The Influence of Digitalization of Internal Audit Efficacy in the Malaysian Public Sector

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ABSTRACT

This study examined the influence of digitalization on internal audit efficacy in the Malaysian public sector. Specifically, the study focused on four main factors; technological infrastructure, organisational structure, organisational strategy, and auditors' skills and knowledge. Grounded in the Socio-technical Theory, this research highlighted the interaction between technical and social sub-systems in shaping the effectiveness of internal audit functions. Data were collected using a structured questionnaire distributed to internal auditors across Malaysian ministries, with a total of 132 usable responses obtained. Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed to test the proposed relationships. The findings indicated that technological infrastructure and organisational strategy had a significant positive influence on internal audit efficacy. However, organisational structure and auditors' skills and knowledge showed non-significant relationships with internal audit efficacy in the current public sector context. These results suggested that while digital tools and strategic alignment were important in enhancing audit performance, existing structural arrangements and skill development initiatives may not yet fully support digital transformation efforts. This study provided empirical evidence from the Malaysian public sector and contributes to the limited literature on digitalization and internal audit efficacy. The findings offered useful insights for policymakers and public sector managers in strengthening internal audit functions through appropriate digital investments and strategic planning.

Keywords: Digitalization, Internal Audit Efficacy, Sub-system Technology, Sub-system Social, Public Sector

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INTRODUCTION

Internal audits play a crucial role in ensuring transparency, accountability, and efficient use of resources in public sector organizations. Technological advancements continue to reshape various sectors, and the field of internal auditing is no exception. Digitalization offers numerous potential benefits for internal audit functions, including improved accuracy, efficiency, and real-time data analytics. However, despite the acknowledged advantages, the extent to which digitalization impacts the efficacy of internal audits in the public sector remains underexplored. This study aimed to provide a comprehensive understanding of how digitalization can enhance internal audit efficacy.

While existing research discussed digitalization and its broader organization implications, deliberation on how it affected internal audit efficacy is limited (Ahmi et al., 2016). Digitalization encompasses a range of technologies, including artificial intelligence (AI), machine learning (ML), data analytics and cloud computing, which could revolutionize internal audit practices. However, the existing literature often addresses digitalization in a general organization context without delving into the nuances of how these technologies specifically impact internal audit functions. According to Ahmi et al. (2016), it is essential to examine the influence of digitalization on internal audit efficacy, particularly considering organization context and factors such as technological infrastructure and organization structure.

Moreover, the role of technological infrastructure in enabling advanced audit tools and techniques, which can enhance audit processes and outcomes, has not been thoroughly explored (Lutfi and Alqudah, 2023). Technological infrastructure includes hardware, software, networks, and other IT resources that support the implementation and operation of digitalization tools. Although Ahmi et al. (2016) discussed the importance of digitalization adoption, there is insufficient research on how specific technologies, such as AI and ML, can transform internal audit functions in the public sector. For instance, AI can automate routine audit tasks, identify anomalies, and provide insights from vast amounts of data, while ML algorithms can improve over time by learning from audit outcomes. The integration of such technologies could significantly improve the efficiency and accuracy of audit processes, but detailed studies on their implementation and impact are lacking (Lutfi and Alqudah, 2023).

In addition, organization structure influenced how effectively new technologies are integrated and utilized within audit functions (Noor et al., 2023). Organization structure encompasses the hierarchy, communication channels and distribution of roles and responsibilities within an organization (Otia and Bracci, 2022). The successful adoption of digital audit tools depended on how well these technologies are aligned with the existing organization structure and strategy (Otia and Bracci, 2022). However, there is limited research on how organization structure and strategy impacted the adoption and efficacy of digital audit tools (Noor et al., 2023). The existing literature lacked a detailed examination of the alignment between digitalization goals and organization structures, which is critical for successful technology integration. For example, a centralized organization structure might face challenges in implementing digital tools that require decentralized decision-making and quick adaptability (Alqaraleh et al., 2022).

While the importance of auditor skills and knowledge in leveraging digitalization is recognized (Ahmad et al., 2009), there is a gap in research focusing on the continuous professional development required for auditors to stay abreast of emerging technologies and trends. The role of auditors is evolving, and they must possess not only traditional auditing skills but also competencies in digital tools and technologies. This gap included the need for studies on training programs and strategic thinking capabilities essential for modern auditors (Noor et al., 2024). Effective training and development programs are crucial for auditors to fully utilize advanced digital tools. For instance, understanding how to interpret data analytics outputs, working with AI- driven audit software, and maintaining cybersecurity standards are essential skills for auditors in the digital age. Yet, there is a paucity of research on how these skills can be developed and maintained over time (Ahmad et al., 2009).

Shuwaili, Nordin, and Salin (2022) presented comprehensive models for internal audit efficacy, emphasizing factors influenced by digitalization. The models provided a theoretical foundation for understanding the impact of digital tools on audit efficacy. Nevertheless, there is a need for more focused research that integrates these findings into practical frameworks applicable to the Malaysian public sector, providing actionable insights for policymakers and practitioners. Practical frameworks would help in

the effective implementation of digital audit practices. For instance, how can Supreme Audit Institutions (SAI) in Malaysia develop and implement strategic plans for digitalization? What best practices from other countries can be adapted to the Malaysian context to improve audit efficacy?

Therefore, this study aimed to address the causal relationship between digitalization and internal audit efficacy in the Malaysian public sector. By exploring the interplay between technological infrastructure, organization structure, organization strategy and auditor skills and knowledge, this study sought to develop strategies that enhanced internal audit efficacy in the digital age. The findings will provide valuable insights for policymakers and practitioners, helping public sector organizations effectively leverage digital tools to improve transparency, accountability and resource efficiency.

LITERATURE REVIEW

Socio-Technical Theory

The socio-technical perspective views an organization as a complex system composed of two primary subsystems: the technical subsystem and the social subsystem. The technical subsystem encompasses the tools, techniques, infrastructure, and processes used to transform inputs into outputs. It encompasses the physical and procedural elements that define how work is performed. The social subsystem comprises the people, their roles, relationships, and the organizational culture. It includes aspects such as skill, knowledge, organization strategy, job design, team dynamics, and communication patterns. Joint optimization of these subsystems is essential for achieving high performance. The Socio-technical Theory advocates for a participative approach to work design, where employees are involved in decision-making processes related to their work environment and tasks. This participative approach not only improves job satisfaction but also leads to better utilization of technology and processes (Trist & Bamforth, 1951).

A study of internal audits by Otia and Bracci (2022) utilized the Socio-technical Theory to explore how the SAI perceived and implemented digital transformation. At the core of the framework is the SAI's digital transformation process, driven by external technological changes such as

big data analytics and AI. The framework highlighted several interconnected factors that influenced this transformation which were organization, process, people and culture, strategy and technology. Firstly, the organization component involved the structural changes within the SAI that required to support digital transformation. This included redesigning workflows, updating organizational hierarchies and ensuring alignment with new digital initiatives. Secondly, the process element addressed the changes in audit processes brought about by digital transformation, such as integrating new technologies into audit procedures to improve efficiency and efficacy through automation and enhanced data analysis. Thirdly, the people and culture aspect emphasized the human and cultural dimensions of digital transformation. It involved developing digital skills among auditors, fostering a culture that supported innovation and digital adoption, and engaging employees to embrace new technologies. Fourth, the strategy component involved strategic planning to guide digital transformation, including setting clear objectives, aligning digital initiatives with organizational goals, and ensuring a coherent plan for successful digital integration. Finally, the technology element represented the technological tools and systems implemented during the digital transformation. This included the adoption of advanced technologies such as AI, big data analytics, and other digital tools that enhance audit efficacy. This framework is highly useful for studying the impact of digitalization on internal audit efficacy in the public sector. It provides a comprehensive approach that ensures both technological advancements and human factors are optimized for effective digital transformation. By highlighting the importance of aligning organization structures and processes with digital initiatives, developing digital skills among auditors and fostering a supportive culture, the framework ensures that digital transformation is holistic and effective. The emphasis on strategic planning and process improvement further ensures that digital initiatives are aligned with organization goals, leading to more robust and accurate audit outcomes.

The Socio-technical Framework emphasizes the need for a balanced approach, integrating both technological advancements and human, organization and cultural elements to achieve successful digitalization. Technological infrastructure encompasses networking of technology system, advanced tools like big data analytics and AI that enhance the audit process. On the social side, organization structure involves redesigning workflows

and processes to support digital initiatives. While organization strategy encompasses the strategic alignment of digital transformation goals with overall organization objectives, ensuring that the transformation is guided by a clear and coherent plan. Auditors' skills and knowledge are critical, as they need to be equipped with the necessary competencies to leverage new technologies effectively. By optimizing both technical and social aspects, this research aimed to comprehensively assess how digitalization can improve internal audit efficacy and lead to more robust and efficient internal audit functions, ultimately improving auditing performance in the digital era.

Therefore, based on the discussion above, this research applied the Socio-technical Theory to assess the impact of digitalization on internal audit efficacy (DV). This research had identified four independent variables (IVs) essential to the socio-technical system: technology infrastructure (sub-technical elements), organization structure, organization strategy and auditors' skills and knowledge (sub-social elements). This research evaluated how digitalization enhanced internal audit efficacy, proposing a holistic approach to internal audit efficacy. No figure included.

Internal Audit Efficacy

Internal audit efficacy, according to the International Professional Practices Framework (IPPF) 2024, is defined as the degree to which an internal audit function meets its objectives and adds value to the organization. This involves evaluating the efficacy of governance, risk management, and control processes within the organization. The IPPF outlines several key elements that contribute to internal audit efficacy, including independence, objectivity, competence, and alignment with organization goals (IIA, 2024).

Independence and objectivity are critical, ensuring that internal auditors can perform their work without undue influence from management or other stakeholders. Independence allows auditors to provide unbiased and accurate assessments. Competence is another vital factor, as internal auditors must possess the necessary knowledge, skills, and experience to carry out their duties effectively. The IPPF guideline emphasizes the importance of continuous professional development to maintain and enhance these competencies. The internal audit function must also align with the

strategic objectives of the organization. This alignment ensures that the audit activities are relevant and contribute to the achievement of organization goals. The chief audit executive (CAE) plays a crucial role in this matter by developing a risk-based audit plan that addresses the significant risks facing the organization. The plan should be dynamic and regularly updated to reflect changes in the organization environment and risk landscape. Furthermore, effective communication with stakeholders, including the board and senior management, is essential. The CAE must ensure that audit findings and recommendations are clearly communicated and understood, facilitating their implementation. As defined by the IPPF, internal audit efficacy involves a combination of independence, competence, alignment with organization objectives, effective communication, and continuous quality improvement. These elements collectively ensure that the internal audit function can effectively support the organization in achieving its goals and managing risks (IIA, 2024).

Grossi et al. (2023) stated that this function was crucial in identifying weaknesses and recommending improvements, thereby safeguarding the organization's assets and ensuring compliance with policies and regulations. As emphasized by Kifflee and Jusoh (2022), internal audits contributed significantly to operational efficiency by systematically assessing the efficacy and efficiency of operations, helping to identify areas where processes can be streamlined and costs reduced. It was also highlighted by Ahmad et al. (2009) that internal auditors played a vital role in fraud prevention and detection by conducting thorough reviews of financial transactions and internal controls, thus, acting as a deterrent against fraudulent activities.

Additionally, Shuwaili et al. (2022) stated that internal audits boosted stakeholders' confidence by ensuring well-managed operations and effective risk mitigation, positively influencing investor and public trust. Moreover, Badara and Saidin (2013) noted that effective internal audit functions can improve the overall governance structure by ensuring that internal policies and procedures are adhered to and by providing a mechanism for continuous improvement. The efficacy of public sector audits was significantly increased by expanding the scope of audits to include performance and compliance audits (Mohd Noor et al., 2023).

On the contrary, critics of internal audit efficacy highlighted several challenges. Chambers and Odar (2015) pointed out that internal audits often lacked independence due to the auditors' organizational positioning, which can result in bias and reduced objectivity. This is particularly problematic in cases where internal auditors report to management levels that may influence their findings and recommendations. It was also noted by Kifflee and Jusoh (2022) that resource constraints could severely limit the scope and depth of internal audits, especially in public sector organizations that may not prioritize or adequately fund the internal audit function. Ahmad et al. (2012) argued that the efficacy of internal audits is often compromised by insufficient professional competency and continuous training among internal auditors, leading to superficial audits and overlooked risks.

In summary, while internal audits are designed to enhance governance, operational efficiency, and stakeholder confidence, issues like independence, resource constraints, professional competency, and implementing recommendations often hinder their efficacy. Therefore, the debate on the efficacy of internal audits remains balanced. It highlights both the potential benefits and significant challenges inherent in the internal audit function.

Hypotheses Development

Technological infrastructure and internal audit efficacy

Gupta and Sharma (2003) argued that tailored technological infrastructure, whether through traditional, cloud, or hyper approaches, connected all components of the system, ensuring efficient digital services management. The Institute of Internal Auditors (IIA, 2023) noted that advancements in computing and digitalization significantly impacted audit efficacy by allowing comprehensive analyses and deeper insights through sophisticated data analytics tools. Lehman and Thor (2020) also emphasized the significant investment required in technology infrastructure to achieve audit efficacy, highlighting governance, agile methodologies, and enabling technology as crucial components. They advocated for strategic vision, supportive structures, resource management, and advanced technologies like machine learning and AI to enhance audit processes. Similarly, KPMG (2022) suggested investing in technological infrastructure to harness innovation, improve efficiency, and enhance decision- making. Bracci and Otia (2022) also highlighted the disruptive potential of emerging

technologies, that enabled real-time and continuous auditing, thus reducing the need for sampling and improving audit efficacy.

In contrast, some research has revealed non-significant relationships. Al-Khasawneh (2022) pointed out the substantial financial investment required for advanced digital tools and ongoing expenses. Lois et al. (2020) discussed integration challenges with existing systems, potentially disrupting audit processes. Meanwhile, Al-Mohammedi (2020) warned about cybersecurity risks, necessitating robust and costly measures. Erişen and Erer (2022) mentioned the significant learning curve associated with new technologies, which required substantial investment in training and poses challenges for audit functions with limited resources or resistance to change.

Based on the literature review, it was evident that technological infrastructure was integral to the digitalization efforts and the efficacy of internal audits. This technological advancement not only improved the accuracy and efficiency of audits but also enhanced decision-making processes within the organization. Therefore, the relationship between the technological infrastructure of digitalization and internal audit efficacy was substantial, as robust technological infrastructure supported comprehensive and in-depth auditing practices. Thus, the first hypothesis (H1) was formulated as follows:

H_1: There is a significant relationship between the technological infrastructure of digitalization and internal audit efficacy.

Organization structure and internal audit efficacy

Betti and Sarens (2020) argued that digitalization requires the integration of IT and data analytics skills within internal audits, expanding their scope to include more consulting activities and necessitating changes in organization structures. Erişen and Erer (2022) emphasized the need for internal auditors to enhance their knowledge of digital technologies, leading to significant changes in the profession, including increased emphasis on cybersecurity. On the same note, Al-Mohammedi (2020) concluded that digitalization helped auditors acquire compatible skills with modern technologies, enhancing efficacy. Alqaraleh et al. (2022) asserted the role of organization culture in mediating the relationship between IT and internal audit efficacy, while Otia and Bracci (2022) mentioned that the digital

transformation in public sector auditing came with some challenges that require organization changes.

Despite these advantages, noteworthy challenges existed, such as substantial financial investments (Lois et al., 2020) and structural rigidity deterring digital transformation (Imran et al., 2022). Tharouma and Oudai (2022) discussed the challenges of handling increased data volume and process automation. Meanwhile, Cortellazzo et al. (2019) emphasized leadership roles in navigating digital transformation. Mihret and Yismaw (2007) and Al-Sabti (2023) found that internal audit efficacy was more influenced by the quality of the audit and management support than by organizational context. Moradi and Nia (2020) obtained mixed results regarding the impact of organizational size, while Deyganto (2019) suggested that internal audit functions' independence was advantageous but must be complemented by management support and adequate resources. Likewise, Imran et al. (2022) highlighted that rigidity and hierarchical structures hindered audit efficacy, corroborating previous findings that favored internal audit quality and management support over broader organization structures.

Based on the literature review, it was evident that organization structure had a significant influence on the efficacy of internal audits in a digitalized environment. Advanced technological tools and systems enabled internal auditors to conduct thorough analyses and provided valuable insights, but these benefits can be moderated by the organization's structure. Structural rigidity, bureaucratic inefficiencies, and leadership styles were crucial factors that influence how well digitalization impacted internal audit efficacy. Therefore, the relationship between organization structure and internal audit efficacy was significant, as flexible and supportive structures were necessary for leveraging digital advancements in internal audits. The second hypothesis (H) was formulated as follows:

H_2: There is a significant relationship between the organization structure of digitalization and internal audit efficacy.

Organization strategy and internal audit efficacy

Betti et al. (2021) found that digitalization increased the use of data analytics in internal audits, thereby enhancing consulting activities and

adding value to organizations. Similarly, Selg and Shachmurove (2023) highlighted that digital transformation aligned internal audit practices more closely with corporate strategy and governance needs. Al- Mohammedi (2020) emphasized the importance of digital skills and modern technologies in developing effective internal audit practices in IT environments. Otia and Bracci (2022) analyzed supreme audit institutions' approached to digital transformation, revealing a significant strategic shift towards comprehensive digitalization with the establishment of innovation labs. Deloitte (2018) also stressed that internal audit units should engage in strategic planning to effectively embrace automation technologies, integrating their vision with the enterprise risk management framework to support organizational objectives. Furthermore, Alqaraleh et al. (2022) demonstrated that organizational culture significantly mediated the relationship between IT and internal audit efficacy, indicating that a supportive culture was crucial for leveraging digital technologies in audits.

However, several challenges persisted. Al-Sabti found no statistically significant relationship between digitalization mechanisms and internal audit quality, suggesting that digital initiatives alone did not inherently improve audit standards. The study recommended a comprehensive approach, including new regulations to govern digital transformation in audits. Lois et al. (2020) echoed these concerns, noting the emerging stage of digitalization made it difficult to predict long-term impacts and develop strategic plans. They argued that while technological advancements were essential, their full benefits can only be realized through careful and strategic implementation, addressing technology integration and employee readiness challenges. Shamki and Alhajri (2017) found that senior management's response, as part of organization strategy, did not significantly influence internal audit efficacy in the Omani public sector, suggesting other factors may be more critical.

Based on the literature review, it was evident that the organization strategy of digitalization significantly impacts internal audit efficacy. Therefore, the relationship between organization strategy and internal audit efficacy was significant, as a well-planned digital strategy supports comprehensive and effective auditing practices. The third hypothesis (H3) is formulated as follows:

H_3: There is a significant relationship between the organization strategy of digitalization and internal audit efficacy.

Audit skills and knowledge and internal audit efficacy

Erişen and Erer (2022) found a substantial need for enhanced digital competencies among internal auditors to keep up with evolving business processes. Betti and Sarens (2020) also emphasized that digitalization expanded the scope of theinternal audit function, necessitating greater agility and increased knowledge, especially in cybersecurity. Shuwaili et al. (2022) suggested that improving internal audit efficacy can be achieved by providing technological resources, training courses, and familiarizing auditors with technological capabilities, particularly in the Iraqi Government sector. Al-Mohammedi (2020) concluded that digital skills significantly enhanced internal audit practices within digital environments. Otia and Bracci (2022) asserted that SAI needed comprehensive digital transformation strategies to meet stakeholder demands effectively. However, they noted a lack of strategy and resources for effective implementation. Likewise, Deloitte (2018) underscored the importance of digital skills and how technologies like robotic process automation and cognitive intelligence can transform internal audit processes. They recommended training for internal auditors to understand and utilize these technologies, suggesting the recruitment of subject matter specialists to bring fresh perspectives.

However, KPMG (2022) noted that many organizations lacked sufficiently skilled resources to implement digital innovation in internal audit units, often outsourcing basic analytics tasks. They suggested a resourcing model to address the skills gap, emphasizing cost-effective and efficient strategies. Lois et al. (2020) also argued that despite the emphasis on digital skills, the actual impact on audit efficacy was limited due to the rapid pace of technological advancements and insufficient depth in training programs. They stressed that organizational support and the right technological environment were crucial for effectively applying these skills. Meanwhile, Almodallah, Shahimi, and Azmi (2023) examined the Absorptive Capacity Theory in internal auditing, finding that the impact of digital skills is significantly moderated by organizations' ability to assimilate and apply new knowledge. They emphasized that digital skills must be part of a broader strategic initiative, supported by continuous learning and a conducive work environment, to translate into improved audit outcomes.

Based on the literature review, it was evident that auditors' skills and knowledge of digitalization significantly impacted internal audit efficacy. Therefore, the relationship between auditors' skills and knowledge of digitalization and internal audit efficacy was imperative, as digital competencies supported comprehensive and effective auditing practices. Thus, the fourth hypothesis (H4) was formulated as follows:

H_4: There is a significant relationship between auditors' skills and knowledge of digitalization and internal audit efficacy.

METHODOLOGY

Research Design and Approach

This study adopted a quantitative research approach to examine the influence of digitalization on internal audit efficacy in the Malaysian public sector. A quantitative method was considered appropriate because this study aimed to test the relationship between several independent variables and internal audit efficacy using statistical analysis. The study was grounded on the Socio-technical Theory, which emphasized the interaction between technical and social sub-systems in organizational settings.

A cross-sectional survey design was employed, where data were collected at one point in time from internal auditors working in Malaysian public sector ministries. This approach allowed the researcher to gather perceptions from a large number of respondents efficiently and to analyse patterns and relationships among variables in a systematic manner.

Population and Sampling

The population of this study consisted of internal auditors serving in Malaysian public sector ministries. Based on information obtained from official ministry websites, there were 28 ministries and departments, each with its own Internal Audit Unit (IAU), involving approximately 755 internal auditors in total. Purposive sampling technique was used in this study. This method was suitable because the respondents must possess specific knowledge and experience related to internal audit practices and digitalization. Questionnaires were distributed to all 755 internal auditors

across the 28 ministries. From this distribution, a total of 132 usable responses were received, representing an overall response rate of 17.48 percent. Although the response rate may be considered relatively low, it was consistent with prior studies conducted in the Malaysian public sector, where low response rates were commonly reported due to workload constraints and administrative procedures.

For instance, a study on the efficacy of internal auditing in the Malaysian public sector distributed 500 questionnaires and received only 75 responses, resulting in a 15% response rate, highlighting the common difficulties in obtaining high response rates in public sector surveys (Othman et al., 2009). Additionally, a study on the adoption of information technology by internal audit departments in the Malaysian public sector distributed 266 questionnaires and received 103 responses, resulting in a 38.7% response rate, underscoring the issue of low engagement (Ahmi et al., 2016). Similarly, another study involving 203 public sector auditors in Malaysia distributed questionnaires and received 70 responses, resulting in a 34.5% response rate, emphasizing the persistent issue of low engagement in public sector surveys (Raihana et al., 2023). Therefore, the sample size was deemed acceptable for statistical analysis and hypothesis testing.

Data Collection Procedure

Data were collected using a self-administered structured questionnaire. The questionnaires were distributed through official channels within the ministries, with the assistance of internal audit departments. Respondents were informed that participation was voluntary and that their responses would be kept confidential to encourage honest and unbiased answers. The questionnaire was designed in English, as English is commonly used in professional and audit-related documentation within the Malaysian public sector. Clear instructions were provided in each section to ensure respondents understood the questions properly before answering.

Research Instrument

The questionnaire development was based on the Socio-technical Theory comprising two major sections for capturing public sector internal audit efficacy and readiness to utilize digital auditing. The research

instrument isappended. The questionnaire comprised of six sections (sections A–F). Respondents were asked to complete all sections of the questionnaire, and detailed instructions were provided after each section to help respondents answer the questions.

Part A Six questions about demographic information, such as age, gender, qualification, position, work experience, and level of position, madeup this section. The primary goal of collecting demographic information from respondents was to establish their credibility.

Part B The questionnaire used the Technological Infrastructures Questionnaire (TI) (Otia & Bracci, 2022, Lehman & Thor, 2020 and KPMG, 2022) to assess the respondents' agreement on technological infrastructure. This measure focused on the overall concept of universal principles as well as a more exact description of technological infrastructure. It consisted of 8 items. The TIwas a set of statements for which respondents were asked to rate their level of agreement on a five-point Likert scale (1 being "strongly disagree" and 5 being "strongly agree") in the current study. Averaging the answers to the 8 elements of the technological infrastructure constructs yielded the technological infrastructure scores.

Part C The questionnaires required the respondent to answer 5 items of Organizational Structure (OSE) adopted from Otia & Bracci (2022) and Betti & Sarens (2020). The 5 items assessed the respondents' agreement on IAU structure, Manpower of the auditor, Setup of the innovation lab, Duties and responsibilities, and Significant changes in the internal audit unit structure. The OSE was a set of statements for which respondents were asked to rate their level of agreement on a five-point Likert scale (1 being "strongly disagree" and 5 being "strongly agree") in the current study. Averaging the answers to the 5 elements of the organizational structure constructs yielded the organizational structure scores.

Part D The questionnaire used the Organizational Strategy Questionnaire (OSY) (Otia & Bracci, 2022, Lehman & Thor, 2020 and KPMG, 2022) to assess the respondents' agreement on Organizational Strategy. This measure focused on the overall concept of universal principles as well as a more exact description of organizational strategy. It consists of 7 items. The OSY was a set of statements for which respondents were

asked to rate their level of agreement on a five-point Likert scale (1 being "strongly disagree" and 5 being "strongly agree") in the current study. Averaging the answers to the 7 elements of the organizational strategy constructs yielded the organizational strategy scores, which covered the organization policies, the organization support, the organization goals, Reward/incentives, the regulation/law, strengthening awareness, and the Internal auditor's independence.

Part E The questionnaires required the respondents to answer 6 items of Auditors' Skills and Knowledge (ASK) adopted from Otia & Bracci (2022), Lehman & Thor (2020) and KPMG (2022). The 6 items assessed the respondents' agreement on Training of auditor, Technological skills of auditors, Technological knowledge of auditor, Auditor's perception, Experience exchange in audit development course. The ASK was a set of statements for which respondents were asked to rate their level of agreement on a five-point Likert scale (1 being "strongly disagree" and 5 being "strongly agree") in the current study. Averaging the answers to the 6 elements of the Auditors' Skills and Knowledge constructs yielded the Auditors' Skills and Knowledge scores.

Part F The questionnaire required respondents to answer nine questions on Internal Audit Efficacy (IAE), adopted from Alqaraleh et al, (2022), so that internal auditors can evaluate the acceptability of each question using the Internal Audit Efficacy framework. The IAE comprised 9 items, which were IC monitoring, evaluation and consultation, Internal auditing helps organizations enhance operations, Internal auditing contributes to the organization's value-creating, Internal auditing assists the business in achieving its goals, Internal audit's tasks and activities satisfy expectations, Internal auditing offers information on flaws in the organization's activities or control systems, The findings of internal audits are extremely important to the organization, Internal audit ensures that organization resources are used in the most cost- effective, effective, and efficient manner possible, Monitoring, assessing, and consulting on and risk management processes to enhance them. The respondents were asked to rate their level of agreement on a five-point Likert scale (1 being "strongly disagree" and 5 being "strongly agree") in the current study.

Data Analysis

The data analysis for this study was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM) with the aid of SmartPLS software version 4. PLS-SEM was selected because it is suitable for exploratory and predictive research, particularly when the research model is complex and involves multiple latent constructs. In addition, PLS-SEM is appropriate for studies with relatively small to medium sample sizes and does not require strict normality assumptions.

The analysis process followed a two-stage approach, which involved the assessment of the measurement model followed by the structural model. This approach is consistent with recommended PLS-SEM procedures and allows for a systematic evaluation of both construct validity and hypothesised relationships.

Measurement Model Assessment

The measurement model was assessed to examine the reliability and validity of the constructs used in this study. Convergent validity was evaluated using factor loadings and Average Variance Extracted (AVE). Items with loadings above the acceptable threshold were retained, and AVE values exceeding 0.50 indicated that the constructs sufficiently explained the variance of their indicators. Internal consistency reliability was assessed using Cronbach's alpha, composite reliability (ρc), and rho_A (ρa). These reliability measures were examined to ensure that the items consistently measured their respective constructs. All constructs achieved reliability values above the recommended cut-off level, indicating acceptable internal consistency.

Discriminant validity was assessed using the Heterotrait–Monotrait (HTMT) ratio. HTMT values were examined to ensure that each construct was empirically distinct from the others. Although some constructs showed relatively high HTMT values, the overall discriminant validity was considered acceptable for model evaluation.

Structural Model Assessment

After confirming the adequacy of the measurement model, the structural model was evaluated to test the proposed hypotheses. Path coefficients, t-statistics, and p-values were obtained using a bootstrapping procedure with a large number of resamples. This procedure allowed for robust estimation of the significance of relationships between constructs.

The coefficient of determination (R^2) was examined to assess the explanatory power of the model. The R^2 value indicated the proportion of variance in Internal Audit Efficacy explained by Technological Infrastructure, Organisational Structure, Organisational Strategy, and Auditors' Skills and Knowledge.

In addition, effect size (f^2) was calculated to evaluate the relative impact of each independent variable on Internal Audit Efficacy. This analysis provided further insight into the practical significance of each predictor beyond statistical significance alone.

Predictive Relevance and Model Fit

The predictive relevance of the model was assessed using the PLS-Predict procedure, which evaluated the model's out-of-sample prediction capability. The Q^2predict value was examined to determine whether the model had sufficient predictive power. Positive Q^2predict values indicated that the model performed well in predicting endogenous constructs.

Model fit was evaluated using the Standardized Root Mean Square Residual (SRMR), along with other model fit indices provided by SmartPLS. An SRMR value within the acceptable threshold suggests that the model adequately fits the observed data. Although PLS-SEM does not emphasise global goodness-of-fit measures as strongly as covariance-based SEM, these indices provide additional support for model adequacy.

Overall, the use of SmartPLS and PLS-SEM techniques allowed this study to comprehensively examine both the measurement properties and the structural relationships of the proposed model, ensuring that the findings were statistically sound and theoretically meaningful within the context of digitalization and internal audit efficacy in the Malaysian public sector.

RESULTS AND DISCUSSION

Demographic Information

Table 1 represents the demographic profile of the respondents, which was divided in terms of age, gender, qualification, position, work experience, level of position, and ministries. The majority of internal auditors were concentrated within the Ministry of Defence, which accounted for a substantial 76.5% of the total respondents. Other ministries, such as the Ministry of Education and the Prime Minister Department, represented 8.3% and 4.5% respectively. The remaining ministries included Agriculture and Food Securities (2.3%), Health (2.3%), Home Affairs (3.0%), Housing and Local Government (0.8%), Transport (1.5%), and Entrepreneur and Cooperative Development (0.8%). The age distribution revealed a predominance of internal auditors within the 36-45 age group, constituting 52.3% of the total respondents. The 26-35 age group followed at 22.7%, and the 46-51 age group at 16.7%. Internal auditors aged 52 and above represented 7.6%, while those in the 18-25 age bracket were the least represented at 0.8%.

Gender analysis indicated a higher proportion of males (66.7%) compared to females (33.3%). Regarding educational qualifications, the majority of the internal auditors had a Bachelor's Degree (43.9%), followed by those with Diplomas (23.5%) and Master's Degrees (12.9%). Internal auditors with a Ph.D. were the least represented (1.5%). Furthermore, a significant number of internal auditors had positions as Internal Auditors (49.2%), followed by Assistant Internal Auditors (29.5%), and Heads of Internal Audit Departments (21.2%). The internal auditors' experience varied, with a notable 42.4% having 11 to 20 years of working experience, and 33.3% having more than 21 years. Internal auditors with 1 to 5 years and 6 to 10 years of experience each constituted 12.1%. When examining the types of audits, a diverse involvement was observed: 33.4% were involved in more than one type of audit, while 24.2% were engaged in Financial Audits, 23.5% in Compliance Audits, 13.6% in Performance Audits, and 5.3% in Operation Audits.

Table 1: Demographic Profile of the Respondents

	Frequency	Per cent
Ministry		
Ministry of Agriculture and Food Securities	3	2.3%
Ministry of Defence	101	76.5%
Ministry of Education	11	8.3%
Ministry of Entrepreneur and Cooperative Development	1	0.8%
Ministry of Health	3	2.3%
Ministry of Home Affairs	4	3.0%
Ministry of Housing and Local Government	1	0.8%
Ministry of Transport	2	1.5%
Prime Minister Department	6	4.5%
TOTAL	**132**	**100**
Age		
18-25	1	0.8%
26-35	30	22.7%
36-45	69	52.3%
46-51	22	16.7%
52 and above	10	7.6%
TOTAL	**132**	**100**
Gender		
Female	44	33.3%
Male	88	66.7%
TOTAL	**132**	**100**
Qualification		
Sijil Pelajaran Malaysia	24	18.2%
Diploma	31	23.5%
Bachelor's Degree	58	43.9%
Master's Degree	17	12.9%
Ph.D.	2	1.5%
TOTAL	**132**	**100**
Position		
Head of Internal Audit Department	28	21.2%
Assistant Internal Auditor	39	29.5%
Internal Auditor	65	49.2%
TOTAL	**132**	**100**

	Frequency	Per cent
Years of Working		
1 to 5 years	16	12.1%
6 to 10 years	16	12.1%
11 to 20 years	56	42.4%
More than 21 years	44	33.3%
TOTAL	**132**	**100**
Type of Audit		
Compliance Audit	31	23.5%
Financial Audit	32	24.2%
Operation Audit	7	5.3%
Performance Audit	18	13.6%
Involve more than one type of audit	44	33.4%
TOTAL	132	100

Descriptive Statistics

Based on Table 2, the average of Technological Infrastructure was 4.1875, indicating a generally high evaluation and strong technological infrastructure within the organization. The average Organization Structure was 3.6682, a moderately high evaluation and a positive perception of the organization structure. Organization Strategy, the mean score was 3.7955, a favorable view. This suggested a generally positive perception of organization strategy. For Auditors' Skills & Knowledge, the meanwas moderate at 3.4515. This reflected a moderate yet generally positive view of auditors' skills & knowledge. Lastly, Internal Audit Efficacy had a mean score of 3.92, indicating a favorable assessment. This pointed to a strong perception of internal audit efficacy.

Table 2: Descriptive Statistics

	N	Mean	SD
Technological Infrastructure	132	4.1875	0.62528
Organization Structure	132	3.6682	0.73301
Organization Strategy	132	3.7955	0.73824
Audit Skill Knowledge	132	3.4515	0.79526
Internal Audit Efficacy	132	3.9242	0.68277

Structural Equation Modelling

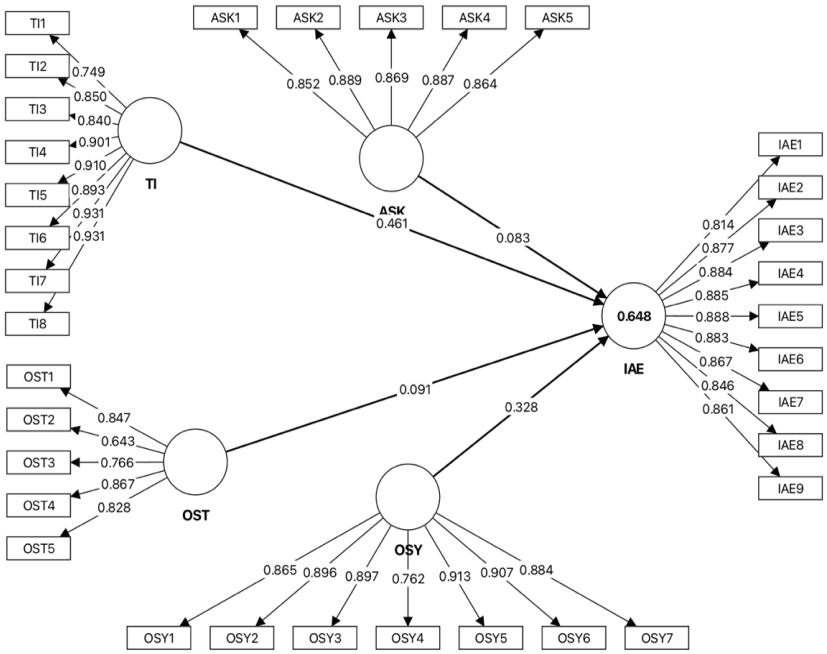

Figure 1: Measurement Model

Table 3: Convergent Validity

Constructs/Items	ASK	IAE	OST	OSY	TI	AVE
Auditors' Skills and Knowledge (ASK)						0.761
ASK1	0.852					
ASK2	0.889					
ASK3	0.869					
ASK4	0.887					
ASK5	0.864					
Internal Audit Efficacy (IAE)						0.753
IAE1		0.814				
IAE2		0.877				
IAE3		0.884				

Constructs/Items	ASK	IAE	OST	OSY	TI	AVE
IAE4		0.885				
IAE5		0.888				
IAE6		0.883				
IAE7		0.867				
IAE8		0.846				
IAE9		0.861				
Organisational Structure (OST)						0.631
OST1			0.847			
OST2			0.643			
OST3			0.766			
OST4			0.867			
OST5			0.828			
Organisational Strategy (OSY)						0.767
OSY1				0.865		
OSY2				0.896		
OSY3				0.897		
OSY4				0.762		
OSY5				0.913		
OSY6				0.907		
OSY7				0.884		
Technological Infrastructure (TI)						0.77
TI1					0.749	
TI2					0.85	
TI3					0.84	
TI4					0.901	
TI5					0.91	
TI6					0.893	
TI7					0.931	
TI8					0.931	

As indicated in Table 3 each construct achieved an acceptable convergent validity since all AVE values exceeded the threshold of 0.50. Technological Infrastructure had an AVE of 0.770, Organisational Strategy 0.767, Organisational Structure 0.631, Internal Audit Efficacy 0.753, and Auditors' Skills and Knowledge 0.761. The item loadings for TI ranged from 0.749 to 0.931, OSY loadings ranged from 0.762 to 0.913, OST loadings ranged from 0.643 to 0.867, IAE loadings ranged from 0.814 to 0.888, and ASK loadings ranged from 0.852 to 0.889. These loading values indicated that each item contributed well to its respective construct.

Table 4: Construct Validity and Reliability

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
TI	0.957	0.96	0.964
OST	0.855	0.882	0.894
OSY	0.949	0.954	0.958
ASK	0.925	0.958	0.941
IAE	0.959	0.959	0.965

As shown in Table 4 all constructs achieved strong reliability. Technological Infrastructure (TI) recorded the highest Cronbach's alpha at 0.957, followed by Internal Audit Efficacy (IAE) at 0.959, Organisational Strategy (OSY) at 0.949, Auditors' Skills and Knowledge (ASK) at 0.925, and Organisational Structure (OST) at 0.855. The composite reliability values (rho_c) also confirmed high consistency, where TI was 0.964, IAE was0.965, OSY was 0.958, ASK was 0.941, and OST was 0.894. The rho_a values further strengthened the reliability evidence, with TI at 0.960, IAE at 0.959, OSY at 0.954, ASK at 0.958, and OST at 0.882. These results showed that the constructs had excellent internal consistency and were suitable for further analysis.

Table 5: Discriminant Validity (HTMT)

	ASK	IAE	OST	OSY
IAE	0.474			
OST	0.819	0.716		
OSY	0.678	0.719	0.951	
TI	0.224	0.723	0.568	0.519

Based on Table 5, the HTMT values showed acceptable discriminant validity for most construct pairs. ASK and IAE recorded 0.474, TI and ASK showed 0.224, and OST and ASK recorded 0.819. For the relationship between TI and IAE, the value was 0.723, while TI and OST were 0.568, and TI and OSY was 0.519. The highest HTMT value was between Organisational Structure and Organisational Strategy at 0.951, indicating that respondents may have perceived these two constructs as closely related. Despite this higher value, the overall discriminant validity remained acceptable for model assessment.

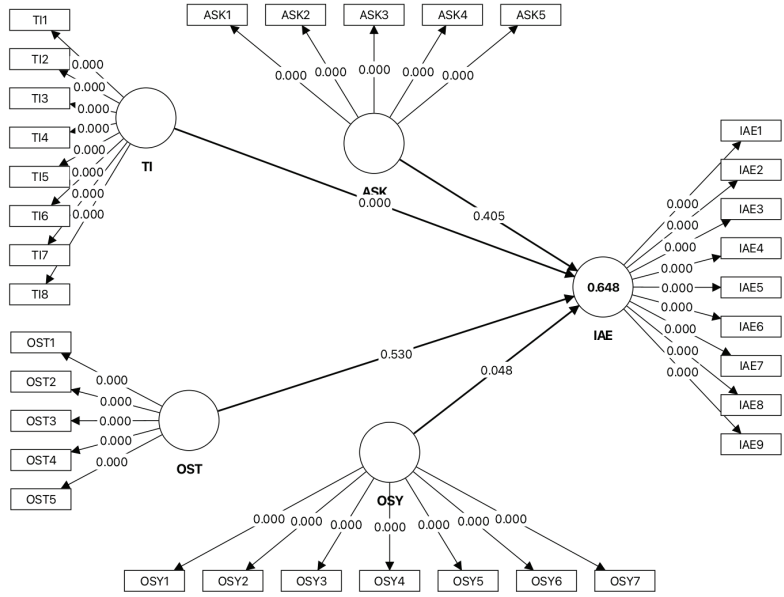

Figure 2: Structural Model

Table 6: Path Coefficient (Hypothesis Testing)

Hypothesis	Latent Variables	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	2.50%	97.50%
H1	TI -> IAE	0.461	0.458	0.107	4.303	0.000	0.269	0.677
H2	OST -> IAE	0.091	0.082	0.145	0.628	0.530	-0.19	0.379
H3	OSY -> IAE	0.328	0.333	0.166	1.978	0.048	0.011	0.646
H4	ASK -> IAE	0.083	0.094	0.099	0.832	0.405	-0.118	0.276
R Square		0.637						

Table 6 presents the structural model results. Technological Infrastructure had an original sample coefficient of 0.461, a standard deviation of 0.107, a t statistic of 4.303, and a p value of 0.000, showing a significant relationship with Internal Audit Efficacy, thus supporting H1. Organisational Strategy had an original sample of 0.328, a standard deviation of 0.166, a t statistic of 1.978, and a p value of 0.048, also indicating a significant effect, hence supporting H3. However, Auditors' Skills and Knowledge showed an original sample coefficient of 0.083, a standard deviation of 0.099, a t statistic of 0.832, and a p value of 0.405, making it not significant, so H4 was not supported. Organisational Structure also showed a non significant effect with an original sample coefficient of 0.091, a standard deviation of 0.145, a t statistic of 0.628, and a p value of 0.530, thus H3 also was not supported. The model's R square value was 0.637, meaning that 63.7 percent of the variance in Internal Audit Efficacy was explained by the four predictors.

Table 7: Effect Size

Construct	F^2 Square
ASK	0.009
OST	0.005
OSY	0.077
TI	0.388

Table 7 presents the effect size (F^2) for each construct in predicting Internal Audit Efficacy. The results showed clear differences in the strength of influence contributed by each independent variable. Auditors' Skills and Knowledge (ASK) recorded an F^2 value of 0.009, which indicated a very

small effect size. This means that ASK contributed minimally to changes in Internal Audit Efficacy, supporting the earlier findings where ASK was not a significant predictor. The low value suggested that although skills and knowledge were important conceptually, their actual measurable impact on audit performance in this model was very limited.

Organisational Structure (OST) showed an even smaller effect size of 0.005, indicating almost no practical influence on Internal Audit Efficacy. This aligned with the non significant relationship observed earlier and suggests that the current organisational structures may not have played an impactful role in improving audit outcomes, possibly due to structural rigidity or limited adaptability within public sector environments.

Organisational Strategy (OSY) had a moderate effect size with an F^2 value of 0.077. Although it was not large, this value indicated that OSY meaningfully contributed to changes in Internal Audit Efficacy. This reflected the importance of having clear strategic direction and alignment when adopting digital audit practices. While the effect was not very strong, it remained operationally relevant.

Technological Infrastructure (TI) demonstrated the largest effect size with an F^2 value of 0.388, which was considered a medium to large effect. This clearly showed that TI played the most substantial role in influencing Internal Audit Efficacy among all predictors in the model. The high effect size indicated that improvements in technological infrastructure led to meaningful and impactful enhancements in audit processes, efficiency and overall audit outcomes.

Overall, the effect size results as in Table 7 highlighted that Technological Infrastructure was the most influential driver of Internal Audit Efficacy, followed by a smaller but meaningful contribution from Organisational Strategy. Auditors' Skills and Knowledge and Organisational Structure showed very small effect sizes, suggesting that their impact was minimal within the current digital audit environment.

Table 8: PLS Predict

	Q^2predict	RMSE	MAE
IAE	0.579	0.666	0.421

Table 8 reports the predictive relevance of the model. Internal Audit Efficacy had a Q^2predict value of 0.579, indicating strong predictive accuracy. The RMSE value was 0.666, while the MAE was 0.421, showing that the model performed reasonably well in predicting Internal Audit Efficacy outcomes.

Table 9: Model Fit

	Saturated model	Estimated model
SRMR	0.08	0.08
d_ULS	3.763	3.763
d_G	2.679	2.679
Chi-square	1568.132	1568.132
NFI	0.727	0.727

Table 9 presents the model fit results for both the saturated model and the estimated model, and the values showed that the model achieved an acceptable level of fit. The Standardized Root Mean Square Residual (SRMR) for both models was 0.08, which fell within the commonly accepted threshold of 0.08, indicating that the difference between the observed correlations and the model predicted correlations was reasonably small. This suggested that the model fit the data well.

The d_ULS value for both models was 3.763, and the d_G value was 2.679. These values represented the discrepancy between empirical and model implied correlation matrices. While there was no strict cut off for these indices, lower values generally reflected better model performance. The fact that the saturated and estimated models shared the same values indicated consistency in how the model reproduces the empirical data.

The Chi square value was 1568.132 for both models. Although Chi square was sensitive to sample size and often appeared large in studies with more variables, its purpose was to assess overall model fit. In this case, the equal values again showed consistency between the saturated and estimated versions of the model.

The Normed Fit Index (NFI) value was 0.727, which indicated a moderate level of fit. Although NFI values closer to 1.0 represented stronger fit, values around 0.70 were still considered acceptable in complex models, especially those involving multiple constructs and indicators. This NFI result suggested that the model explained a substantial portion of the covariance in the dataset and performs reasonably well.

Overall, the model fit statistics in Table 8 showed that the model was acceptable and performed consistently across saturated and estimated assessments. The SRMR value further supported that the model fits the data at an adequate level, and the remaining indices confirmed that the model structure was stable and aligned with the observed data.

Discussion of Findings

The results of analysis revealed that *Technological Infrastructure* and *Organization Strategy* had a significant influence on *Internal Audit Efficacy*. In terms of Organization Structure and Audit Skill Knowledge, both showed a non - significant influence on Internal Audit efficacy.

The results suggested that Technology Infrastructure was crucial for optimizing audit processes and ensuring robust information systems. This finding is consistent with the literature, which emphasized that effective technological infrastructure enables auditors to perform comprehensive data analyses, identify patterns, and detect anomalies that may not be evident through traditional methods. According to this study, technological advancements such as data analytics and artificial intelligence significantly enhanced the accuracy and efficiency of audits. These tools allowed auditors to analyze large datasets quickly, providing deeper insights into organization operations and risks. This capability is essential for modern auditing, where the volume and complexity of data have increased substantially (Otia and Bracci, 2022, Lehman and Thor, 2020, Ahmi et al., 2016, Noor et al., 2023, and Ahmad et al., 2009). However, Betti and Sarens (2020) and Erişen and Erer (2022) argued that digitalization required internal audit functions to integrate information technology and data analytics skills, expanding the scope of internal audits to include more consulting activities. This necessitates changes in organization structures to support the new roles and capabilities.Imran et al. (2022) highlighted that the rigidity of

traditional hierarchies and resource allocation challenges can impede digital transformation in internal audit functions. In the Malaysian public sector, hierarchical structures often result in slow decision-making processes and insufficient flexibility to adapt to new technologies and methodologies. The shortage of auditors further worsens these challenges, limiting the ability of audit units to effectively implement and utilize digital tools. These structural issues are reflective of the broader organizational context within the Malaysian public sector. Traditional hierarchical structures, characterized by rigid command-and- control systems hinder the agility and responsiveness required for successful digital transformation. This study suggested that for digitalization to be effective, there must be significant changes in organization structure, including the establishment of innovation labs and adequate staffing.

The study also found that strategic planning that aligned with digital initiatives played a crucial role in enhancing audit efficacy. Organization strategies that incorporated digitalization will effectively manage risks and enhance the overall audit process. The literature supports this finding by highlighting the importance of strategic alignment in digital transformation (Betti et al., 2021, Selg and Shachmurove, 2023, and Otia and Bracci, 2022). However, Al-Sabti (2023) and Lois et al. (2020) found no statistically significant relationship between the mechanisms of digitalization and the quality of internal auditing, indicating that the mere implementation of digital initiatives does not inherently improve audit quality. This finding highlights the importance of a comprehensive approach that includes the establishment of new regulations and laws to govern digital transformation in internal audits. Furthermore, the nascent stage of digitalization poses challenges in making accurate predictions and drawing definitive conclusions about the long-term impacts of these digital tools. noted the difficulty of predicting the outcome of digitalization, making it challenging to develop strategic plans and policies. Organizations are still learning how best to integrate these technologies into their operations; their strategic planning requires continuous adaptation and flexibility.

As for Organizational Structure and Auditors' Skills and knowledge, the result suggested that the current reward and incentive structures of the Malaysian public sector are not adequately aligned with the goals of digital transformation. Effective reward and incentive systems

were strong motivators for employees to adopt and utilize digital tools efficiently. Alqaraleh et al. (2022) asserted that a supportive organization culture, including appropriate reward systems, is essential for successful digitalization in internal audit functions. The lack of adequate rewards and incentives could demotivate auditors and hinder the effective adoption of digital tools. The study also found that auditors' skills and knowledge were critical in leveraging digital tools effectively. Continuous professional development and training in new technologies was essential for auditors to keep pace with advancements and maintain audit efficacy. The literature supports this finding by emphasizing the importance of building digital competencies among auditors. Betti and Sarens (2020), Erişen and Erer (2022) and Turetken et al. (2020) highlighted the need for auditors to adopt new technologies and digital skills to remain effective in a digitalized environment. They emphasized the importance of enhancing digital competencies among internal auditors to ensure they can provide valuable insights and recommendations in a digitalized environment. They provided a comprehensive framework for understanding and measuring the efficacy of internal audits. They pointed out several key factors influencing internal audit efficacy, including the competence of the internal audit department, organizational setting, compliance with standards, and management support. These factors underscored the importance of auditor competence and continuous professional development in maintaining audit efficacy.

Likewise, Alqaraleh et al. (2022) emphasized that a supportive organizational culture, which included continuous professional development, was essential for successful digitalization in internal audit functions. The lack of adequate training programs and professional development opportunities in the Malaysian public sector highlights the need for significant investment in auditor training to ensure they are equipped with the necessary skills and knowledge to navigate the digital transformation effectively. Overall, the study found that digitalization significantly impacts internal audit efficacy in the Malaysian public sector. The integration of advanced digital technologies, strategic organizational planning, and continuous skill development among auditors are crucial for enhancing audit practices. Effective technological infrastructure provides the tools necessary for comprehensive data analyses and improved audit accuracy. A supportive organization structure facilitates the integration and utilization of digital tools, while strategic planning ensures alignment with

digital initiatives. Continuous professional development and training in new technologies are essential for auditors to keep pace with advancements and maintain audit efficacy. Policymakers and practitioners must prioritize these areas to address the complexities of a digitalized environment effectively. By addressing these factors, public sector organizations can enhance internal audit efficacy, improve governance, and ensure accountability in a rapidly changing digital landscape

CONCLUSION

This study has demonstrated that digitalization significantly influenced internal audit efficacy in the Malaysian public sector through various critical factors. Technological infrastructure and strategic alignment emerged as the strongest predictors of audit efficacy, highlighting the necessity of robust digital systems and coherent organization strategies. The findings also highlighted the importance of continuous training and upskilling of auditors to keep pace with technological advancements. Addressing potential issues related to multicollinearity, the study confirms that the relationships between the studied variables are valid and significant. In conclusion, this research provides valuable contributions to both academic and practical applications, setting the path for future research to explore the dynamic relationship between digitalization and internal audit efficacy. The insights gained from this study serve as guidelines for policymakers and audit professionals in optimizing audit practices and enhancing governance and transparency in the public sector.

IMPLICATIONS OF THE STUDY, LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The findings of this research have several practical implications for enhancing internal audit efficacy in the public sector. Firstly, the adoption of advanced digital tools and technologies can significantly enhance the efficiency and efficacy of internal audits. Public sector organizations should prioritize investment in technological infrastructure to support audit functions, ensuring that these tools are robust and capable of meeting the demands of modern audit processes. Secondly, aligning organization strategies with

digitalization plans is critical for audit efficacy. Organizations should ensure that their digital strategies are integrated with overall organization goals, creating a cohesive approach that leverages digital tools to enhance audit outcomes. Thirdly, continuous training and upskilling of auditors in digital competencies are essential. Organizations should develop targeted training programs to equip auditors with the necessary skills to leverage digital tools effectively, fostering an environment of continuous improvement and adaptation to new technologies.

In terms of theoretical contributions, this research integrated the Social-Technical Theory into the study of internal audit efficacy in the context of digitalization. Therefore, it highlights the interplay between technological and social factors in enhancing audit processes, offering a comprehensive understanding of how digitalization impacts internal audit functions. Additionally, the study provides empirical evidence on the impact of digitalization on internal audit efficacy in the Malaysian public sector. This fills a gap in the existing literature and offers a foundation for future research in this area, providing valuable insights and data for future studies and practical applications. These contributions not only advance academic discourse but also offer practical guidance for organizations seeking to optimize their audit processes through digitalization.

Future research can build on the findings of this study by exploring several avenues. Comparative studies across different countries and regions can provide insights into the impact of cultural and regulatory differences on the digitalization of internal audit functions, helping to identify best practices and challenges unique to various contexts. Implementing longitudinal research designs can examine the long-term effects of digitalization on internal audit efficacy, allowing researchers to observe how these impacts evolve and identify any sustained benefits or emerging issues. Extending the research to other sectors, such as the private sector or non-profit organizations, can determine if the findings are consistent across different organization contexts, providing a broader understanding of the implications of digitalization on internal auditing. Additionally, investigating the impact of specific digital technologies, such as blockchain, artificial intelligence, and machine learning on internal audit processes and outcomes can offer deeper insights into how these advanced tools can further enhance audit efficacy and efficiency. These future research directions will contribute to a

more comprehensive understanding of the role of digitalization in internal auditing and strategies for optimizing audit practices across various sectors and regions.

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REFERENCES

Ahmi, A., Saidin, S. Z., & Abdullah, A. (2017). Examining CAATTs Implementation by Internal Auditors in the Public Sector. *Indian-Pacific Journal of Accounting and Finance, 1*(2), 50–56. https://doi.org/10.52962/ipjaf.2017.1.2.14.

Ahmi, A., Saidin, S. Z., Abdullah, A., Che Ahmad, A., & Ismail, N. A. (2016). State of IT Adoption by Internal Audit Department in Malaysian Public Sector. *International Journal of Economics and Financial Issues, 6,* 103–108.

Al Natour, A. R., Al-Mawali, H., Zaidan, H., & Said, Y. H. Z. (2024). The role of forensic accounting skills in fraud detection and the moderating effect of CAATTs application: evidence from Egypt. *Journal of Financial Reporting and Accounting, 23*(1), 30–55. https://doi.org/10.1108/JFRA-05-2023-0279.

Al-Khasawneh, R. O. (2022). Challenges (Problems) Facing External Auditor While Auditing Banking Accounting Systems In the Light of the Use of Digital Technologies of Fourth Industrial Revolution In Jordan. *American Journal of Industrial and Business Management, 12*(4), 672–698. https://doi.org/10.4236/AJIBM.2022.124035.

Almodallah, Y. I., Shahimi, S., Azriati, A., & Azmi, C. (2023). Building A Conceptual Model For Internal Auditing: The Perspective Of Absorptive Capacity Theory. *Advanced International Journal Of Banking, Accounting And Finance (AIJBAF), 5*(15), 1–21. https://doi.org/10.35631/AIJBAF.515001.

Al-Mohammedi, Y. A. (2020). The Role of Digitalization in Developing Internal Audit Practices in an IT Environment. Proceedings - 2020 2nd Annual International Conference on Information and Sciences, AiCIS 2020, 230–236. https://doi.org/10.1109/AiCIS51645.2020.00043.

Alqaraleh, M. H., Almari, M. O. S., Ali, B. J. A., & Oudat, M. S. (2022). The Mediating Role Of Organizational Culture On The Relationship Between Information Technology And Internal Audit Effectiveness. *Corporate Governance and Organizational Behavior Review, 6*(1), 8–18. https://doi.org/10.22495/CGOBRV6I1P1.

Al-Sabti, A. A. W. H. (2023). Implications for Enhancing the Financial Reporting Quality Brought on by the Digital Revolution of Internal Control. *International Journal of Professional Business Review, 8*(4), e01381. https://doi.org/10.26668/businessreview/2023.v8i4.1381.

BADARA, M. S., & SAIDIN, S. Z. (2013). The Journey so far on Internal Audit Effectiveness: a Calling for Expansion. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 3*(3). https://doi.org/10.6007/IJARAFMS/V3-I3/225.

Betti, N., & Sarens, G. (2021). Understanding the internal audit function in a digitalised business environment. *Journal of Accounting & Organizational Change, 17*(2), 197–216. https://doi.org/10.1108/JAOC-11-2019-0114.

Betti, N., Sarens, G., & Poncin, I. (2021). Effects of digitalisation of organisations on internal audit activities and practices. *Managerial Auditing Journal, 36*(6), 872–888. https://doi.org/10.1108/MAJ-08-2020-2792.

Bougie, R., & Uma, S. (2020). Research Methods for Business: A Skill-Building Approach (8th ed.). John Wiley & Sons.

Chambers, A. D., & Odar, M. (2015). A new vision for internal audit. *Managerial Auditing Journal, 30*(1), 34–55. https://doi.org/10.1108/MAJ-08-2014-1073.

Coiera, E. (2007). Putting the technical back into socio-technical systems research. *International Journal of Medical Informatics, 76*(SUPPL. 1), S98–S103. https://doi.org/10.1016/J.IJMEDINF.2006.05.026.

Cortellazzo, L., Bruni, E., & Zampieri, R. (2019). The role of leadership in a digitalized world: A review. *Frontiers in Psychology, 10(AUG), 456340.* https://doi.org/10.3389/FPSYG.2019.01938/BIBTEX.

Dahlan, M. K. M., Abdullah, N., & Suhaimi, A. I. H. (2021). The Propose Organization Structure for Digital Workplace. *ISCI 2021 - 2021 IEEE Symposium on Computers and Informatics, 31–35.* https://doi.org/10.1109/ISCI51925.2021.9633508.

Deloitte. (2018). Auditing the risks of disruptive technologies| Internal Audit in the age of digitalization. Deloitte.

DeVellis, R. F. (2016). Theory and Applications (Applied Social Research Methods) Fourth Edition. SAGE Publication.

Eason, K., & Abdelnour-Nocera, J. L. (2011). Socio-Technical Theory and Work Systems in the Information Age. *Handbook of Research on Socio-Technical Design and Social Networking Systems.* https://doi.org/10.4018/9781605662640.CH005.

Erişen, O., & Erer, M. (2023). Exploring the Impacts of Digitalization on the Internal Audit Profession. *Journal of Research in Business, 8*(1), 171–190. https://doi.org/10.54452/jrb.1182813.

Ferry, L., Hamid, K., & Hebling Dutra, P. (2023). An international comparative study of the audit and accountability arrangements of supreme audit institutions. *Journal of Public Budgeting, Accounting & Financial Management, 35*(4), 431–450. https://doi.org/10.1108/JPBAFM-10-2022-0164.

Finance, M. O. (2013). Pelaksanaan Audit Dalam Di Kementerian Atau Jabatan Persekutuan Dan Kerajaan Negeri. Retrieved from. Retrieved from Treasury Circular PS 3.1: http://1pp.treasury.gov.my.

Gartner. (2023, July 14). Digitalization. Retrieved from Gartner Glosary: https://www.gartner.com/en/information-technology/glossary/digitalization.

Gomathy, C. K., Swarna, D. S., Chowdary, U. S., & Bharadwaj Sai, V. (2023). A Study on Organization Structure and Design. *Interantional Journal of Scientific Research in Engineering and Management, 07*(05), 1–11. https://doi.org/10.55041/IJSREM20880.

Govers, M., & Amelsvoort, P. van. (2019). A Socio-Technical Perspective on the Digital Era: The Lowlands view. *European Journal of Workplace Innovation, 4*(2). https://doi.org/10.46364/EJWI.V4I2.589.

Grossi, G., Hay, D. C., Kuruppu, C., & Neely, D. (2023). Changing the boundaries of public sector auditing. *Journal of Public Budgeting, Accounting and Financial Management, 35*(6), 140–153. https://doi.org/10.1108/JPBAFM-05-2023-0079/FULL/PDF.

Gupta, J. N. D., & Sharma, S. K. (2003). Globalization and Information Management Strategy. *Encyclopedia of Information Systems, 475–487*. https://doi.org/10.1016/B0-12-227240-4/00081-2.

Halimah, N., Universiti, A., Othman, R., & Teknologi, U. (2012). The Effectiveness of Internal Audit in Malaysian Public Sector. *Journal of Accounting and Auditing, 5*(9), 53–62.

Haron, R., Paino, H., & Mohamed, N. (2022). A Phenomenology Study on Misappropriation of Assets and Corruption in Malaysian Local

Authorities: A Reality Check. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 12*(3). https://doi.org/10.6007/IJARAFMS/V12-I3/14427.

Hill, C. L., Schilling, M., & Jones, G. (2016). Strategic Management: An Integrated Approach, 12e. Cengage Publishers.

IBM. (n.d.). What is IT Infrastructure? Retrieved from IBM: https://www.ibm.com/topics/infrastructure.

IIA. (2023). Impact of digitisation on the internal Audit Activitity. Chatered Institute of Internal Auditors, 1-7.

IIA. (2024). Global Internal Audit Standard. Retrieved from The Institute of Internal Audit: https://www.theiia.org/en/standards/what-are-the-standards/definition-of-internal-audit/.

Imran, F., Shahzad, K., Aurangzeab Butt, A., & Kantola, J. (2022). Structural challenges to adopt digital transformation in industrial organizations: A multiple case study. *Human Factors in Management and Leadership, 55, 47–52.* https://doi.org/10.54941/AHFE1002231.

Iskandar, T. M., Lasa, Y. M., & Hassan, N. S. A. (2014). Financial management performance of public sector: Quality of internal auditor. *International Journal of Accounting, Auditing and Performance Evaluation, 10*(3), 229–254. https://doi.org/10.1504/IJAAPE.2014.064233.

Kifflee, S., & Jusoh, M. (2022). Internal Audit Efficacy: A Pilot Study Analysis at Malaysia Public Sector. *International Journal of Academic Research in Accounting Finance and Management Sciences, 708 – 727*. doi:DOI:10.6007/IJARAFMS /v12-i2/14175.

Kotb, A., Elbardan, H., & Halabi, H. (2020). Mapping of internal audit research: a post-Enron structured literature review. *Accounting, Auditing and Accountability Journal, 33*(8), 1969–1996. https://doi.org/10.1108/AAAJ-07-2018-3581.

KPMG. (2022, October). Transforming Internal Audit and Control Through Digital Innovation. Retrieved from KPMG: https://assets.kpmg.com/content/dam/kpmg/ng/pdf/transforming- ia-and-ic-through-digital-innovation-new-latest.pdf.

Krejcie, R., & Morgan, D. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement, 607-610*.

Lehman, D., & Thor, M. (2020, February 13). The Next Generation of Internal Audit: Harnessing Value from Innovation and Transformation. Retrieved from The CPA Journal: https://www.cpajournal.com/2020/02/18/the-next-generation-of-internal-audit/.

Lois, P., Drogalas, G., Karagiorgos, A., & Tsikalakis, K. (2020). Internal audits in the digital era: opportunities risks and challenges. *EuroMed Journal of Business, 15*(2), 205–217. https://doi.org/10.1108/EMJB-07-2019-0097.

Lutfi, A., & Alqudah, H. (2023). The Influence of Technological Factors on the Computer-Assisted Audit Tools and Techniques Usage during COVID-19. *Sustainability 2023, Vol. 15, Page 7704, 15*(9), 7704. https://doi.org/10.3390/SU15097704.

Mahlangu, S., & Moosa, R. (2023). IT Knowledge Requirements of an External Auditor. *Academic Journal of Interdisciplinary Studies, 12*(4), 84–100. https://doi.org/10.36941/AJIS-2023-0097.

Mahmoud Al-Taie 1*, P. D. M. (2024). Impact Of Skills Of The External Auditor On Auditing Quality. *Muthanna Journal of Administrative and Economic Sciences, 14*(4), 65–86. https://doi.org/10.52113/6/2022-12-3/65-86.

Mahzan, N., & Veerankutty, F. (2011). IT auditing activities of public sector auditors in Malaysia. *African Journal of Business Management, 5*(5), 1551–1563. https://doi.org/10.5897/AJBM09.423.

MAMPU. (2021). Pencapaian Keseluruhan Pelaksanaan Pelan Strategik ICT Sektor Awam 2016- 2020. MAMPU. Retrieved from https://www.

mampu.gov.my/wp- content/uploads/2021/09/Final_Slaid-Dokumen-PSPSA-2021-2025-RE.pdf.

Mihret, D. G., & Yismaw, A. W. (2007). Internal audit effectiveness: an Ethiopian public sector case study. *Managerial Auditing Journal, 22(5), 470–484. https://doi.org/10.1108/02686900710750757.*

Münch, C., Marx, E., Benz, L., Hartmann, E., & Matzner, M. (2022). Capabilities of digital servitization: Evidence from the socio-technical systems theory. Technological Forecasting and Social Change, 176, 121361. https://doi.org/10.1016/J.TECHFORE.2021.121361.

Noor, N. R. A. M., Ramayah, T., Khadzil, S. A. A. J. S., Noor, N. H. H. M., & Yusof, W. Y. R. B. W. (2023). Scope of Audit and Effectiveness of Public Sector Audit in Malaysia. International Journal of Business and Society, 24(1), 330–342. https://doi.org/10.33736/ijbs.5619.2023.

Normarsya, F., Faizul, M., Rahman, N. A., & Omar, N. (2022). Factors Affecting Internal Audit Efficacy in the Malaysian Public Sector. *Insight Journal, 9*(3), 1–17. https://journal.uitm.edu.my/ojs/index.php/IJ/article/view/3484.

Ochs, T., & Riemann, U. A. (2017). IT Strategy Follows Digitalization. IGI Global.

ONAY, A. (2021). Factors Affecting the Internal Audit Effectiveness: A Research of the Turkish Private Sector Organizations Author profile: *Ege Akademik Bakis (Ege Academic Review), 1–15.* https://doi.org/10.21121/eab.873867.

Orkaido Deyganto, K. (2019). Internal Audit Quality and Its Impact on Public Sector Organizational Performance: Evidence from Sector Bureaus of Southern Ethiopia. *International Journal of Economy, Energy and Environment, 4*(6), 118. https://doi.org/10.11648/J.IJEEE.20190406.12.

Otia, J. E., & Bracci, E. (2022). Digital transformation and the public sector auditing: The SAI's perspective. *Financial Accountability and Management, 38*(2), 252–280. https://doi.org/10.1111/FAAM.12317.

Pallant, J. (2016). SPSS Survival Manual: A Step by Step Guide to Data Analysis using IBM SPSS. UK: McGraw-Hill Education.

Rouse, M. (2022, April 25). What is IT Infrastructure? - Definition from Techopedia. Retrieved from Techopedia.

Selg, M., & Shachmurove, Y. (2023). The Digital Transformation of Auditing and the Evolution of the Internal Audit Open Access. *J Econ Managem Res, 4*(4), 1–2. https://doi.org/10.47363/JESMR/2023(4)184.

Shariman, J., Nawawi, A., Saiful, A., & Salin, A. P. (2018). Issues and concerns on statutory bodies and federal government - Evidence from Malaysian Auditor General's report. *International Journal of Public Sector Performance Management, 4*(2), 251–265. https://doi.org/10.1504/IJPSPM.2018.090757.

Shin, D., & Ibahrine, M. (2020). The socio-technical assemblages of blockchain system: how blockchains are framed and how the framing reflects societal contexts. *Digital Policy, Regulation and Governance, 22*(3), 245–263. https://doi.org/10.1108/DPRG-11-2019-0095.

Shuwaili, A. M. J., Hesarzadeh, R., & Bagherpour Velashani, M. A. (2024). Designing an internal audit effectiveness model for public sector: qualitative and quantitative evidence from a developing country. *Journal of Facilities Management, 22*(5), 792–810. https://doi.org/10.1108/JFM-07-2022-0077.

Sihombing, R. P., Narsa, I. M., & Harymawan, I. (2023). Big data analytics and auditor judgment: an experimental study. *Accounting Research Journal, 36*(2–3), 201–216. https://doi.org/10.1108/ARJ-08-2022-0187.

Soh, D. S. B., & Martinov-Bennie, N. (2015). Internal auditors' perceptions of their role in environmental, Social and governance assurance and consulting. *Managerial Auditing Journal, 30*(1), 80–111. https://doi.org/10.1108/MAJ-08-2014-1075.

Sunarmin, S., & Junaidi, A. (2022). Auditor Skill, Work Experience and Professional Skepticism on Performance of Auditors. *Ilomata*

International Journal of Tax and Accounting, 3(2), 183–190. https://doi.org/10.52728/IJTC.V3I2.453.

THAROUMA, S., & OUDAI, M. (2022). A Review of the Literature on Internal Audit in the Era of Digital Transformation. *Finance and Business Economies Review, 6*(4), 215–225. https://doi.org/10.58205/FBER.V6I4.123.

Turetken, O., Jethefer, S., & Ozkan, B. (2020). Internal audit effectiveness: operationalization and influencing factors. *Managerial Auditing Journal, 35*(2), 238–271. https://doi.org/10.1108/MAJ-08-2018-1980.

Veerankutty, F., Ramayah, T., & Ali, N. A. (2018). Information Technology Governance on Audit Technology Performance among Malaysian Public Sector Auditors. *Social Sciences 2018, Vol. 7, Page 124, 7*(8), 124. https://doi.org/10.3390/SOCSCI7080124.

Vitalis, A., Boritz, J. E., & Simeoni, L. (2024). Enhancing CPA competencies for internal audit roles. *International Journal of Auditing, 28*(3), 458–484. https://doi.org/10.1111/IJAU.12337; JOURNAL: JOURNAL: 10991123;ISSUE:ISSUE:DOI.

Wan Mohamad Noor, W. N. B., Abd Razak, S. N. A., Mat Jusoh, Y. H., & Hasan, S. J. (2024). Navigating the Digital Landscape: Unraveling Technological, Organizational, and Environmental Factors Affecting Digital Auditing Readiness in the Malaysian Public Sector. *Journal of Emerging Technologies in Accounting, 21*(1), 111–127. https://doi.org/10.2308/JETA-2022-072.