

The Key Factors of Internal Audit Performance in Public Healthcare Facilities in Riyadh, Saudi Arabia

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Abstract: Saudi Arabia's healthcare transformation has increased the importance of internal audit as a governance mechanism for accountability, control, and risk oversight. This study examined how auditors' competency (AC), e-audit (EA), and management support (MS) relate to internal audit performance (IAP) in public healthcare facilities, with audit quality (AQ) specified as a mediator and risk management (RM) as a moderator. A quantitative cross-sectional survey was conducted in 80 public healthcare facilities in Riyadh, Saudi Arabia. Responses from personnel involved in internal audit, control, risk, and related governance functions were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS. The reported measurement results indicated strong reliability and convergent validity across the six constructs. The structural model reported positive coefficients from AC, EA, and MS to AQ and IAP, with the largest coefficient to AQ being AC ($\beta = 0.397$), followed by MS ($\beta = 0.384$) and EA ($\beta = 0.293$). AQ had a positive coefficient with IAP ($\beta = 0.297$), while the reported indirect coefficients through AQ for AC, EA, and MS were 0.118, 0.087, and 0.114, respectively. The reported RM interaction coefficients were also positive for AC ($\beta = 0.140$), EA ($\beta = 0.128$), and MS ($\beta = 0.112$). Because the manuscript does not report the inferential statistics required to establish path significance, the structural coefficients are interpreted descriptively. The reported pattern suggests that internal audit performance in Riyadh public healthcare is associated with professional capability, digital audit practices, management support, audit quality, and risk governance.

Keywords: Auditors' competency, E-audit, Audit quality, Risk management, Internal audit performance, Saudi healthcare.

1. Introduction

Saudi Arabia's healthcare sector is undergoing extensive institutional and service transformation under Vision 2030, creating stronger expectations for accountability, transparency, operational control, and effective use of public resources. The reform agenda has expanded the scale and complexity of healthcare delivery, while digital systems and new models of care have increased the volume of financial, operational, clinical, and compliance information available for oversight. Mani and Goniewicz (2024) describe this transformation as a broad restructuring of healthcare governance, financing, digitalization, and service delivery. Suleiman and Ming (2025) likewise show that the evolving Saudi model of care places greater emphasis on coordinated, patient-centered, and system-level performance. In this environment, internal audit is not limited to checking transactions after they occur; it is expected to provide assurance on controls, risk exposure, governance processes, and the reliability of information used by decision makers. The performance of internal audit therefore has direct relevance to the quality and resilience of public healthcare management.

Internal audit effectiveness depends on more than the formal existence of an audit unit. Research has consistently linked effectiveness to the characteristics of the internal audit team, the quality of audit processes, and the organizational relationships that enable auditors to perform their work

independently and credibly. Arena and Azzone (2009) found that internal audit effectiveness is associated with team characteristics, audit processes, and organizational links. In the Saudi public sector, Aljabr and Almubarak (2021) reported that top management support is positively related to internal auditing effectiveness, reinforcing the importance of organizational backing in environments governed by public-sector regulations. These findings are particularly relevant to healthcare institutions because audit work may cover procurement, information systems, clinical support processes, compliance, and operational risk. Alshamrani (2023) further demonstrated the relevance of internal audit to patient-safety governance in Saudi primary healthcare, indicating that audit quality and organizational conditions can affect the practical contribution of audit activities.

Three determinants are central to the present study. Auditors' competency represents the professional knowledge, technical skill, judgment, and sector understanding needed to plan and execute useful audit work. E-audit represents the use of digital tools and information systems to examine data, automate procedures, identify exceptions, and improve the timeliness of assurance. Mujalli (2024b) found that e-auditing adoption can improve internal audit department performance in Saudi Arabia, showing that digital capability is increasingly material to audit productivity and reliability. Management support represents the resources, access, authority, and organizational legitimacy provided to the internal audit function. Endaya and Hanefah (2016) found that internal auditor characteristics influence internal audit effectiveness and that senior-management support plays an important moderating role. Together, these factors suggest that internal audit performance is shaped by the interaction of human capability, technological capacity, and organizational support rather than by any single resource in isolation.

The study extends this logic by distinguishing the direct effects of these determinants from the mechanisms through which they operate. Audit quality is treated as a mediator because competent auditors, effective e-audit systems, and supportive management should improve performance partly by producing more accurate, objective, timely, and actionable audit work. Risk management is treated as a moderator because the value of internal audit resources may be greater where risk identification, assessment, and response are embedded in organizational practice. Almgrashi and Mujalli (2024) provide Saudi public-sector evidence linking management support and risk-management practices to the implementation of risk-based internal auditing. Greapcă and Lungu (2024) also document the strong conceptual connectivity between internal audit and risk management in the contemporary literature. Accordingly, this study examines an integrated model in which AC, EA, and MS predict AQ and IAP, AQ mediates the three predictor-to-IAP relationships, and RM strengthens the direct relationships between the three predictors and IAP.

The purpose of this study was therefore to examine the relationships of auditors' competency, e-audit, and management support with audit quality and internal audit performance in Saudi public healthcare institutions, and to examine the proposed mediating role of audit quality and moderating role of risk management. The study responds to the need for evidence that integrates professional, technological, organizational, quality, and risk-governance factors within one empirical model. By focusing on public healthcare facilities in Riyadh and estimating the model with PLS-SEM, the research provides a structured assessment of the reported relationships and their relative coefficient magnitudes. The resulting model is intended to support both scholarly understanding and practical decisions concerning auditor development, digital audit investment, management support, and risk-based governance in a healthcare environment undergoing continuing institutional reform.

1.1 Research question

How do auditors' competency, e-audit, and management support affect audit quality and internal audit performance, how does audit quality mediate these relationships, and how does risk management moderate them in Saudi public healthcare institutions?

1.2 Literature Review

1.3 Governance and internal audit

Governance defines how authority, accountability, risk oversight, and control are organized within an institution. Internal audit contributes to this system by independently evaluating whether controls and governance processes are designed and operating in a manner consistent with organizational objectives. In public-sector settings, this contribution is especially important because audit findings may influence resource stewardship, compliance, service quality, and confidence in management decisions. Karagiorgos et al. (2024) identify internal audit as a mechanism that can strengthen transparency, security, and performance in public organizations. The Saudi context adds a further institutional dimension because public organizations operate within formal regulatory structures while also responding to the transformation objectives of Vision 2030. Alktani and Ghareebi (2014) documented continuing concerns regarding the independence and professional status of internal audit in the Saudi public sector, showing why the quality of the audit function cannot be assumed merely from its formal establishment. For healthcare institutions, effective internal audit therefore requires both governance authority and operational relevance.

The distinction between internal and external audit is also important to the model. External audit primarily addresses the credibility of financial reporting, whereas internal audit has a broader and continuing mandate that may include operational efficiency, compliance, information systems, risk management, and internal control. This wider scope makes the internal audit function dependent on access to information, competent personnel, appropriate methods, and organizational cooperation. Arena and Azzone (2009) show that organizational links and audit-process characteristics are central to internal audit effectiveness. In healthcare, the breadth of the mandate means that auditors may need to understand procurement, digital records, regulatory requirements, patient-safety processes, and administrative controls. Alshamrani (2023) demonstrates that internal audit can contribute to patient-safety governance in Saudi primary healthcare. Consequently, the present study treats internal audit performance as an organizational outcome shaped by professional capability, technology, management support, audit quality, and risk governance.

1.4 Auditors' competency

Auditors' competency refers to the knowledge, technical skills, professional judgment, experience, and sector understanding required to perform audit work effectively. Competency affects the ability to identify material risks, evaluate controls, interpret evidence, use analytical tools, communicate findings, and formulate recommendations that management can act upon. Endaya and Hanefah (2016) provide empirical evidence that internal auditor characteristics have a significant effect on internal audit effectiveness. In a technology-enabled environment, competency also includes the ability to work with information systems and digital audit procedures rather than relying only on traditional manual techniques. Supriadi et al. (2019) found that auditor competency in the use of information technology influences successful e-audit implementation. In healthcare institutions, professional competence is especially important because auditors must often evaluate processes that combine financial, operational, technological, and regulatory dimensions. The study therefore expects higher auditor competency to improve both the quality of audit work and the resulting performance of the internal audit function.

1.5 E-audit

E-audit refers to the use of digital technologies, electronic records, data-analysis tools, and automated procedures to support audit planning, testing, exception detection, documentation, and reporting. Its principal value is not the technology itself but the capacity to examine larger volumes of data, identify anomalies more quickly, and improve the timeliness and consistency of assurance work. Mujalli (2024b) found that e-auditing adoption positively affects internal audit department performance in Saudi Arabia, providing direct contextual support for the inclusion of EA in the present model. Digital

audit capability also requires competent users, reliable information systems, secure access, and management willingness to invest in the necessary infrastructure. Othman (2025) found that technology-related applications can improve audit-firm efficiency and audit quality in Saudi Arabia when they are strategically integrated and supported by training. Accordingly, e-audit is expected to influence IAP directly and indirectly through the quality of the audit process it enables.

1.6 Management support

Management support represents the organizational commitment that gives internal audit the authority, resources, access, and institutional legitimacy needed to perform its responsibilities. Support may be reflected in adequate staffing and budgets, access to records and personnel, protection of audit independence, timely responses to recommendations, and visible recognition of the audit function. Aljabr and Almubarak (2021) found a positive relationship between top management support and internal auditing effectiveness in Saudi public universities. Dellai and Omri (2016) similarly identified management support as an important determinant of internal audit effectiveness in Tunisian organizations. The mechanism is straightforward: even technically competent auditors cannot produce strong organizational outcomes if they lack information, resources, cooperation, or the ability to communicate findings to decision makers. In healthcare organizations, where audit issues may cut across finance, procurement, information technology, clinical administration, and compliance, management support is expected to improve audit quality while also facilitating the implementation and organizational use of audit recommendations.

1.7 Audit quality as mediator

Audit quality captures the extent to which audit work is reliable, objective, evidence-based, professionally executed, timely, and useful for governance and decision making. In the present model, AQ is positioned as a mediator because AC, EA, and MS are not assumed to improve organizational audit performance only through direct channels. Competent auditors should produce stronger analyses and recommendations; e-audit should improve the scope, speed, and consistency of procedures; and management support should enable auditors to obtain evidence and maintain effective organizational access. The combined effect of these conditions should be reflected in the quality of the audit process and outputs before it is reflected in broader internal audit performance. Endaya and Hanefah (2016) show that auditor characteristics and organizational support are materially related to internal audit effectiveness, supporting this process-oriented logic. The mediation test therefore examines whether AQ constitutes a measurable pathway through which professional, technological, and organizational resources are converted into improved IAP.

1.8 Risk Management

Risk management provides a structured process for identifying, assessing, prioritizing, and responding to uncertainty that may affect organizational objectives. Internal audit and risk management are distinct functions, but they are closely connected because audit planning, control assurance, and the evaluation of governance processes depend on an understanding of material organizational risks. Greapcă and Lungu (2024) show that internal audit and risk management have developed as strongly connected research domains with substantial overlap in governance and control. In Saudi public organizations, Almgrashi and Mujalli (2024) found significant relationships among management support, risk-management practices, and the implementation of risk-based internal auditing. This study therefore treats RM as a contextual moderator rather than as a substitute for auditor competency, e-audit, or management support. The expectation is that these resources will contribute more strongly to IAP when the institution has a mature risk-management environment that directs audit attention toward significant threats, priorities, and control weaknesses.

1.9 Theoretical framework and hypotheses development

The theoretical framework integrates professional, technological, organizational, quality, and risk-governance perspectives in one PLS-SEM model. AC, EA, and MS are specified as exogenous predictors because they represent three different resource domains: human capability, digital audit capability, and organizational support. AQ is modeled as an endogenous mediator that captures the quality mechanism through which these resources can be translated into stronger audit outcomes. IAP is the final endogenous construct and represents the effectiveness and contribution of the internal audit function. RM is included as a moderator because a stronger risk environment should increase the organizational relevance and use of audit capability. The model is consistent with prior evidence that internal audit effectiveness depends on auditor characteristics, organizational support, process quality, and risk-oriented governance. Mujalli (2024a) further shows that risk-based internal auditing in Saudi public organizations is influenced by organizational and risk-management factors, supporting the contextual relevance of the model.

The hypotheses therefore test direct, mediated, and moderated relationships rather than treating the determinants as independent explanations. The direct paths examine whether AC, EA, and MS improve AQ and IAP and whether AQ improves IAP. The mediation paths test whether AQ transmits part of the effects of AC, EA, and MS to IAP. The moderation paths test whether RM strengthens the relationships of AC, EA, and MS with IAP. This structure allows the study to distinguish between resources that affect performance immediately and resources whose effects operate through audit quality or depend on the risk-governance environment. Table 1 states the corresponding hypotheses in the same order used in the final structural-model results.

Table 1 : Hypotheses

Hypothesis	Statement
H1	Auditors' competency positively affects Audit Quality.
H2	Auditors' competency positively affects Internal Audit Performance.
H3	Audit Quality positively affects Internal Audit Performance.
H4	E-audit positively affects Audit Quality.
H5	E-audit positively affects Internal Audit Performance.
H6	Management Support positively affects Audit Quality.
H7	Management Support positively affects Internal Audit Performance.
H8	Audit Quality mediates the relationship between Auditors' competency and Internal Audit Performance.
H9	Audit Quality mediates the relationship between E-audit and Internal Audit Performance.
H10	Audit Quality mediates the relationship between Management Support and Internal Audit Performance.
H11	Risk Management positively moderates the relationship between Auditors' competency and Internal Audit Performance.
H12	Risk Management positively moderates the relationship between E-audit and Internal Audit Performance.
H13	Risk Management positively moderates the relationship between Management Support and Internal Audit Performance.

2. Methodology

This study used a quantitative cross-sectional survey design to test the relationships among auditors' competency, e-audit, management support, audit quality, risk management, and internal audit performance. The design was appropriate because the model contains clearly specified constructs and direct, mediating, and moderating relationships that can be estimated statistically. Primary data were collected through a structured questionnaire from personnel involved in internal audit and related governance activities in public healthcare institutions. Respondents included internal auditors and other personnel with responsibilities related to financial control, risk, compliance, or audit management. Their involvement in organizational control processes made them an appropriate source of evidence about the conditions influencing internal audit performance. The study focused on

perceptions of actual audit practices and organizational support rather than secondary administrative indicators, allowing the model to capture how professional capability, technology, audit quality, and risk governance are experienced within the participating healthcare institutions.

The questionnaire measured six constructs: Auditors' Competency (AC), E-Audit (EA), Management Support (MS), Audit Quality (AQ), Risk Management (RM), and Internal Audit Performance (IAP). Items were rated on a five-point Likert scale ranging from strong disagreement to strong agreement. The measurement structure comprised six items for AC, six for EA, six for MS, six for AQ, six for RM, and eight for IAP. The instrument therefore provided multiple indicators for each latent construct and supported the subsequent assessment of reliability and convergent validity. The constructs and item structure were adapted from the internal-audit and governance literature to fit the objectives of the study and the public-healthcare context. The demographic profile collected information on gender, age, nationality, education, designation, institution type, organizational age, and number of employees, providing descriptive context for the participating institutions and respondents without changing the unit of analysis used in the structural model.

Data were collected within 80 public healthcare facilities in Riyadh, Saudi Arabia. Riyadh was used as the study setting because it contains a substantial concentration of public hospitals, specialized medical centers, health clusters, and administrative healthcare activity. The manuscript therefore treats the empirical setting as Riyadh-based and does not generalize the sampling frame to all Saudi healthcare institutions. The cross-sectional design captured the respondents' assessments at one point in time and is consequently appropriate for examining associations and predictive relationships, but it does not establish temporal causality. This limitation is important when interpreting the structural paths: positive coefficients indicate reported relationships within the model rather than proof that one construct causes another over time. The sector-specific selection of respondents supports interpretation within the defined Riyadh public-healthcare context.

The data were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS. PLS-SEM was selected because the study estimates a multi-construct model containing direct, indirect, and interaction paths and emphasizes prediction and explanation of variance rather than strict covariance-based model fit. Hair et al. (2022) describe PLS-SEM as suitable for complex latent-variable models and provide procedures for evaluating both measurement and structural models. The analysis followed two stages. First, the measurement model was evaluated using indicator loadings, Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE). Second, the structural model was interpreted using the reported path coefficients, indirect coefficients, and interaction coefficients presented in the study tables. The structural results are interpreted descriptively with respect to coefficient direction and magnitude. Because bootstrap t-statistics, p-values, and confidence intervals are not reported in the manuscript, statistical significance is not inferred from coefficient signs alone. Measurement-model interpretation is limited to the reliability and convergent-validity evidence reported in Tables 3–6.

3. Results

The participating institutions represented a range of public healthcare settings and organizational sizes. As shown in Table 2, 70% of respondents were male and 30% female; the largest age group was 41–50 years (45%); and 82% were Saudi. More than half held a bachelor's degree (55%), while 32% held a master's degree and 10% reported professional certifications such as CIA, CPA, or CISA. Internal auditors and senior internal auditors together accounted for 63% of respondents, with audit/risk managers and department heads or directors comprising the remainder. Public hospitals represented 63% of institutions, followed by specialized medical centers (22%) and health clusters (15%). Most institutions had operated for more than ten years, and 70% employed at least 500 people. These characteristics indicate that the participating institutions were predominantly established, relatively large public healthcare organizations with respondents who held roles directly related to audit and governance.

Table 2 : Demographic Profile of Respondents and Institutions

Category	Sub-Category	Percentage (%)
Gender	Male	70%
	Female	30%
Age Range	33–40 years	28%
	41–50 years	45%
	51–58 years	27%
Nationality	Saudi	82%
	Non-Saudi	18%
Education Level	Bachelor's Degree	55%
	Master's Degree	32%
	Professional Certifications (CIA/CPA/CISA)	10%
	Doctorate	3%
Designation	Internal Auditor	38%
	Senior Internal Auditor	25%
	Audit/Risk Manager	22%
	Department Head / Director	15%
Type of Institution	Public Hospital	63%
	Specialized Medical Centre	22%
	Health Cluster	15%
Length of Operation	< 5 years	8%
	5–10 years	17%
	>10 years	75%
Number of Employees	< 250	12%
	250–499	18%
	500–999	34%
	≥ 1,000	36%

3.1 Measurement model

The reported measurement results demonstrated strong internal consistency and convergent validity across the six constructs. Cronbach's alpha values ranged from 0.919 for AQ to 0.986 for IAP, while composite reliability (ρ_c) ranged from 0.937 to 0.988. These values exceed commonly used reliability thresholds and indicate that the item sets consistently measure their intended constructs. Table 3 reports the number of items and Cronbach's alpha for each construct, while Table 5 provides the more detailed reliability statistics, including ρ_a , ρ_c , and AVE. The summary reliability values are interpreted consistently with the detailed construct-reliability statistics reported in Table 5. Accordingly, the measurement-model conclusions in this manuscript are limited to internal consistency and convergent validity; no discriminant-validity conclusion is drawn from the statistics reported here.

Table 3 : Reliability Analysis (Cronbach's Alpha)

Construct	Number of Items	Cronbach's Alpha (α)	Interpretation
Auditors' Competency (AC)	6	0.965	Excellent reliability
E-Audit (EA)	6	0.962	Excellent reliability
Management Support (MS)	6	0.965	Excellent reliability
Audit Quality (AQ)	6	0.919	Excellent reliability
Internal Audit Performance (IAP)	8	0.986	Excellent reliability
Risk Management (RM)	6	0.970	Excellent reliability

Convergent validity was also supported by the reported standardized loading ranges and AVE values. The item loadings ranged from 0.825 to 0.871 for AQ, 0.889 to 0.954 for EA, 0.911 to 0.939 for MS, 0.917 to 0.931 for AC, 0.917 to 0.949 for RM, and 0.936 to 0.971 for IAP. All reported ranges were above 0.70, indicating that the indicators were strongly associated with their respective constructs. AVE values ranged from 0.711 for AQ to 0.913 for IAP, exceeding the conventional 0.50 benchmark and showing that each construct explained more than half of the variance in its indicators. Together, the loading and AVE results provide adequate support for convergent validity before interpretation of the structural paths.

Table 4 : Standardized Factor Loadings for Convergent Validity

Construct	Items	Standardized Loadings	Interpretation
Auditors' Competency (AC)	AC1–AC6	0.917–0.931	High convergent validity
E-Audit (EA)	EA1–EA6	0.889–0.954	High convergent validity
Management Support (MS)	MS1–MS6	0.911–0.939	High convergent validity
Audit Quality (AQ)	AQ1–AQ6	0.825–0.871	High convergent validity
Internal Audit Performance (IAP)	IAP1–IAP8	0.936–0.971	High convergent validity
Risk Management (RM)	RM1–RM6	0.917–0.949	High convergent validity

Table 5 : Construct Reliability and Validity

Factor	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AC	0.965	0.965	0.971	0.850
AQ	0.919	0.920	0.937	0.711
EA	0.962	0.963	0.969	0.841
IAP	0.986	0.987	0.988	0.913
MS	0.965	0.965	0.971	0.850
RM	0.970	0.970	0.975	0.869

Tables 4–6 summarize the reported measurement evidence. The most comprehensive results appear in Table 5, where AC and MS each report an AVE of 0.850 and rho_c of 0.971; EA reports an AVE of 0.841 and rho_c of 0.969; AQ reports an AVE of 0.711 and rho_c of 0.937; IAP reports an AVE of 0.913 and rho_c of 0.988; and RM reports an AVE of 0.869 and rho_c of 0.975. These statistics support strong reported reliability and convergent validity for the six latent constructs. The measurement-model interpretation therefore remains limited to the reported loading ranges, reliability coefficients, and AVE values presented in the study tables.

Table 6 : Average Variance Extracted and Composite Reliability

Construct	AVE	CR	Interpretation
Auditors' Competency (AC)	0.850	0.971	Strong convergent validity & excellent reliability
E-Audit (EA)	0.841	0.969	Strong convergent validity & excellent reliability
Management Support (MS)	0.850	0.971	Strong convergent validity & excellent reliability
Audit Quality (AQ)	0.711	0.937	Strong convergent validity & excellent reliability
Internal Audit Performance (IAP)	0.913	0.988	Strong convergent validity & excellent reliability
Risk Management (RM)	0.869	0.975	Strong convergent validity & excellent reliability

3.2 Structural model

The structural model reported positive coefficients for all specified direct paths, as summarized in Tables 7 and 8. The largest coefficients leading to AQ were AC → AQ ($\beta = 0.397$) and MS → AQ ($\beta = 0.384$), followed by EA → AQ ($\beta = 0.293$). For IAP, AQ had a coefficient of 0.297, AC 0.285, RM 0.170, EA 0.126, and MS 0.067. These reported coefficients are directionally consistent with the corresponding hypotheses, but coefficient signs and magnitudes alone do not establish statistical significance. Figure 1 presents a SmartPLS-style structural model using only the documented construct structure and reported coefficients.

Table 7 : Direct Structural Coefficients

Path	Direction	β
AC → IAP	Positive	0.285
EA → IAP	Positive	0.126
MS → IAP	Positive	0.067
AC → AQ	Positive	0.397
EA → AQ	Positive	0.293
MS → AQ	Positive	0.384
AQ → IAP	Positive	0.297
RM → IAP	Positive	0.170

The reported standardized coefficients are presented in Table 8 and Figure 1.

Table 8 : Path Coefficients

Path	Path coefficient (β)
AC $\rightarrow$ AQ	0.397
AC $\rightarrow$ IAP	0.285
AQ $\rightarrow$ IAP	0.297
EA $\rightarrow$ AQ	0.293
EA $\rightarrow$ IAP	0.126
MS $\rightarrow$ AQ	0.384
MS $\rightarrow$ IAP	0.067
RM $\rightarrow$ IAP	0.170
RM $\times$ AC $\rightarrow$ IAP	0.140
RM $\times$ EA $\rightarrow$ IAP	0.128
RM $\times$ MS $\rightarrow$ IAP	0.112

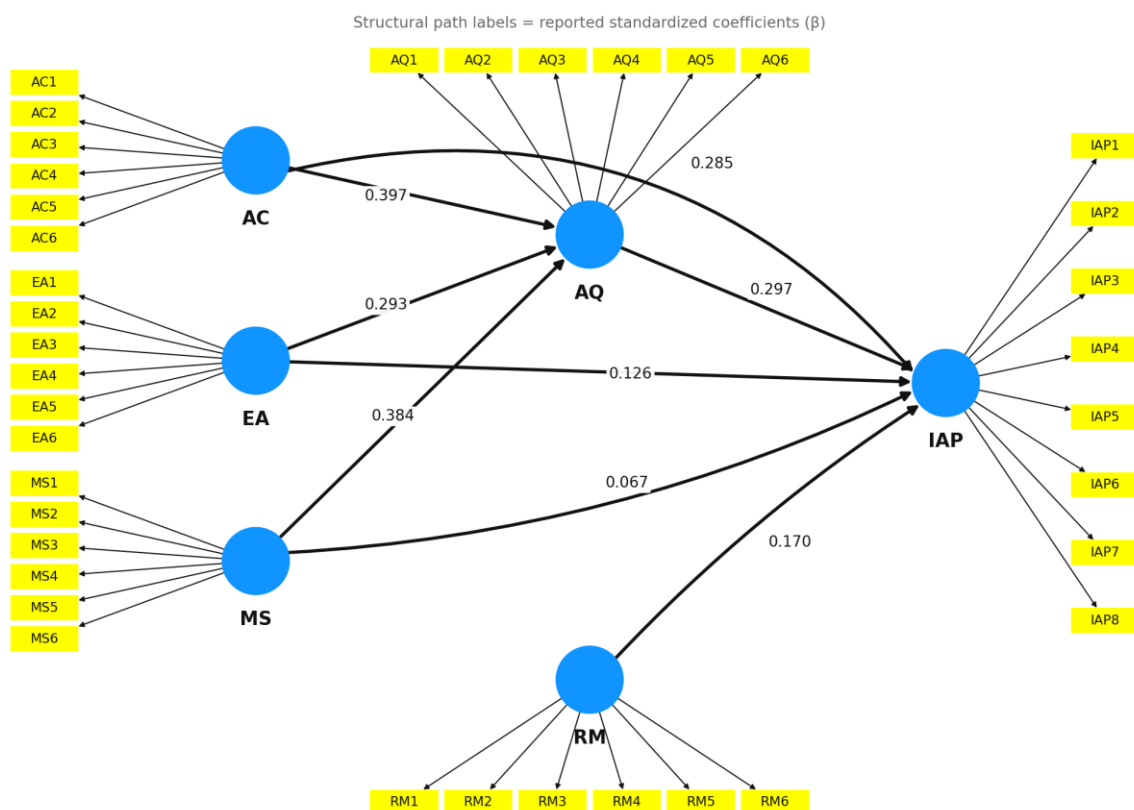


Figure 1. SmartPLS-style structural model showing reported direct paths and the audit-quality indirect-path architecture.

As illustrated in Figure 1, the structural model separates direct resource paths from the audit-quality pathway through which those resources may be associated with internal audit performance. Auditors' competency has the largest reported coefficient to audit quality ($\beta = 0.397$), followed by management support ($\beta = 0.384$) and e-audit ($\beta = 0.293$), while audit quality has a positive reported coefficient with internal audit performance ($\beta = 0.297$). The reported indirect coefficients for competency, e-audit, and management support are 0.118, 0.087, and 0.114, respectively; to rounding, these values are arithmetically consistent with the products of their component path coefficients. They are therefore consistent with indirect pathways through audit quality, but statistical mediation is not inferred from the coefficients alone. Competency also has the largest direct predictor coefficient with performance ($\beta = 0.285$), whereas e-audit and management support have smaller direct coefficients of 0.126 and 0.067; risk management has a reported direct coefficient of 0.170. The descriptive pattern is consistent with the study's theoretical logic that capability, digitalization, and organizational support may contribute to performance partly through audit quality.

Predictors of audit quality (AQ)

Auditors' competency had the largest reported coefficient with audit quality ($\beta = 0.397$). This pattern is consistent with a close association between professional knowledge, judgment, experience, and the quality of internal audit work. Management support produced a similarly large positive coefficient ($\beta = 0.384$), while e-audit also had a positive reported coefficient with AQ ($\beta = 0.293$). Descriptively, the three coefficients are consistent with the study's theoretical logic that audit quality is associated with the combined operation of human capability, digital capacity, and organizational support rather than with any single resource in isolation.

Predictors of Internal Audit Performance (IAP)

The direct path from AC to IAP was positive ($\beta = 0.285$), making competency the largest of the three reported direct predictor coefficients with performance. EA also had a positive direct coefficient ($\beta = 0.126$), while MS had a smaller positive direct coefficient ($\beta = 0.067$). AQ had a positive reported coefficient with IAP ($\beta = 0.297$), and RM also showed a positive direct coefficient with IAP ($\beta = 0.170$). Taken together, these reported values show that professional capability and audit quality have the largest direct coefficient magnitudes with performance among the paths described here, while technology, management support, and risk management show smaller positive coefficients. The relatively small $MS \rightarrow IAP$ coefficient is interpreted cautiously because MS also has a much larger reported coefficient with AQ.

Risk-management interaction coefficients (RM)

The model reports positive interaction coefficients for the three RM-by-predictor terms associated with IAP. The coefficient for $RM \times AC \rightarrow IAP$ was 0.140, for $RM \times EA \rightarrow IAP$ 0.128, and for $RM \times MS \rightarrow IAP$ 0.112. These positive interaction coefficients are directionally consistent with the hypothesized strengthening pattern, with the AC interaction showing the largest reported magnitude. Because inferential statistics for the interaction terms are not reported in the manuscript, the coefficients are interpreted descriptively rather than as independently established statistical moderation. Figure 2 illustrates the reported interaction structure within the SmartPLS-style model.

Table 9 : Reported Risk-Management Interaction Coefficients

Interaction path	Interaction coefficient (β)
$RM \times AC \rightarrow IAP$	0.140
$RM \times EA \rightarrow IAP$	0.128
$RM \times MS \rightarrow IAP$	0.112

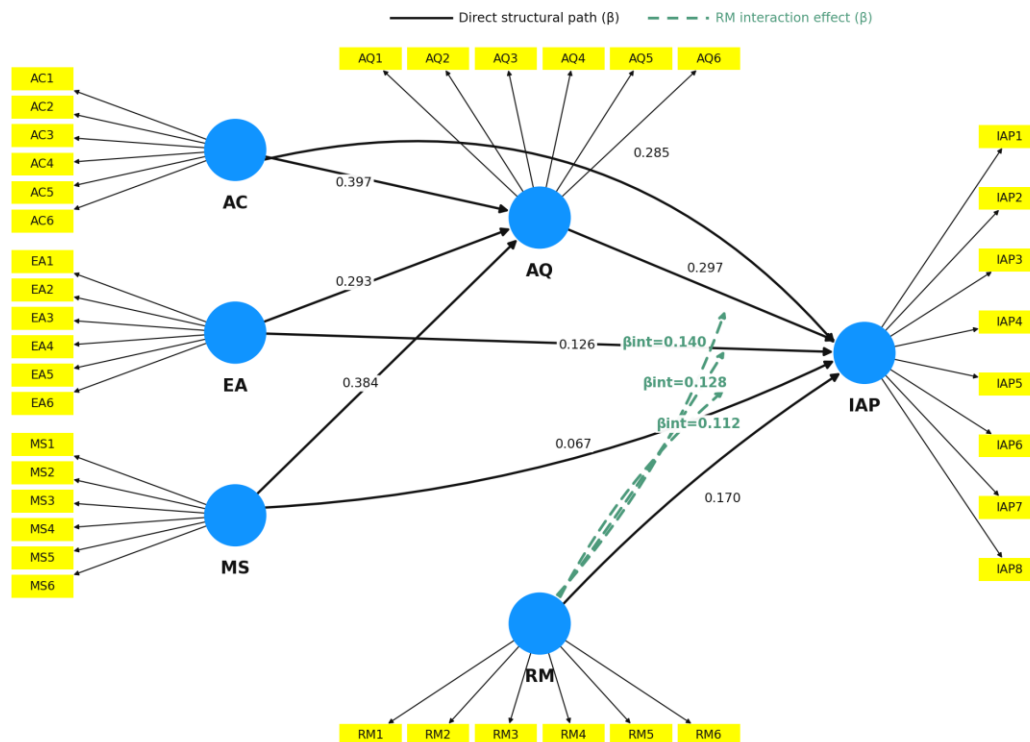


Figure 2. SmartPLS-style structural model illustrating the reported risk-management interaction coefficients for the predictor-to-IAP relationships.

Figure 2 depicts risk management as the proposed contextual moderator and shows the three reported interaction coefficients. The $RM \times AC \rightarrow IAP$ interaction has the largest reported coefficient ($\beta = 0.140$), followed by $RM \times EA \rightarrow IAP$ ($\beta = 0.128$) and $RM \times MS \rightarrow IAP$ ($\beta = 0.112$). All three coefficients are positive, which is directionally consistent with the proposed strengthening role of the risk-management environment. This pattern is theoretically compatible with risk-based auditing logic, but the coefficient values alone do not establish statistical significance of the interaction terms. Accordingly, the figure is interpreted as a descriptive representation of the reported interaction structure rather than as independent evidence that moderation has been statistically confirmed.

3.3 Reported indirect effects through audit quality

The structural results report three indirect coefficients through Audit Quality (AQ): Auditors' Competency (AC) $\rightarrow$ AQ $\rightarrow$ Internal Audit Performance (IAP), E-Audit (EA) $\rightarrow$ AQ $\rightarrow$ IAP, and Management Support (MS) $\rightarrow$ AQ $\rightarrow$ IAP. Table 10 reports positive indirect coefficients for all three pathways, complementing the direct-path results by distinguishing direct coefficients from coefficients that operate through AQ. The reported values are arithmetically consistent, to rounding, with the products of their component path coefficients. They are therefore suitable for descriptive interpretation of the proposed indirect pathways; statistical mediation, however, is not inferred from the coefficient values alone.

Table 10 : Indirect Effects Through Audit Quality

Indirect path	Indirect effect
AC $\rightarrow$ AQ $\rightarrow$ IAP	0.118
EA $\rightarrow$ AQ $\rightarrow$ IAP	0.087
MS $\rightarrow$ AQ $\rightarrow$ IAP	0.114

AC $\rightarrow$ AQ $\rightarrow$ IAP (Reported Indirect Effect = 0.118)

The reported indirect coefficient from Auditors' Competency to Internal Audit Performance through Audit Quality was 0.118. This positive value is consistent with an indirect pathway in which competency is associated with performance partly through audit quality. Competent auditors are

better positioned to exercise professional judgment, design suitable procedures, evaluate evidence, identify control weaknesses, and communicate findings effectively. Because the direct $AC \rightarrow IAP$ coefficient was also positive, the reported coefficient pattern is consistent with complementary direct and indirect routes rather than an exclusively indirect relationship. The indirect coefficient is interpreted descriptively and is not treated as proof of statistically significant mediation without corresponding inferential statistics.

EA $\rightarrow$ AQ $\rightarrow$ IAP (Reported Indirect Effect = 0.087)

The reported indirect coefficient from E-Audit to Internal Audit Performance through Audit Quality was 0.087. Although this was the smallest of the three reported indirect coefficients, it remained positive and is directionally consistent with AQ as an intervening pathway linking digital audit capability with performance. E-audit can expand data coverage, accelerate testing, improve exception detection, and support consistent documentation, but these capabilities create organizational value when they improve the reliability and usefulness of audit work. The coefficient pattern is therefore consistent with an integrated rather than technology-only explanation of internal audit performance, without treating the reported indirect value alone as proof of statistically significant mediation.

MS $\rightarrow$ AQ $\rightarrow$ IAP (Reported Indirect Effect = 0.114)

The reported indirect coefficient from Management Support to Internal Audit Performance through Audit Quality was 0.114. This value is informative because the direct $MS \rightarrow IAP$ coefficient was comparatively small, whereas the $MS \rightarrow AQ$ coefficient was among the largest relationships reported in the model. Descriptively, this pattern is consistent with management support contributing through conditions that enable high-quality audit work, including adequate resources, access to information, organizational cooperation, and protection of audit independence. The reported indirect coefficient therefore provides a plausible quality-based pathway for interpreting the small direct $MS \rightarrow IAP$ coefficient, while statistical mediation is not inferred from the coefficient alone.

Table 11 : Hypothesis Directional Alignment with Reported Coefficients

Hypothesis	Path	Reported β	Direction	Descriptive interpretation	Directional alignment
H1	$AC \rightarrow AQ$	0.397	Positive	Largest reported coefficient to AQ	Consistent
H2	$AC \rightarrow IAP$	0.285	Positive	Largest direct predictor coefficient with IAP	Consistent
H3	$AQ \rightarrow IAP$	0.297	Positive	Positive reported AQ–IAP coefficient	Consistent
H4	$EA \rightarrow AQ$	0.293	Positive	Positive reported EA–AQ coefficient	Consistent
H5	$EA \rightarrow IAP$	0.126	Positive	Positive but smaller direct coefficient	Consistent
H6	$MS \rightarrow AQ$	0.384	Positive	Large positive reported MS–AQ coefficient	Consistent
H7	$MS \rightarrow IAP$	0.067	Positive	Small positive direct coefficient	Consistent
H8	$AC \rightarrow AQ \rightarrow IAP$ (Indirect path)	0.118	Positive	Positive reported indirect coefficient through AQ	Consistent
H9	$EA \rightarrow AQ \rightarrow IAP$ (Indirect path)	0.087	Positive	Positive reported indirect coefficient through AQ	Consistent
H10	$MS \rightarrow AQ \rightarrow IAP$ (Indirect path)	0.114	Positive	Positive reported indirect coefficient through AQ	Consistent
H11	$RM \times AC \rightarrow IAP$ (Interaction)	0.140	Positive	Largest reported RM interaction coefficient	Consistent
H12	$RM \times EA \rightarrow IAP$ (Interaction)	0.128	Positive	Positive reported RM interaction coefficient	Consistent
H13	$RM \times MS \rightarrow IAP$ (Interaction)	0.112	Positive	Positive reported RM interaction coefficient	Consistent

4. Discussion

The reported coefficient pattern is consistent with an integrated view of internal audit performance in which professional capability, technology, organizational support, audit quality, and risk management operate together. AC had the largest reported coefficient with AQ and the largest of the three direct predictor coefficients with IAP, indicating the continued relevance of auditor competence in a digital environment. Endaya and Hanefah (2016) similarly linked internal auditor characteristics with internal audit effectiveness. Supriadi et al. (2019) also showed that auditor information-technology competency contributes to successful e-audit implementation. For Saudi healthcare organizations, the descriptive pattern supports combining core audit knowledge with data, systems, risk, and sector-specific capabilities rather than treating digital tools as substitutes for professional judgment. E-audit had positive reported coefficients with both AQ and IAP, while the larger coefficient with AQ is consistent with its contribution operating importantly through the audit process. Mujalli (2024b) provides Saudi evidence that e-auditing adoption can improve internal audit department performance. The positive reported indirect coefficient through AQ is directionally consistent with that logic. Technology investment alone, however, is not equivalent to better governance outcomes. Digital audit tools require competent users, secure and reliable information, suitable procedures, and management support. The results therefore suggest that healthcare institutions should evaluate e-audit investment by the quality and usefulness of assurance it produces, not simply by the availability of technology.

Management support had one of the largest reported coefficients with AQ but the smallest direct coefficient with IAP. This pattern suggests that leadership may influence performance substantially by shaping the conditions under which internal audit operates. Aljabr and Almubarak (2021) found that top management support was positively related to internal auditing effectiveness in Saudi public universities. Dellai and Omri (2016) also identified management support as an important determinant of internal audit effectiveness. In practice, support includes adequate staffing and budgets, access to records, protection of independence, and timely responses to findings. The positive reported indirect coefficient through AQ is consistent with this interpretation, while its statistical mediation significance is not inferred from the coefficient alone. Audit quality occupies a central position in the reported model. The positive $AQ \rightarrow IAP$ coefficient and the three positive reported indirect coefficients are consistent with AC, EA, and MS being associated with performance partly through the reliability and usefulness of audit work. This distinction separates resources from outcomes: professional competence, technology, and management support are inputs, whereas AQ reflects the quality of the audit process and outputs. In particular, the small $MS \rightarrow IAP$ coefficient should be read together with the larger $MS \rightarrow AQ$ coefficient and the positive reported indirect coefficient, rather than being interpreted in isolation.

The three reported RM interaction coefficients were positive, which is directionally consistent with the proposition that predictor-to-IAP relationships become stronger in a more developed risk-management environment. Almgrashi and Mujalli (2024) found that risk-management factors and management support are materially associated with risk-based internal auditing in Saudi public organizations. Greapcă and Lungu (2024) likewise identify a close connection between internal audit and risk management research. In healthcare, this relationship is particularly relevant because financial, operational, regulatory, cyber, and patient-safety risks can interact. The reported interaction pattern is therefore theoretically plausible, but it is interpreted descriptively because coefficient values alone do not establish statistical moderation. The findings have practical implications but should be interpreted within the study design. Public healthcare organizations should coordinate investment in auditor capability, digital audit infrastructure, management support, quality assurance, and risk-based planning rather than treating them as separate initiatives. The cross-sectional survey design identifies positive reported relationships but does not establish temporal causality, and perception-based measures may not capture every objective aspect of audit performance. Future research should replicate the model across additional Saudi regions and health clusters and, where feasible, use longitudinal or mixed-source data. Such work would test whether the reported direct, indirect, and interaction patterns remain stable across different institutional settings and over time.

5. Conclusion

This study examined the determinants of internal audit performance in Riyadh public healthcare by integrating Auditors' Competency, E-Audit, Management Support, Audit Quality, and Risk Management in one PLS-SEM model. AC, EA, and MS had positive reported coefficients with AQ and IAP, while AQ also had a positive reported coefficient with IAP. AC produced the largest coefficient with AQ ($\beta = 0.397$), closely followed by MS ($\beta = 0.384$), and AQ had a direct coefficient of 0.297 with IAP. Descriptively, the reported pattern indicates that internal audit performance is associated with both the resources available to the audit function and the quality of the processes through which those resources may be converted into reliable assurance and organizational value. Positive indirect coefficients through AQ were reported for AC, EA, and MS (0.118, 0.087, and 0.114, respectively), and these values are arithmetically consistent with their component paths to rounding. They are directionally consistent with a quality-based indirect pathway but are not treated as independent proof of statistically significant mediation in the absence of reported inferential statistics. The RM interaction coefficients for the AC-, EA-, and MS-to-IAP relationships were also positive (0.140, 0.128, and 0.112, respectively), which is directionally consistent with the proposed strengthening role of risk management. These interaction coefficients are likewise interpreted descriptively rather than as independently verified statistical moderation.

For Saudi healthcare organizations, the reported pattern supports an integrated internal-audit development agenda centered on auditor competence, digital audit capabilities, management support and organizational access, quality assurance, and risk-informed audit planning. These priorities are consistent with the wider transformation of healthcare governance under Vision 2030. Mani and Goniewicz (2024) describe the Saudi health transformation as a broad system-level reform, while Suleiman and Ming (2025) emphasize the continuing evolution of the national model of care. Internal audit can contribute most effectively when its professional, technological, quality, and risk-governance components are developed together rather than in isolation. The findings should be interpreted within the limits of a cross-sectional survey conducted in 80 public healthcare facilities in Riyadh. The model reports positive coefficient patterns but cannot establish temporal causality, and perception-based measures may not capture every objective dimension of internal audit performance. The geographic concentration of the participating institutions also limits the extent to which the findings can be generalized to all Saudi healthcare institutions. In addition, the measurement evidence reported in the manuscript supports reliability and convergent validity, while the structural-path tables do not report the inferential statistics needed to independently establish path significance. Future research should replicate the framework across additional regions and health clusters, compare public and private healthcare settings, and use longitudinal or mixed-source evidence where feasible. Such extensions would provide stronger evidence on the stability and statistical robustness of the reported direct, indirect, and interaction patterns across institutional contexts and over time.

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