digital efficiency. Based on Cohen's (1988) criteria, both models demonstrate moderate explanatory power.

Table 6. Model Fit

	R Square	*Adjusted R-Square*
Effectiveness of internal auditors	0.590	0.590
Digital efficiency	0.568	0.567

Source: PLS output, 2025

Statistical significance was determined using the p-value criterion with a maximum threshold of 0.05 (alpha = 5%), where a p-value less than or equal to 0.05 indicates

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statistical significance. Alternatively, the t-statistic from the Student's t-test can be used, where a t-value greater than 1.96 signifies significance at the 95% confidence level. Details of the significance results are presented in Table 7 and Figure 2.

Table 7. Summary of Results: Direct/Indirect Path Analysis.

Hypotheses	Beta	Mean	SD	t-value	p-value	Result
CBA→EIA	1.093	1.087	0.087	11.906	0.000	Supported
CBA→DE	0.981	0.981	0.009	111.386	0.000	Supported
DG→ EIA	-0.098	-0.091	0.089	1.042	0.271	Not Supported
Indirect						
CBA→DE →EIA	-0.096	-0.090	0.087	1.098	0.273	Not Supported
Moderating						
CBA→ EIA	1.096	1.087	0.087	12.568	0.000	Supported
DE→EIA	-0.087	-0.078	0.087	1.056	0.292	Not Supported
CBA*DE →EIA	0.018	0.018	0.011	1.600	0.110	Not Supported

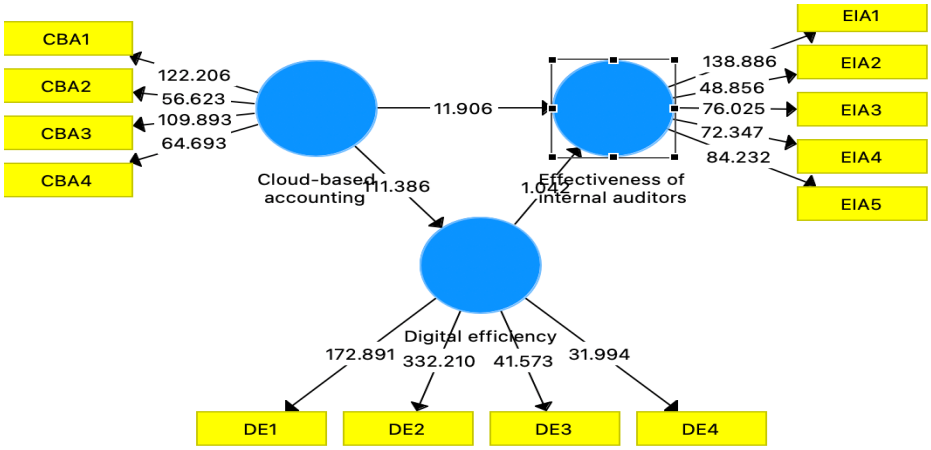

Figure 2. Model Direct Relationship Results

This research model views digital efficiency as a mediating variable and moderating variable (see Table 7 and Figure 3).

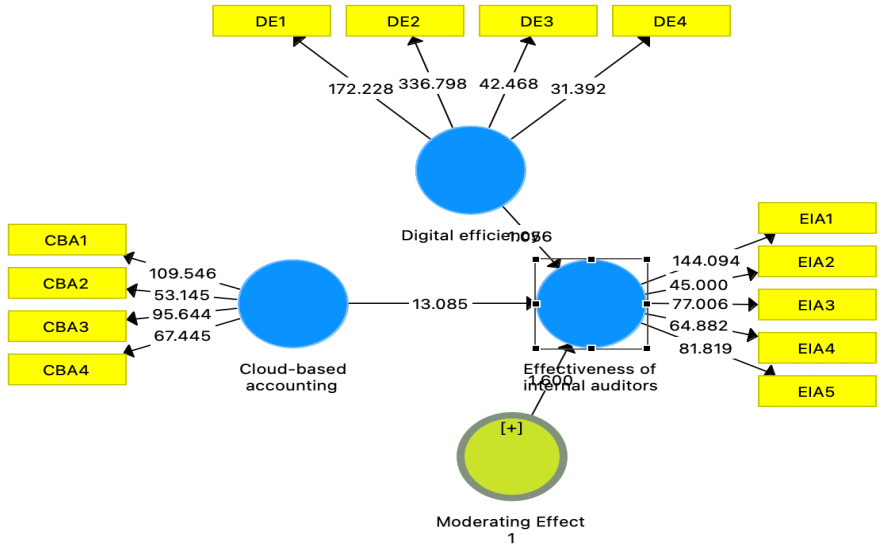

Figure 3. Results of the Moderation Relationship

This research investigates digital efficiency as both a mediating and moderating variable in the relationship between cloud-based accounting adoption and internal auditor effectiveness in type A and B hospitals in Makassar City (see Figures 2 and 3). It extends existing literature by examining how cloud-based accounting influences internal auditor effectiveness while incorporating digital efficiency as a central dual-role factor. The findings provide theoretical and empirical evidence supporting the positive relationship between cloud-based accounting utilization and auditor effectiveness, highlighting the significance of digital efficiency within the proposed model. Figures 2 and 3 summarize the PLS analysis results derived from the research framework.

The results reveal a positive and significant relationship between cloud-based accounting adoption and internal auditor effectiveness, with a p-value of 0.000. Cloud-based accounting enhances operational efficiency, strengthens internal controls, improves transparency, and enables auditors to detect and manage risks more effectively. Hospitals adopting this technology benefit not only from improved financial and operational performance but also from enhanced internal oversight, thereby supporting sound corporate governance. These findings align with prior research (Alqudah, Mansour, Rawashdeh, et al., 2024; Moudud-Ul-Huq et al., 2020; Saad et al., 2022; Yau-Yeung et al., 2020). For example, Abdulmunim (2018) highlighted that internal auditors must develop intellectual capital to adapt to the knowledge-based economy and cloud technologies, while Al-dhubaibi & Sharaf-addin (2022) found that external auditors are increasingly skilled in using cloud systems and big data for evidence collection and evaluation. Similarly, Putri et al. (2025) observed that cloud-based accounting enables SMEs to manage bookkeeping independently, reducing dependence on external auditors, though adoption remains limited. Moudud-Ul-Huq et al. (2020) further argued that cloud-based accounting and data frameworks can transform public sector accounting models and organizational strategies.

Based on these findings, it is recommended that type A and B hospitals enhance their adoption of cloud-based accounting to strengthen internal audit effectiveness. Additionally, systematic efforts to improve auditors' digital efficiency are essential, as it represents a key determinant of successful technology implementation in the healthcare and public sectors. Adopting cloud-based accounting requires skilled human resources in computing and information technology to ensure reliable and accurate financial data, as found by previous researchers (Altin & Yilmaz, 2022; Huy & Phuc, 2025; Saad et al., 2022). For auditors, technology enhances performance and supports organizational objectives, while adequate resources enable greater efficiency Mujalli et al. (2024). Similarly, Saad et al. (2022) found that cloud-based accounting reduces IT investment through scalable, flexible systems, allowing hospitals to manage bookkeeping independently and rely less on external auditors. Other factors, such as security, management support, organizational readiness, and vendor assistance, also positively influence adoption. These findings confirm that cloud-based accounting and digital efficiency significantly enhance auditor performance. Rudansky-Kloppers & Van den Bergh (2019) further reported that over 90% of accounting firms adopted cloud-based systems for their efficiency, mobility, and cost-saving benefits, including in public sector contexts such as type A and B hospitals.

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However, this research found a negative and non-significant relationship between digital efficiency and auditor effectiveness (p = 0.271). Although digital efficiency can theoretically improve performance, its impact may be limited by overreliance on digital tools, misalignment between systems and audit needs, inadequate training, or an excessive focus on efficiency over accuracy. Thus, hospitals should adopt a balanced approach that integrates technology, human capability, and comprehensive audit strategies to enhance auditor effectiveness.

This result contrasts with prior research, including research by Almagrashi et al. (2023) and Volodina et al. (2022). The finding is particularly unexpected given the increasing emphasis on digitalization in organizational settings, including among public sector auditors in type A and B hospitals (Manita et al., 2020). That research identified five key areas where digital technologies influence public sector auditing, particularly the audit's role as a governance mechanism. Digitalization is believed to enhance audit relevance by expanding service scope and leveraging data analytics, thereby improving audit quality and fostering a culture of innovation. While these developments strengthen governance, they may also limit managerial discretion.

This research highlights the need for efficient digital strategies to guide regulators in adapting existing auditing standards. Public sector auditing, particularly in hospitals, involves policies and practices that measure, record, and evaluate organizational performance. Recent shifts toward market-oriented philosophies and performance-based assessments have transformed the function of public sector audits (Mattei et al., 2021). Although Hay & Cordery (2018), Otia & Bracci (2022), and Shibambu & Ngoepe (2024) have documented various aspects of this evolution, comprehensive analyses remain limited. Competent internal auditors are therefore essential for achieving organizational objectives and safeguarding financial integrity. Their effectiveness depends on adequate resources such as top management support, collaboration with external auditors, operational independence, audit unit capacity, and external incentives. These extrinsic incentives also act as moderating factors that strengthen the link between auditor empowerment and performance effectiveness in the public sector, including hospitals (Alqudah, Afza, et al., 2023).

In the present research, digital efficiency did not significantly mediate the relationship between cloud-based accounting adoption and internal auditor effectiveness (p = 0.273). This suggests that the effectiveness of auditors is not influenced solely by improvements in digital system efficiency. Instead, the direct effects of cloud technologies or other non-digital organizational factors may play a more dominant role. Hence, organizations should not focus exclusively on digital efficiency when implementing technology but should also consider human resource readiness, the relevance of technology to audit functions, and the organizational culture that supports technological adoption.

Whereas Abdulmunim (2018), Al-Okaily et al. (2023), and Altin & Yilmaz (2022) emphasize the crucial mediating role of digital efficiency. In the public sector, particularly in hospitals, cloud-based accounting implementation still faces significant challenges (Al-Sharafi et al., 2023; Bello et al., 2021). These include the complexity of cloud technologies, structural incompatibilities with legacy systems, and the technical difficulties of data migration. Aligning new cloud infrastructures with existing organizational systems

often proves difficult, as seamless integration requires specialized technical expertise that may not be readily available. Consequently, the technical and structural challenges associated with cloud adoption may weaken the mediating influence of digital efficiency on auditor effectiveness.

The implementation of cloud-based accounting poses organizational challenges that require senior management to address changes in culture, processes, and work relationships (Yau-Yeung et al., 2020). Successful adoption depends on management's readiness to recognize its business value and invest in technological capability development (Lee, 2021). Human resource competency is equally crucial, particularly in technical and IT skills related to digital efficiency. IT managers play a vital role in providing training to ensure effective system use, which enhances productivity and audit effectiveness. Adequate digital resources further enable more efficient task execution and improved audit performance.

Cloud-based accounting also creates competitive challenges across sectors. Understanding its strategic potential is key to sustaining organizational performance (Cheng, 2021b). In hospitals, adoption is often hindered by limited service availability, inadequate support, and data security concerns involving third-party access and storage. Existing frameworks are insufficient to address these complexities, as cloud accounting requires advanced digital efficiency skills (Gong et al., 2024), making traditional adoption models difficult to apply (Almagrashi et al., 2023). Alqudah, Mansour, Salem, et al. (2024) stress the importance of developing digital efficiency to strengthen the link between cloud-based accounting adoption and auditor performance. Similarly, Volodina et al. (2022) highlight that public sector digitalization reshapes data production, sharing, and control systems, making them increasingly decentralized, automated, and cross-institutional.

The findings of this research show that, in Type A and B hospitals in Makassar City, digital efficiency does not moderate the relationship between cloud-based accounting implementation and internal auditor effectiveness. This suggests that technological benefits do not automatically translate into improved auditor performance. Auditing requires a professional approach that may not always align with efficiency principles, while factors such as organizational structure, work culture, and individual readiness also influence successful technology integration.

To enhance effectiveness, hospitals should complement cloud accounting adoption with broader managerial strategies, including auditor training in digital tools, system integration into audit processes, and strengthened governance and interdepartmental collaboration. The results indicate that digital efficiency does not amplify the positive effect of cloud-based accounting on auditor performance, contradicting earlier research, where auditors with strong digital skills make better use of cloud technology and apply best audit practices. Such competencies reduce errors and enhance audit reliability (Budiman & Syafrony, 2023; Lutfi & Alqudah, 2023; Nikou et al., 2022). Hence, digital competence remains essential for maximizing the effectiveness of cloud-based accounting systems in public sector auditing, particularly in Type A and B hospitals.

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5. Conclusion, Implications, and Limitations

This research examined the influence of internal auditors' digital efficiency on the relationship between cloud-based accounting implementation and auditor effectiveness in Type A and B hospitals in Makassar City. The findings reveal that cloud-based accounting adoption significantly enhances auditors' digital efficiency, yet digital efficiency does not play a significant mediating or moderating role in this relationship. The research affirms the relevance of the Technology-Organization-Environment (TOE) framework as a suitable analytical model for understanding technological innovation adoption in the hospital sector. Practically, cloud-based accounting reduces the need for physical infrastructure and operational costs, allowing hospitals to allocate financial resources more effectively to strengthen internal audit functions.

This research contributes both theoretically and practically. Theoretically, it addresses a gap in the literature on cloud-based accounting adoption and its impact on internal auditor effectiveness, particularly within the hospital industry. The results emphasize the importance of adopting cloud-based accounting systems to improve internal audit performance. By exploring digital efficiency as a potential mediating and moderating factor, this research extends the understanding of technology adoption in developing-country contexts and reinforces the applicability of the TOE framework, which highlights the interdependence of technological, organizational, and environmental factors in innovation decisions. Practically, cloud-based accounting enhances internal audit operations by providing real-time data access, streamlining workflows, and supporting remote collaboration among auditors. It reduces reliance on physical infrastructure and lowers system maintenance costs, enabling hospitals to allocate resources more strategically. Moreover, by leveraging digital efficiency and cloud-based data storage, hospitals can maintain operational continuity and resilience against disruptions such as natural disasters.

The present research suffers from several limitations. First, this research assessed the overall impact of cloud-based accounting without analyzing individual system components. Future research should investigate specific features to determine their distinct effects on auditor performance. Second, the research focused solely on Type A and B hospitals in Makassar City. Expanding the geographical scope and including diverse hospital types would offer a more comprehensive understanding, including potential cultural influences on technology adoption. Third, as cloud-based accounting adoption in hospitals remains a relatively new phenomenon, further research should explore the factors influencing adoption across different system components. Lastly, future research could extend beyond the healthcare sector to compare findings across industries, thereby broadening insights into the relationship between cloud-based accounting and internal audit effectiveness.

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