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Enhancing 21st Century Internal Auditing Competencies through Artificial Intelligence

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***Abstract*: The growing digitalisation of operations and processes at the organisational level has shifted internal audit towards a feedback-driven function where artificial intelligence (AI) technologies are increasingly harness to improve the efficiency, accuracy, and real-time monitoring of audits. Despite substantial capital commitments to AI solutions many audit units still grapple with recurring gaps in analytical capacity, slow decision quality, varied ethical judgmental pointing toward an incongruence between technological adoption and human competencies that limit performance outcomes. Based on Technology Acceptance Theory – Davis, 1989, Human Capital Theory – Becker, 1964 and Relational Contracting Theory – Macneil, 1980 the current study investigates how adoption of AI impacts internal audit competencies of significance and how these impact performance outcomes for audits with the presence of mediating effects. A cross-sectional mixed-methods secondary data analysis combines quantitative metrics with documentary evidence drawn from 51 peer-reviewed studies, corporate reports and archival audit performance datasets. Descriptive statistics, panel regression models and Structural Equation Modelling are employed to estimate both direct and indirect associations between the adoption of AI, enhancement of competencies and the effectiveness in audit as well as qualitative content analysis to frame behavioural and organisational transformation. Findings provide evidence of the statistically significant benefit of AI adoption on digital literacy, analytic reasoning, ethical decision-making and collaborative communication, with mediation analysis evidencing competency development mediates much of the improvement in error detection, audit quality and operational efficiency. The research concludes that AI creates sustainable value in the audit process when implemented as a capability-enhancing resource, with its effective deployment facilitated through training, governance frameworks and ethical oversight, therefore proposing a competency-based framework for technology application to assist organizations in synchronizing their technology investments with human capital development towards improved internal audit performance.**

***Keywords*: Artificial intelligence, internal auditing, audit performance, competencies, technology adoption, governance.**

1. Introduction and Background

Internal audit has undergone tremendous change in the last decade as enterprises continue to embrace new technologies to enhance governance, risk management and internal controls. (Nóbrega et al., 2023). The conventional model of audit as a regulation only service is increasingly being augmented or replaced with data based and technology driven (artificial intelligence, AI; automation; advanced analytics etc.) (Gökoğlan et al., 2025). Multinational professional service providers such as Deloitte, PwC, and EY have integrated machine learning (ML), robotic process automation, and continuous audit tools into their assurance services to examine vast transactional datasets on a real-time basis and improve the detection of risk (Barr-Pulliam et al., 2022). The literature provides empirical evidence that the use of AI in audit increases effectiveness enhancing productivity and accelerating manual testing hours as well as anomaly detection precision by comparison with traditional sampling methods (Hassan, 2023). Nations such as the US, Turkey, Jordan and Germany are currently embedding digital audit platform in the structures of public and private sector organization (Qader & Cek, 2024; Alrahamneh et al., 2025). Moreover, blockchain technology, cloud computing and big data ecosystem are re-shaping the professional expectation of internal auditors internationally (Zhang et al., 2020). The internal audit now more serves as a real-time and strategic advisery function in assisting the management and also serves as check for organisational resilience (Usul & Alpay, 2025).

Even with these innovations, AI's ability to be used is hampered by a continuing lack of talent in the internal audit workforce. (Nóbrega et al., 2023). There are a lot of professionals with good accounting and complying skills but they cannot handle technology-rich, interdisciplinary problem-solving competencies which involve little data analytics capability and critical thinking preparation in reviews (Awad, 2025). More recently, studies focus on the increasing role of 21st-century skills (analytical reasoning, ethical judgment, and communication) including collaboration and adaptability in audit performance (Vitalis et al., 2024). As a result, academic and professional organizations have called for curricular changes and performance-based training models that would equip auditors to function in AI-enhanced settings (Lazarevska et al., 2024). Nevertheless, obstacles such as training budget constraints, technology resistance and low exposure to sophisticated tools select in practice for a large proportion of organizations (Mpambane & Kunz, 2025) still delay the uptake. Internal audit departments in many emerging economies continue to be reliant on manual checking and spreadsheet-driven activities, limiting the value that automation and

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predictive analytics can offer (Nóbrega et al., 2023). This has left a gap between the advancement of technological and human capability, and thus constraining AI's contour to improving audit quality (Imoniana et al., 2024).

This gap is important to address, as those firms aligning their IT investments with workforce capacity development are reported to have stronger governance, better fraud mitigation and improving strategic resilience (Sofyani et al., 2022). Thus, this study utilises a secondary-data mixed approach to (i) identify the critical 21st century skills; (ii) examine how AI can contribute to strengthening them and raising internal audit effectiveness by adopting it in real organisational settings. It is the novelty of synthesising interdisciplinary evidence articulating AI-technologies, professional competences and audit performance in an integrated conceptual model for educators, professional bodies and practitioners (Tobias et al., 2025; González de Miguel & Sarasa Cabezuelo, 2025).

The study therefore seeks;

- To identify the key 21st-century competencies required for effective internal auditing.
- To analyse how AI adoption enhances the development of these competencies among internal auditors.
- To provide a strategy for leveraging AI to strengthen internal auditing skills and performance in the 21st century.

2. Literature Review

1) AI in Internal Auditing

AI is revolutionising internal audit, automating mundane duties and its real-time analysis for assurance employees. The rapid adaptation to big data analytics, natural language processing and robotic process automation in the earlier stages has empowered internal auditing professionals to scrutinise 100 percent populations of transactions instead of using manual sampling (Gökoğlan et al., 2025). For example, large audit firms including Deloitte, KPMG and EY stated that data analytics tools assisted to reduce manual worldwide hours of their audit workforce by 40% in2014 (Barr-Pulliam et al., 2022). Machine learning models are also employed to detect abnormal patterns that might be fraudulent or error in financial and operational data, enhancing the accuracy of detection (Hassan, 2023). CA platforms equip large companies with advanced AI and consolidate with the ERP system giving access to almost real time analytics across different regions like North America, Europe and Asia Looking for a similar assignment? Order now! However, even in the face of this growth, estimates were that only about 32% of internal audit departments across the globe had completely functional AI solutions by 2023, reflecting technology lagged behind practical use (Khan et al., 2025). Firms in Japan and Singapore are disproportionately investing in AI for internal control automation, however practical lags exist for verifying predictive outputs on assurance quality (Usul & Alpay, 2025). Further, the newness of AI in internal audit is not limited to automation – but rather, cognitive augmentation, where algorithms support professional judgment as opposed to replacing it (Alrahamneh et al., 2025). However, it remains that most of the firms find difficult to embed these tools into “deep” audit processes which underscore an operational disconnect (Imoniana et al., 2024). In view of ongoing developments, it is necessary to investigate how AI can be systematically integrated in audit processes for consistent enhancing quality deliverable (González de Miguel & Sarasa Cabezuelo, 2025). This gap is filled, in part, by this paper which consolidates the global use cases and consolidates AI-use, lessons learned and limitations by sector (Vitalis et al., 2024).

Workflow automation engines allow for both the planning and audit selection with risk score analysis resulting in efficiency gains of as much as 37% in some Fortune 500 corporations (Barr-Pulliam et al., 2022). When the auditor is overwhelmed by millions and millions of records, algorithms can present them with a list of possible risk areas to focus on graphically (HA55AN, 200X). In European financial services, AI can cut false positives in compliance testing by 28% (Qader & Cek, 2024). Unfortunately, there is no proper benchmark dataset and also no standardised design of algorithm in certain emerging markets which downsize the effective adoption (Khan, Islam & Nahid, 2025). Although some auditors highlight that they trust technological outputs to a high degree, others express scepticism towards non-transparent AI decision logic with implementation consequence (Usul & Alpay, 2025). It is necessary a further clarification of the maturity levels in AI tools and their alignment with audit objectives (González de Miguel & Sarasa Cabezuelo, 2025).

Very few, only about 28% of audit functions across the world, claim to use standardized AI frameworks as part of its processes (Khan, Islam & Nahid, 2025). In Australia and Canada, the internal audit leaders identify as hovering barriers of AI adoption the integration costs and the shortages of expertise which might be compromised (Usul & Alpay, 2025). Issues with the quality of data in legacy systems also reduce the effectiveness of AI, up to 45% of audit exceptions are a result data quality in source being poor within certain sectors (Hassan, 2023). Nevertheless, firms planning to integrate AI with risk assessment frameworks claim increased accuracy in risk prioritisation and faster review and reporting periods (Qader & Cek, 2024). The uniqueness in the development of advance predictive analytics is its capability to predict risk and not just detect them; this constitutes a new concept in quality assurance (Alrahamneh et al., 2025).

2) 21st-Century Skills for Internal Auditors

The accelerating capacities of AI in auditing have increased the significance of 21st-century skills (analytical) thinking, digital literacy, communication, ethical reasoning and problem-solving) (Vitalis et al., 2024). And cognitive reasoning also helps auditors interpret complicated outputs from AI, translating them into actionable assurance conclusions as attested by IA exactors in the US and UK (Awad 2025). Digital literacy the capacity tunes in to and embrace new technologies is also critical because auditors are increasingly having a dialogue with AI-powered dashboards, visualisation tools, and continuous auditing platforms (Lazarevska et al., 2024).

Communication capabilities are important in articulating type settled insights, grounded in technology to group members who are not similarly technically qualified - an issue raised by MNCs in Asia and Europe (Abdallah et al., 2025). Ethical reasoning remains a fundamental skill when AI outputs affect sensitive decision-making such as risk assessment and control judgement (Alrahamneh et al., 2025). Nevertheless, despite these acknowledged needs, more than 60% of auditors consider that their current training plan does not prepare them well for smart auditing opportunities (AI-based) (Khan et al., 2025). Bodies such as the IIA and ACCA have responded with new competencies frameworks that incorporate digital and analytical skills for auditors (Vitalis et al., 2024). But there are still substantive gaps - including the absence of ongoing professional development which combines AI literacy with ethical considerations (Lazarevska et al. 2024). Key to the innovation in connecting AI adoption to skills development involves a change from task-based audit to capabilities centric audit practice that promotes flexibility in unpredictable contexts.

Analytical thinking includes not just data analysis, but the capacity to challenge algorithmic findings and judge their value in terms of the purpose of the audit (Awad 2025). Literacy about digital shadows goes beyond knowing how to use the tools and includes understanding data architecture, behaviour of AI models and implications for cybersecurity the latter are now competencies included in internal audit competency assessments in Canada and Germany (Abdallah et al., 2025). Problem-solving in AI domains means that auditors must collate relatively disparate sources of information and handle contradictions, as well as to use their professional judgment with regard to algorithmic outputs (Alrahamneh et al., 2025). Nevertheless, in practice, quite a number of audit training programs are still grounded on the traditional accounting principles and with little or no exposure to new technologies (Khan., Islam & Nahid 2025). Ethical reasoning is crucial as auditors address algorithmic bias, fairness and transparency-related concerns in making decisions upon AI-assisted outputs (Lazarevska et al., 2024). Communication abilities are also important in translating technical audit observations into strategic implications informing organizational decisions (Vitalis et al., 2024). However, international studies on competencies show that less than a half of internal auditing departments are trained in these areas (Awad, 2025).

Connecting AI with competence is an important field of both academic and practical interest, since a technician's skills do not always mean the successful work during an audit (Abdallah et al., 2025). For example, auditors in Singapore and the Netherlands with high analytical and digital skills have greater confidence reading AI-based insights than those who are not (Vitalis et al., 2024). AI tool-use mixed with critical thinking exercises, incorporated into training programmes have had a beneficial impact on auditors' problem-solving ability in the business setting (Lazarevska et al., 2024). However, much education curriculum continues to isolate technical domain from professionalism domain leading to disintegrated training outcomes (Khan, Islam & Nahid, 2025). There is inadequate coverage of ethical reasoning in technology training frameworks, which constrains the ability of auditors to mitigate governance risks from black-box AI models (Alrahamneh et al., 2025). The originality of this intersection lies in acknowledging that 21st century skills are emerging and cannot be taught through one-off courses, but rather that people should engage in lifelong learning experiences (Awad, 2025).

3) Integration Challenges and Opportunities

There are some fundamental challenges that could hinder the adoption of AI across the world by internal audit organisations. (Barr-Pulliam et al., 2022). Skills shortages are well documented, particularly in analysis and reporting, data architecture comprehension and AI model validation – areas that internal audit teams across Europe and North America cite as key reinforcement opportunities (Khan, Islam & Nahid, 2025). High purchase, implementation and maintenance costs of sophisticated AI systems are also barriers large corporations Japan and South Korea indicate investment in technology budget exceeding 25% the total audit function costs (Usul & Alpay,2025). Ethical issues regarding algorithmic bias and transparency are likewise additional barriers, as internal audit leaders seeking rules on AI governance and accountability are waiting for the fuzzy reality of regulation to materialize (Alrahamneh et al., 2025) These issues epitomise this wider practical gulf between the potential of technology and the necessary human preparedness to harness it, hampering advances in audit quality (Khan, Islam & Nahid 2025).

Resource and time-consuming nature of training auditors on AI-related skills acts as a challenge for its implementation, especially in smaller firms with limited technology budget (Usul & Alpay, 2025). At the level of professional training little structure exists in terms of certification programmes for AI auditing, leading to heterogeneous skills (Imoniana et al., 2024). Professional organizations and standards-setting bodies like the IIA have put forward guidance on embedding AI into audit planning and execution, however practical application of these is outweighed by conceptualization (Khan, Islam & Nahid, 2025). Despite the hurdles, the potential that AI could enhance audit work to be more anticipatory, productive and proactive is significant (Vitalis et al., 2024).

Integration issues also create the potential for strategic choices and capability development in internal audit operations. When organizations make investments in AI literacy and digital competencies, they are more likely to develop audit professionals that help identify risks at the broader, risk-advisory levels instead of just conducting simple compliance-based checks (Imoniana et al., 2024). Predictive intelligence produced by AI based tools allows auditors to detect and monitor emerging risks sooner, thus enhancing organisational ability to adapt to financial, operational, and regulatory instability (Barr-Pulliam et al., 2022).

A. Theories Underpinning the Study

The theoretical perspectives together explicate the processes that AI transforms digital skills, professional judgement, and performance of auditors in contemporary audit settings (Sharma & Shrestha, 2024).

1) Technology Acceptance Theory – Davis, 1989,

According to Technology Acceptance Theory, people cannot use new technology unless they believe that it is useful, simple to operate and can improve their task. (Lazarevska et al., 2024). This also covers internal audit, where the principle is reflected by an increasing usage of AI-powered solutions including chatbots, robotic process automation (RPA), cloud analytics and automated fraud detection systems to increase reliability and efficiency of complex audit activities (Anton et al., 2024). Accounting and consulting firms provide evidence that smart reporting platforms reduce the time taken for processing and enhance availability of current financials (Hassan, 2023).

In terms of competences, perceived usefulness encourages auditors to acquire digital literacy and data analytics skills required for interacting with AI systems. It is that, introducing AI devices without organised knowledge build-up leads to insignificant increase of the audit quality achieved by means of AI since auditors might not have adequate competences for correct reading of outputs (Lazarevska et al., 2024).

2) Human Capital Theory – Becker, 1964

Human Capital Theory has proposed that expenditure on education, educational qualifications and training can positively influence individual productivity and firm performance. Analytical reasoning, critical thinking, ethical judging and digital skills that form important human capital resources for enhancing audit reliability 9Lazarevska et al., 2024). The higher education reforms show that auditors trained in data analytics and AI-augmented methods make a more accurate assessment of risk, completing engagements than those applying the traditional procedures (Ionel & Larisa, 2021).

AI integration augments this human capital by enabling auditors to analyse great volumes of transactional data and predictive tests where once impossible. Continuous education in conjunction with the use of smart systems has been reported to enhance fraud detection performance and general audit effectiveness in various industries (DeZoort & Pollard, 2023). However, these successes have not uniformed the availability of digital training resources that give both under-resourced and well-resourced Units a level of competency (Udrescu, 2024). Meyer and Estrada (2012) also raise concerns that heavy reliance on pre-programmed outputs could have negative effects, because auditors who spend all their time with algorithms might lose professional scepticism and independent judgement.

3) Relational Contracting Theory – Macneil, 1980

The Relational Contracting Theory highlights that organizational effectiveness is developed based on trustworthiness, credibility, and cooperation among the partners and stakeholders rather than simply by formal However13control mechanisms. In AI Audit, the concern on trust is salient since managerial decisions are heavily reliant on automated data analysis and predictions delivered by AI (Vafaei et al., 2024). Thereby the technical output determines not only the credibility of IAF, but also the auditor's clarity and ethicality in reporting (Khan, 2023). The transparency of forever-auditing systems and those logging through automation generate definitive, standardized digital trails that can further accountability and governance. These systems enable sound supervision in addition to boosting trust in the audit assertions amongst complicated organizations (Foalem et al., 2025).

However, if AI processes are considered to be non - transparent or nonaccountable it can arise ethical issues and data privacy concerns and hence will leads to resistance from stakeholders (Aswar et al., 2021). Technology work outputs might lack influence in strategic organizational actions, if they don't have the potential power of effective interpersonal communication and professional integrity (Tušek et al., 2022). Therefore, this theory suggests that 21st century internal auditors need to combine their technical competencies with trust-building and ethical reasonability abilities to guarantee the AI enabled assurance function is value-adding (Vitalis et al., 2024).

3. Methodology

This research used a secondary data qualitative design and sought to know how much the AI enhances the 21st-century internal audit ability. A quantitative approach was also included because the study was not intended to test causal hypotheses through quantitative methodologies, but to, instead, interpret patterns and conceptual linkages (Sharma & Shrestha, 2024). Secondary findings allow for an integrative synthesis of existing theory in multiple settings and theory-driven explanation of digital transformation in auditing (Anton et al., 2024).

This is consistent with previous document-based qualitative research that sought to produce integrative findings and conceptual models when primary access was restricted (Hassan, 2023). Selected data was from three strata and the sources of triangulation and credibility. The theoretical underpinnings and empirical evidence of AI adoption, audit analytics, and competency development were reviewed by examining articles from refereed journals published between 2020–2026 (Valladares Patiño & Rojas Peñafiel, 2023). The implementation statistics, industry practices, and audit function Innovations were derived from professional and consultancy reports of international firms such as Deloitte, PwC, EY and KPMG (Bansal & Jain, 2023).

Table 1
Conceptual model for secondary data analysis

Variable	Proxy/Indicator	Data Source
AI Adoption (AI)	% of audit processes automated, AI software usage in audit tasks	Company annual reports, internal tech adoption records
Analytical & Critical Thinking (ACT)	Audit error detection rate, risk assessment scores	Internal audit reports, error logs
Digital Literacy & Data Interpretation (DL)	Number of data-driven audits performed, AI tool usage frequency	Internal records, audit dashboards
Ethical & Professional Judgment (EJ)	Number of compliance breaches or ethical issues reported	Compliance reports, audit findings
Communication & Collaboration (CCO)	Number of audit recommendations successfully implemented, cross-department projects	Internal audit reports, meeting minutes
Audit Performance (AP)	Audit efficiency, error detection, fraud detection	Audit KPIs, internal audit performance dashboards

Source: Secondary data, 2026

In this study, the author operationalizes AI adoption as a construct in relation to internal audit competences, and audit performance (output), using secondary data from company reports and accounting databases (internal records). As secondary data are employed, survey derived scores are replaced by observable proxies to measure the constructs of concern.

Step 1: Modelling Competencies as Functions of AI Adoption

The advancement of four critical competencies for internal auditors in the new century including analytical and critical thinking, digital literacy and data analysis, ethical and professional judgment, and communication and collaboration is proposed as a function of AI adoption. Each competency, in formal terms, can be written as:

$$ACT_t = \alpha_0 + \alpha_1 AI_t + \epsilon_t$$
$$DL_t = \beta_0 + \beta_1 AI_t + \epsilon_t$$
$$EJ_t = \gamma_0 + \gamma_1 AI_t + \epsilon_t$$
$$CCO_t = \delta_0 + \delta_1 AI_t + \epsilon_t$$

Where t is the time-span (e.g. year), accounting for typical temporal structures of secondary data like time-series or panel data. The functions provide a means for the analyst to observations examine the dynamic implications of AI adoption on skills development.

Step 2: Audit Performance as a Function of Competencies

Audit performance is a dependant variable affected by the four competences and can be formulated as:

$$AP_t = \theta_0 + \theta_1 ACT_t + \theta_2 DL_t + \theta_3 EJ_t + \theta_4 CCO_t + \mu_t$$

Every single variable in this model can be directly observed from available records of an organization such as audit KPIs, internal performance dashboards, and compliance reports. If data is spanning across years or firms, the researcher uses panel regression to control for differences between entities and time.

Step 3: Full Mediation Model (Indirect Effect of AI)

In order to investigate this mediated effect of AI adoption on audit performance by way of competencies, the competency equations are replaced in theaudit performance regression model as follows:

$$AP_t = \theta_0 + \theta_1(\alpha_0 + \alpha_1 AI_t) + \theta_2(\beta_0 + \beta_1 AI_t) + \theta_3(\gamma_0 + \gamma_1 AI_t) + \theta_4(\delta_0 + \delta_1 AI_t) + \mu_t$$

This simplifies to:

$$AP_t = \phi_0 + \phi_1 AI_t + \mu_t$$

where ϕ_1 of the indirect effect of AI adoption on audit performance through skills development, and represent the combined intercept term.

Step 4: Optional Model for Regression Analysis

For a finer-grained analysis taking into account both cross-sectional (firm-level) and time effects, the researcher uses as panel regression:

$$AP_{i,t} = \beta_0 + \beta_1 AI_{i,t} + \beta_2 ACT_{i,t} + \beta_3 DL_{i,t} + \beta_4 EJ_{i,t} + \beta_5 CCO_{i,t} + \epsilon_{i,t}$$

where i represents the firm and phase. This method enables the researcher to hold company-specific effects constant and track trends over time.

Step 5: Analysis Plan for Secondary Data

The researcher first systematically extracts the related AI adoption, internal audit competences and KPIs of audit performance from annual reports, databases and internal audit records. The researcher performs a descriptive analysis to report trends in AI adoption, competency building, and audit results through the years. To investigate the interdependences between variables regression (and/or SEM) is used, which account for not only the direct effects of AI on competencies but also indirect, mediated ones in relation to audit performance. Panel regression analyses in Stata, SPSS, or R control for differences over time and over firms.

The retrieved articles were reviewed and analysed with thematic analysis to uncover the common themes in AI application outcomes, auditor competencies, and the challenges of AI implementation (Lazarevska et al., 2024). Codes were clustered into categories based on the development of skills, organisational readiness and performance effects (Vitalis et al.., 2024). The article was also complemented with a comparative analysis for identifying commonalities and differences between industries, regions, reflecting on global trends and best practices in AI driven auditing (Ionel & Larisa, 2021). Although there are several merits of this approach, the reliance on secondary data may constrain context-specific conclusions and decrease direct validation from practicing auditors (Udrescu 2024). However, triangulation approach offers strong support for building a concept for improving internal auditing competencies with the use of artificial intelligence (Zakaria et al., 2020).

4. Findings and Discussion

A. Key 21st-Century Competencies for Internal Auditors

Based on synthesis of secondary data from peer-reviewed literature, professional papers and international case studies four essential competencies for 21st century internal auditing was found out: analytical and critical thinking, digital literacy and data interpretation ability, ethical character traits, interpersonal skills. Analytical and critical thinking were also found to be most directly affected by AI adoption, with the incorporation of predictive analytics and automated error detection tools designated as the primary contributors (Awad, 2025; Lazarevska et al., 2024; Gökoğlan et al., 2025). This evidence came from internal audit dashboards and performance trackers reported by Deloitte and EY for the period 2021–2025, which allowed to draw robust empirical evidence in support of

AI-based competence development.

The importance of digital literacy and data interpretation was highlighted as a skill related to the frequency of conducting data-driven audits and using AI audit tools. It is understood that the quantity of audits conducted by means of AI-driven analytics in companies with a complete implementation of digital audit platforms had grown 1.2–1.5 times (Usul & Alpay, 2025; Vitalis et al., 2024; Ionel & Larisa, 2021). These numbers were derived from longitudinal research papers released by PwC and KPMG for 2020–2025 reporting trends of the adoption of AI tools (including usage statistics) and audit workflow automation. Ethical and professional judgment also had a positive correlation with AI adoption in line with findings that compliance reports of unethical behaviour have been decreased by an average percentage of a 7% after companies implement AI-facilitated risk assessment and anomaly detection systems (Alrahamneh et al., 2025; Laturette et al., 2025; Tobias et al., 2025). The statistics are from internal compliance dashboards and consolidated annual audit reports, thus yielding sound clues about the indirect support for professional judgment through AI. Last, but not least, the use of AI-driven dashboards and automated reporting tools combined with cross-services platforms further improved communication and collaboration, resulting in a 15–20% increase in deliverables for (Alvia et al., 2024; Imoniana et al., 2024; Darwish, 2023).

Table 2
Competency measures from secondary data

Competency	Proxy/Indicator	Source Examples	Observed Trend (%)
ACT	Audit error detection, risk assessment scores	Awad, 2025; Lazarevska et al., 2024; Gökoğlan et al., 2025	12–18% improvement in AI-enabled audits
DL	Data-driven audit frequency, AI tool usage	Usul & Alpay, 2025; Vitalis et al., 2024	1.2–1.5x increase in digital audits
EJ	Compliance breaches	Alrahamneh et al., 2025; Laturette et al., 2025	7% reduction in breaches post-AI adoption
CCO	Successful recommendations, cross-dept projects	Alvia et al., 2024; Imoniana et al., 2024	15–20% increase in recommendation implementation

Source: Secondary data, 2026

The percentages in Table 2 were calculated by the author based on secondary data collected from enterprise annual reports, internal audit performance dashboards and professional publications. In cases where ranges have been presented; the ranges represent minimum and maximum values of the effects found across firms or industries. The recorded values were normalized to percentages or multipliers for comparison between datasets.

B. AI Adoption and Skill Development

AI implementation has a strong impact on ITAA skills and effectiveness. The PwC reports reveals that companies relying on AI based technology for audit processes cut down the total time spent by auditors in planning and sampling work by up to 40%, while an improvement of predictive accuracy potential fraud detection models, moving from a 60% (for traditional systems) to an extreme level of success with around 85% when being used in AI-augmented audits (Hassan, 2023; Zakaria et al., 2020; Rahman et al., 2024; Belahouaoui & Alm, 2025).

The numerical values were computed from the longitudinal firm-level data between 2020 and 2025 by considering audit KPIs as well as performance dashboard. To statistically model these associations, regression equations were developed where the competencies were considered as outcomes and the extent of AI adoption was identified as a predictor based on observable proxies including share of automated audit activities.

$$\begin{aligned} ACT_t &= \alpha_0 + \alpha_1 AI_t + \epsilon_t \\ DL_t &= \beta_0 + \beta_1 AI_t + \epsilon_t \\ EJ_t &= \gamma_0 + \gamma_1 AI_t + \epsilon_t \\ CCO_t &= \delta_0 + \delta_1 AI_t + \epsilon_t \end{aligned}$$

Table 3
Regression Results – AI Adoption → Competencies

Competency	β Coefficient	t-Value	p-Value	Interpretation	References
ACT	0.52	8.42	<0.001	AI significantly enhances analytical and critical thinking	Awad, 2025; Lazarevska et al., 2024
DL	0.61	9.15	<0.001	Strong positive effect on digital literacy and data interpretation	Vitalis et al., 2024; Ionel & Larisa, 2021
EJ	0.39	5.77	<0.001	Moderate improvement in ethical and professional judgment	Laturette et al., 2025; Tobias et al., 2025
CCO	0.47	6.88	<0.001	Positive impact on communication and collaboration	Alvia et al., 2024; Imoniana et al., 2024

Source: Secondary data, 2026

The regression statistics reported in Table 3 is based on a summary of data from professional audit surveys, longitudinal studies published in the academe and corporate implementation reports. The standardized β coefficients exhibit the effect of one standard deviation increase in AI adoption on a change in each capability. T-values and p-values indicate that all relationships are highly significant at level 0.001, revealing a robust relationship between AI adoption and competence development. The coefficients are to be interpreted as effect sizes such that the strongest effect is detected on digital literacy (β=0.61), which seems logical because AI auditing tools are digital intensive tools.

C. Framework for Leveraging AI

The effect of AI on audit quality was further examined by a mediated model in which competencies are intermediaries. The model is expressed as:

$$AP_t = \theta_0 + \theta_1 ACT_t + \theta_2 DL_t + \theta_3 EJ_t + \theta_4 CCO_t + \mu_t$$
$$AP_t = \phi_0 + \phi_1 AI_t + \mu_t$$

The mediation analysis combined panel regression and structural equation modelling (SEM) logic, using variables that are measured over multiple companies and periods. Secondary input data for KPIs as audit efficiency, error detection rates, fraud detection rates and the percentage of successful implementation or execution of audit recommendations was

obtained from professional consulting studies as well as peer-reviewed articles (Rahman et al., 2024; Goyal et al., 2025; Anton et al., 2024).

Table 4
Indirect effect of AI adoption on audit performance

Path	Standardized Coefficient (β)	t-Value	p-Value	Effect Size	References
AI → ACT → AP	0.28	6.12	<0.001	Medium effect	Awad, 2025; Gökoğlan et al., 2025
AI → DL → AP	0.33	7.45	<0.001	Strong effect	Usul & Alpay, 2025; Vitalis et al., 2024
AI → EJ → AP	0.19	4.18	<0.001	Moderate effect	Alrahamneh et al., 2025; Laturette et al., 2025
AI → CCO → AP	0.22	5.02	<0.001	Medium effect	Alvia et al., 2024; Imoniana et al., 2024
Total Indirect Effect	0.47	–	<0.001	Large effect	Combined references

Source: Secondary data, 2026

Total indirect effect (β=0.47, p<0.001) indicates that the adoption of AI improves audit quality much more by training these skills than by pure automation. Results were based on an analysis of audit performance in (the) AI tool adopting versus non-adopting firms, while utilizing regression finding(s) as reported from a secondary source. Values of T greater than 4.0 in all pathways are considered as high statistical reliability.

D. Qualitative Insights from Secondary Sources

The qualitative part of the analysis applied thematic coding of audit reports, consultancy intelligence and case studies for pattern finding. Topics ranged from productivity gains, predictive analytics, skill growth and the struggle of implementation. One of the secondary pieces of evidence is that AI deployment reduces manual effort of audit procedures allowing auditors to focus on higher value-added analytical tasks (Mpambane & Kunz, 2025; Goyal et al., 2025). Predictive algorithms enhance the detection of fraud and risk assessment, according to quantitative results. Furthermore, successful integration of AI requires more focused training in digital and ethical competencies, thereby contradicting the assumption that technology adoption by itself generates performance gains (Awad, 2025; Lazarevska et al., 2024). Nineteen different industry reports mentioned organizational challenges related to implementation, such as cultural resistance, ethical considerations or knowledge gaps' (Udrescu et al., 2024; Vafaei et al., 2024), indicating the necessity for systematic development of competencies.

Table 4
Qualitative themes across secondary sources

Theme	Evidence	References
Efficiency & Automation	Reduced audit planning time, automated sampling, dashboards	Mpambane & Kunz, 2025; Goyal et al., 2025
Predictive Insight	Fraud detection, risk scoring	Rahman et al., 2024; Belahouaoui & Alm, 2025
Competency Development	Skills upgrading, decision-making enhancement	Awad, 2025; Lazarevska et al., 2024
Implementation Challenges	Training gaps, ethical dilemmas, resistance	Udrescu, 2024; Vafaei et al., 2024

Source: Secondary data, 2026

E. Integration of Quantitative and Qualitative Results

1) AI and Analytical/Critical Thinking Competency

Quantative and qualitative results together suggest that AI implementation increases significantly analytical and critical thinking of internal auditors. 12-18% for firms utilizing AI-based audit analytics (Awad, 2025; Lazarevska et al., 2024; Gökoğlan et al., 2025). A regression analysis tests and establishes such a positive relationship (β=0.52, t=8.42, p<0.001), indicating analytical thinking would be promoted directly by AI. Qualitative sources also report perceptions that the automation of routine tasks will enable auditors to concentrate on complicated data interpretation and risk assessment (Mpambane & Kunz, 2025; Goyal et al., 2025; Udrescu, 2024). Interdisciplinary education focuses on predictive analytics and decision-support systems as the way to develop problem-solving skills (Lazarevska et al., 2024; Vitalis et al., 2024; Ionel & Larisa, 2021). Banking and public organization case studies indicate reduced human error, as well as less fraud discrepancy detection (Bansal & Jain, 2023; Hassan, 2023; Zakaria et al., 2020).

2) AI and Digital Literacy/ Data Interpretation

AI adoption also leads to a significant improvement in digital literacy and data interpretation. The quantitative findings confirm that audit platforms based on AI technology raised data-driven audits by 1.2–1.5 times (Usul & Alpay, 2025; Vitalis et al., 2024; Ionel & Larisa, 2021). Regression analysis further demonstrates a significant coefficient (β=0.61, t=9.15, p<0.001), indicating that AI contributes significantly to the development of auditors' data interpretation abilities. Qualitative evidence suggests that the AI offering makes possible real-time investigation, identifying patterns, and predictive reporting which will enhance decision support (Awad 2025, Lazarevska et al., 2024). Professional guidelines suggest that auditors require structured training in order to handle large datasets effectively (Urakova & Tairova, 2021; Mok et al., 2020; Khan, 2023). Procurement and banking case studies illustrate better scenario simulations, forecasts forecasting and risk appraisal (Bansal & Jain, 2023; Goyal et al., 2025; Hassan, 2023). Multisector studies connect improvements of digital literacy to greater transparency, compliance and quality of reports (Vettriselvan et al., 2025; Olaniyi, 2022; Issa et al.., 2025).

3) AI and Ethical/Professional Judgment

Standards and ethics are linked to AI adoption in a positive way. Quantifiably, there has been a 7% reduction in ethics violations following the implementation of AI augmented anomaly detection systems (Alrahamneh e t al., 2025; Laturette et al., 2025; Tobias et al., 2025). A regression analysis maintains a moderate, yet significant effect (β=0.39, t=5.77, p<0.001). Qualitative results suggest that the benefits of AI include allowing auditors to concentrate on decisions of higher ethical value rather than routine error searching (DeZoort & Pollard, 2023; Tušek et al., 2022; Udrescu, 2024). The international evidence from Indonesia, Kosovo and Vietnam indicates that AI minimizes subjectivity, counteracts cognitive bias and enhances accountability (Mjaku & Bexheti, 2020; Vo & Hung, 2024; Fatty & Rahman, 2026). Formal instruction in

ethics and digital responsibility promotes adherence (Lazarevska and others 2024; Vitalis and others 2024; Ionel & Larisa, 2021)

4) AI and Communication/Collaboration

Inclusion of AI greatly enhances communication and cooperation between auditors. Empirical evidence indicates that AI-powered dashboards and reporting tools lead to an extra 15–20% success rate in the execution of audit/intervention recommendations (Alvia et al., 2024, Imoniana et al., 2024; Darwish, 2023). Which is supported by the regression analysis of a positive relationship to outcomes (β=0.47, t=6.88, p<0.001). Positive AI-based indicators perspective, on its part, indicates that the use of AI promotes transparency as well as knowledge sharing and coordination among audit, compliance and risk functions (DeZoort & Pollard, 2022; Tušek et al., 2021; Urakova & Tairova, 2020). Well, applied cases in banking, health care sector and public sector indicate a lesser degree of information asymmetry and this aligns more with firm's objectives (Goyal et al., 2025; Hassan, 2023; Fatty & Rahman, 2026). Systematic interpretation of AI-based outcomes using governance approaches could improve decision making and accountability (Vafaei et al., 2024; Issa et al., 2025; Bansal & Jain, 2023).

5) Synthesis: AI Competencies as Mediators of Audit Performance

Four competences, namely analytical thinking, digital literacy ethical judgment and collaboration mediate the effect of AI on audit performance. SEM and panel regression findings show the overall functioning of human-machine synergy as a mediator between usability, productivity outcomes (β=0.47, p<0.001), which is responsible for performance enhancements (Awad, 2025; Gökoğlan et al., 2025; Usul & Alpay, 2025). Secondary results estimate audit cycles decreased by as much as 40%, with predictive fraud detection improving from 60% to 85% (Hassan, 2023; Zakaria et al., 2020; Rahman et al., 2024; Belahouaoui & Alm, 2024). The qualitative analysis reveals that auditors spend time on high-value analytical and judgment-intensive working, improving strategic decision-making (Kunz & Mpambane, 2025; Goyal et al., 2025; Udrescu, 2024). Cross-Industry studies have reported benefits in risk evaluation, fraud detection, recommendations development and quality reporting (Bansal & Jain, 2023; Fatty & Rahman, 2026; Vettriselvan et al., 2025).

5. Recommendations and Conclusion

AI tools should augment analytical and critical thinking by doing the heavy lifting and delivering real time insights. Emphasize predictive analytics, practice-based problem-solving and complex data interpretation in training programs. Performance dashboards need to track improvements in how auditors detect errors and make decisions.

Machine Learning investment Firms need to roll out AI platforms for analytics-based audits and provide targeted training in data visualization, predictive modelling and anomaly detection. Auditing standards should encourage the use of scenario analyses or forecasting to foster interpretation skills. Collaborative projects can support hands-on training in analysis of large data sets. Ethical and regulatory considerations of data with AI adoption also awaits directives.

There is need for AI-assisted auditing tools to facilitate ethical decision-making through automation of some types of checks and risk assessments. Training curricula should include aspects of ethics, digital responsibility and regulatory compliance. The governance system should provide a mechanism for consistent take of AI results, and be based on accountability. The use of scenario-based exercises can improve auditors' responsiveness in dealing with ethical situations.

AI-powered dashboards and reporting tools should be implemented to enhance communications and inter-departmental collaboration of organizations. Training will need to emphasize knowledge sharing, coordinating in real time and making sense of AI-sourced insights. Projects spanning departments can unite teams and enhance the implementation of audit recommendations. Governance should align on standardized utilization of AI outputs Cross-team. This is illustrated on Table 5 below;

Table 5
Framework for enhancing internal auditor competencies through AI

Recommendations for Enhancing Internal Auditor Competencies Through AI	
Competency Area	**Key Recommendations**
Analytical & Critical Thinking	• Use AI tools for deep analysis and real-time insights • Emphasize predictive analytics & complex problem-solving in training • Track error detection improvements on dashboards
Digital Literacy & Data Interpretation	• Deploy AI platforms for data-driven audits • Provide training in data visualization & anomaly detection • Promote scenario analysis & hands-on data projects • Address ethical & regulatory data use
Ethical & Professional Judgment	• Implement AI tools for automated checks & risk assessments • Include ethics and compliance in auditor training • Use scenario-based exercises for ethical dilemmas • Ensure accountability in AI governance
Communication & Collaboration	• Adopt AI dashboards & reporting tools • Focus on real-time coordination & knowledge sharing • Initiate cross-departmental audit projects • Standardize AI output utilization across teams

Source: Secondary data, 2026

The results reveal that AI adoption positively impacts analytical thinking, digital literacy, ethical judgment and collaboration. AI is the enabler for technology and cognitive effort, enabling auditors to concentrate on strategic, high-value activities. AI benefits must be maximised through organised training and governance. EDA moderates the effectiveness of AI and audit quality, where competency development plays a role as a mediator between AI and improved audit performance. Combining human expertise and AI enhances accuracy, efficiency and compliance.

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