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Digital Transformation of the Internal Audit Function – Analysis of Technology Acceptance Factors and Perspectives of Future Development

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Abstract: *The rapid evolution of technology and globalisation has intensified competition and raised complex challenges for internal auditors. Adapting to new technologies is pivotal for internal auditors amid the digital transformation era. This paper aims to explore the impact of information technology in internal audit processes, analysing factors influencing its application. The results of the analyses highlight several key factors that significantly influence the adoption and use of CAATs in internal audits across different contexts. While internal auditors are nascent in embracing advanced technologies, the pandemic catalysed their digital maturity, particularly in robotic process automation and data analytics. Despite technological advancements enhancing audit efficiency, human judgment remains irreplaceable. The research underscores the ongoing shift towards technology integration to enhance internal auditing practices.*

1. INTRODUCTION

Technologies, globalisation, and the accelerated pace of change have led to fierce competition and unpredictable demands in the business environment, increasing the challenges faced by internal auditors. However, the role of internal auditors in adapting to these new technologies is crucial and highly valued. Keeping pace with numerous challenges implies a willingness to adapt to new technologies and their requirements. This precondition is necessary for the internal order function to stay relevant (The Institute of Internal Auditors (IIA) 2024a, p. V). The use of technology in internal auditing was also recognised and integrated into the Standards. There is a noticeable shift in emphasis regarding the need for the use of information technology in the last decade, where the 2017 (IIA, 2016) standards specify that internal auditors "must" consider the "use of technology" in the audit process. Using "technology-based audit and other data analysis techniques" is part of exercising due professional care (IIA, 2016, p. 7). New Global Internal Audit Standards (IIA, 2024b, p. 54), effective from 2025, specify "using technology to perform services", the inclusion of these plans within the CAE resources plan, and implementing technology to "improve the internal audit function's efficiency and effectiveness" (IIA, 2024b, p. 55). Also, they directly require that the CAE "must strive to ensure that the internal audit function has the technology to support the internal audit process" (IIA, 2024b, p. 74). While it is possible to identify guidelines within the profession regarding the use of technology in the internal audit process, it is crucial to determine the relevant factors influencing the adoption of such technology. This ensures that significant findings are considered when shaping guidelines at the regulatory level and within individual companies. The primary goal of this paper is to determine which factors affect the application of information technologies in internal audit. The aim of the paper is also to investigate the features of information technologies that are applied in the practice of internal auditing and the perspective of the development of the internal audit function in the future. The

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digital transformation of the internal audit function is a recent and current research topic; however, it should not be limited to researching the features of using digital technology. The paper also analyses the technological readiness of internal auditors to implement emerging technologies. It contributes to existing research in areas providing insights into the features of technology acceptance in internal auditing, which will allow for a better understanding of the supporting conditions for technology application from the perspective of both the individual auditor and the organisation in which the internal auditor operates.

In the continuation of the paper, recent scientific works, publications of professional associations, and reports on the state of the internal audit profession are analysed. In the second part of the paper, the fundamental features of the application of information technology in internal auditing are analysed, as well as the readiness of internal auditors regarding the acceptance of emerging technologies. In the third part of the paper, recent scientific works are analysed, and significant models that provide a framework for exploring the factors influencing technology acceptance in internal auditing are identified, along with empirically validated factors. The fourth part of the paper presents future directions for the profession's development in the context of technology application and competency development, followed by the paper's conclusion.

2. FEATURES OF INFORMATION TECHNOLOGY APPLICATION IN INTERNAL AUDITING

Over the last few decades, the application of information technology has significantly impacted the development of the internal audit function. According to Deloitte (2018a), this development can be divided into three phases: 'Internal Audit 1.0' characterised by the introduction of software solutions for tracking information (from 1940 till late) 1990; 'Internal Audit 2.0' (after the 2000s) with improved information handover through technological tools and an increased focus on IT auditing and data analytics, and 'Internal Audit 3.0' during the fourth industrial revolution, which requires adaptation to new challenges in terms of risks and innovations. In this sense, it is possible to identify an extended period of technology usage in auditing, summarised under Computer-Assisted Audit Tools and Techniques. The term Computer-assisted audit tools and techniques (CAATTs) usually refers to "technologies such as electronic audit working papers, database applications, and business intelligence audit software" (see Siew et al., 2020). More general Computer-assisted audit techniques (CAATs) are defined as the "use of technology to help you evaluate controls by extracting and examining relevant data" (Chartered Institute of Internal Auditors, 2023). Those two terms are often used interchangeably, but they mainly refer to more simple technology, such as Electronic Working Papers, Electronic Spreadsheets, Purpose-Written Programs, and Generalized Audit Software (GAS) (Lutfi & Alqudah, 2023), while more recent Data analytics has been known as the "sophisticated use of CAATs" (Chartered Institute of Internal Auditors, 2023, p. 1).

It is argued that the accounting profession has frequently been slow to adopt new technologies, particularly in big data and data analytics (Tang et al., 2017, p. 17). In this context, research by professional associations and practitioners is highly significant, as it offers insight into the global state of practice. According to a global survey on internal audit conducted by the Institute of Internal Auditors Research Foundation (IIARF, 2015) almost a decade ago with over 14,500 respondents, there was significant room for progress, as only 40% of respondents reported using IT at an "appropriate" level or higher (IIARF, 2015, p. 6), with respondents indicating that "extensive use of technology is the exception, not the rule" (IIARF, 2015, p. 7). The survey identified a higher use of electronic working papers, followed by automated tools for data analytics, data mining tools, flowchart or process mapping software, and software or tools for internal audit risk assessment

(IIARF, 2015, pp. 7-9). According to research by the Institute of Internal Auditors (IIA, 2018; IAF, 2019) in North America, a small percentage of surveyed CAEs (IIA, 2018) believed that their internal audit function fully embraces new technologies, and respondents felt neutral about their preparedness for most innovations (IAF, 2019, p. 11). Greater use of data analytics was reported by more than half of the respondents (IIA, 2018), with a large majority indicating no plans to adopt other technologies, such as RPA and AI, in the near future. In studies conducted from 2018 to 2019 (PWC, 2018, 2019a, 2019b), the digital readiness of internal audit was assessed through three categories: *Evolvers* (advanced technology adoption), *Followers* (technology adoption with slower progress compared to the previous group), and *Observers* (minimal or no technology adoption). The majority of internal audit functions were identified as Followers and some as Observers, with a very small percentage classified as the advanced category, Evolvers. Research by Deloitte (2020, 2021, 2023) indicates that data analytics has the most significant impact on the development of the internal audit function, followed by machine learning and RPA (Deloitte, 2020, 2021), although the latter still needs to be widely adopted.

Emerging technologies, such as data analytics and AI-enabled technologies, significantly enhance risk assessment during the planning phase by analysing large volumes of data (Deloitte, 2018b) and identifying new risk areas (Pickard et al., 2020). Data analytics offers data modelling and testing capabilities across entire populations (Deloitte, 2018b), providing a better understanding of data and more accurate assessments of material misstatements, internal control deficiencies, and fraud (Otete, 2020). Robotic Process Automation (RPA) enables extensive text analysis and continuously monitors business processes, detecting suspicious entries and potential fraud (Deloitte, 2018a), while AI can identify unusual transactions and flag those that violate predefined rules (Pickard et al., 2020). Advanced reporting software speeds up the supervisory review process, reducing travel and overall costs (Aikins, 2020), and using data analytics, auditors can create dashboards with various scenarios to aid in reporting (Deloitte, 2018a). Overall, the application of IT enhances the efficiency and effectiveness of internal audit functions across all phases. Although information technology has numerous benefits, implementing modern technologies in internal audit activities globally has yet to exhibit widespread acceptance. However, certain advancements can be identified in recent periods.

3. TECHNOLOGY ACCEPTANCE FACTORS IN INTERNAL AUDIT – SIGNIFICANT MODELS AND INFLUENTIAL FACTORS

Although information technology facilitates a range of internal audit functions, such as data extraction, querying, and data summarisation, its adoption has yet to be in full swing in most countries. Therefore, analysing the factors influencing technology adoption among internal auditors is essential. Factors of adaptation of information technology in internal audit research involve the cross-disciplinary application of theories related to the adoption of IT to the practice of internal auditing. The initial research focused on analysing the factors influencing the use of CAATTs/CAATs in internal auditing with the idea of exploring motivation for enabling more effective applications (Mahzan & Lymer, 2014).

The consideration of acceptance regarding the use of information technology in internal auditing is analysed from the perspective of individual acceptance, specifically exploring 'how and why individuals adopt new technologies' (Venkatesh et al., 2003, p. 427). However, organisational factors and external influences are also examined, thus providing the results of these research directions with comprehensive insight into the factors affecting the acceptance of information

technology in internal auditing. It is important to note that, although this is a topic that has been extensively researched over the past 15 years in the field of auditing, a significantly smaller number of studies have focused on internal auditing, while a more significant number have pertained to external auditing (Siew et al., 2020; Al-Okaily et al., 2024). Due to the differences between internal and external auditing and differences in the audit environment, it is only partially possible to generalise the results.

Regarding individual acceptance, the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) is commonly used as a basis for research. This theory consists of several models, including the Technology Acceptance Model (TAM), which was also used as a framework in studies on the factors influencing technology acceptance in internal auditing. UTAUT identifies four fundamental constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447). Effort expectancy is associated with the "degree of ease associated with using the system" (Venkatesh et al., 2003, p. 450). Social influence is considered "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451), and facilitating conditions refer to the support of the organisation and are defined as "the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the systems" (Venkatesh et al., 2003, p. 453). The Technology Acceptance Model (TAM) focuses on explaining "the determinants of computer acceptance that is general" (Davis et al., 1989, p. 985) and considers the influence of external variables on attitude towards using and behavioural intention to use technology. It consists of several components: attitude toward using, behavioural intention to use, actual system use, perceived usefulness, and perceived ease of use. According to TAM, perceived usefulness and perceived ease of use "are of primary relevance for computer acceptance behaviour" (Davis et al., 1989, p. 985). Perceived usefulness is defined as the subjective probability that using a specific technology will increase the user's job performance, and perceived ease of use refers to the degree to which an individual anticipates that the system will be simple to operate (Davis et al., 1989).

Although the use of these theories as a basis for researching technology acceptance in internal auditing has been present since the early 2000s, more recent studies have been conducted in geographical areas of developing countries where the functions of internal auditing are less developed. Earlier studies that utilised UTAUT found that performance and effort expectancy were essential factors (Mahzan & Lymer, 2014) and that the acceptance of CAATs is mainly influenced by the perception of benefits from their use in the audit process. Concerning the characteristics of individual auditors, it was concluded that risk-seeking individuals are more likely to implement technology regardless of their perception of budgetary pressure (Curtis & Payne, 2008). According to the results of studies that used the basic or augmented TAM as a foundation, the significance of variables such as organisational support and system quality was established (Huang et al., 2008), along with perceived ease of use and perceived usefulness (Kim et al., 2009), with some interesting conclusions regarding the impact of technology complexity. Based on the results, more complex features of technology negatively impact the willingness to use such technology, and internal auditors are less likely to use those features regardless of their benefit to performance usefulness (Kim et al., 2009, p. 22). Although not part of recent findings, this conclusion is interesting for professional bodies. It aligns with some more recent findings regarding emerging technologies, which indicate that internal auditors believe they need more guidance and frameworks regarding the use of emerging technologies (Eulerich et al., 2020). Abdul Ghani et al. (2022) used UTAUT

as a framework and found, based on a sample of internal auditors in the public sector, that performance expectancy and individual factors are attributes that have the most influence on the adoption of CAATs. Almagrashi et al. (2023) also studied internal auditors in the public sector, expanding the UTAUT model with new factors such as organisational influence, satisfaction, and trust, which proved to have a significant influence on the acceptance of CAATs along with effort expectancy, performance expectancy, facilitating conditions, and behavioural intention. Al-Hiyari et al. (2019) established the relationship between performance expectancy and effort expectancy with the acceptance of CAATs based on the use of UTAUT and suggested that policymakers should encourage internal auditors to adopt CAATs.

Recognising the need to upgrade existing knowledge, researchers have also explored other factors to understand additional external factors contributing to or hindering an individual's acceptance of technology. In this sense, some studies use the Technological, Organisational, and Environmental framework (TOE), initially developed by Tornatzky and Fleischer (1990), which considers these three factors that influence the adoption and implementation of technology. In the context of technological factors, it is necessary to understand the characteristics of the technology itself and its usefulness in the application of the audit process. Within organisational measures, significant factors include "decision-making structure and communication processes by top management and organisation size", while environmental factors consider clients, regulatory requirements, or external pressures (Rosli et al., 2012, p. 5). According to the research conducted by Li et al. (2018) on factors influencing the use of audit analytics in internal auditing, management support, technological competence, and standards are associated with the application-level usage of audit analytics.

Additionally, it was found that professional help, technological competence, and application-level usage influence the feature-level usage of audit analytics. Along with empirical testing, some authors proposed a theoretical framework, combining (the TOE) model with Institutional theory (Mujalli & Almgrashi, 2020) in the case of using GAS to provide better decision-making in public sector internal auditing. Al-Okaily et al. (2024) focused on the public sector of a developing country in the post-COVID period. They included other variables such as support of audit bodies, government regulations, and audit task complexity as environmental factors. According to the results, both organisational and environmental variables prove to be significant for the adoption of CAATs. Organisational readiness, support of top management, auditors' information technology competency, and entity size were significant variables in organisational factors, while government regulation and audit task complexity had a significant influence on the adoption of CAATs as environmental factors. Awuah et al. (2022) also used augmented TOE on a sample of internal auditors in a developing country. They concluded on the significant influence of environmental, organisational and technological readiness related to adaptation of CAATs, suggesting that more attention should be paid to education regarding the use of emerging CAATs, such as big data analytics.

In addition to the mentioned theories, recent studies propose other theoretical foundations for creating a framework to investigate factors related to technology adoption in internal auditing, such as socio-technical systems theory (STS). STS provides a framework for understanding why emerging technologies fail to meet expectations, thereby creating an opportunity for a better understanding of how to optimise the use of technology (Eulerich et al., 2020). Similarly, Lutfi and Alqudah (2023) use the Diffusion of Innovation theory (DOI) as a framework for research variables. The DOI theory has also been used in external auditing in recent studies to investigate factors related to emerging technologies such as artificial intelligence and machine learning

(Handoko et al., 2023). The DOI theory considers significant factors for adopting complex technologies, such as relative advantage, complexity, compatibility, observability, and trialability (Lutfi & Alqudah, 2023). According to the results, relative advantage, compatibility, observability, and trialability were found to significantly impact the use of CAATTs (Audit Automation Software, Test Data and Generalized Audit Software). Additionally, the use of CAATs positively influenced the effectiveness of audit tasks, with auditors' IT knowledge serving as a moderating factor in this relationship. In addition to the conclusions of previous studies, the following results from descriptive studies should also be noted. These studies focus on describing the characteristics of a population or phenomenon without attempting to establish a causal relationship. According to the results, internal auditors tend to use more generic CAATs than specific ones. Furthermore, the size of the workplace and the size of the internal audit department (Dias & Marques, 2018) and years of experience (Inacio et al., 2020) are associated with using specific CAATs.

4. PERSPECTIVE ON THE DEVELOPMENT OF THE INTERNAL AUDIT FUNCTION IN A DIGITAL ENVIRONMENT

As mentioned, among information technologies, data analytics has shown the greatest significance and impact on the development of the internal audit function (Tang et al., 2017; Smidt et al., 2019). Advanced technologies such as artificial intelligence and robotic process automation have yet to be widely adopted, but most internal audit departments plan to change this in the coming years.

The problem primarily lies in internal auditors needing more skills and knowledge. However, these technologies can benefit internal audit departments, and their adoption should increase if they wish to keep pace with the times. The IIA Competency Framework (2022) defines four areas of knowledge and includes knowledge related to information technology: data analytics, security and privacy, and IT control frameworks. Regarding data analytics, internal auditors are expected to understand basic concepts of data analytics in internal audit, apply data analytics, and evaluate the use of data analytics in internal audit (at an expert level). In this context, internal audit functions should strengthen three pillars: "skills/capability, agility/flexibility, and insights/value" to keep pace with the organisations in which they operate (KPMG, 2022, p. 3). "Technology use" is considered "a must" in internal audit (IIA, 2024a, p. 9), with a highlighted need for accelerated development of new knowledge required for the successful implementation of information technology.

The most common reasons cited for digital unpreparedness include a lack of capabilities and skills among auditors (IAF & Deloitte, 2021, pp. 14-18). According to the latest global survey (IIA, 2024, p. 11) involving over 6,500 respondents, nearly all participants acknowledged the high significance of data analytics for future internal audit activities. However, 48% of respondents reported being involved in activities related to artificial intelligence, with less than half of these using AI for internal audit activities or exploring future applications of AI. The remainder were engaged in advisory activities related to AI applications in their companies' operations. Additionally, about one-third of respondents reported low technology or new tool usage. This data indicates that despite high awareness of the importance of keeping up with technology trends, there is still considerable room for advancement in the internal audit profession in this regard.

According to Protiviti (2022, p. 6-9), a global survey was conducted from 2021 to 2022 on respondents in the field of internal auditing. Due to remote work and changed business conditions, the number of internal auditors involved in innovations increased by 6 per cent compared to the previous two years. In this period, 67 per cent of respondents stated that they are undertaking

digital transformation initiatives, while 38 per cent plan to do so within the next two years. The main priority for most respondents is the increased use of data analytics (Protiviti, 2022, p. 10).

The overall results indicate a significant rise in the number of internal audit functions fostering new ideas and those facing innovation challenges for idea generation and seeking new solutions. This clearly shows that more internal audit functions have achieved a higher level of maturity in their innovation and transformation efforts, taking on the role of digital leaders. Additionally, future internal auditors are expected to invest additional efforts in developing expertise regarding technology. This conclusion applies to experienced and entry-level internal auditors (IIA, 2024a, p. 8).

5. CONCLUSION

Information technology is a significant ally in achieving the efficiency and effectiveness of modern internal auditing. Expectations regarding the further implementation of emerging technologies are high, both from the profession and the auditors themselves; however, according to research findings, internal auditors are not entirely prepared for such an undertaking.

The analyses showed that data analytics significantly impacts the internal audit function and that simpler information technologies are mainly applied. Internal audit functions generally have a low level of adoption of more advanced technologies, i.e., at the very beginning of developing their digital capabilities. Although internal auditors' digital maturity level regarding digital transformation is relatively low, the pandemic caused a sharp increase in maturity, especially in robotic process automation, data analytics, and artificial intelligence. An increase in the efficiency of the internal audit using information technologies and their further application in the future was observed.

Although technology is an indispensable part of daily life and offers numerous benefits, the individual's intention to accept technology is influenced by various factors. Various theories are used to investigate factors related to technology adoption in internal auditing. According to the results of recent studies from mainly developing countries, it is not possible to determine a unique set of factors associated with the acceptance of CAATs in internal auditing. Studies highlight several key factors that significantly influence the adoption and use of CAATs across different contexts. These factors include proficiency in and understanding of technology, management support, organisational readiness (including decision-making structures, communication processes, and overall size, as well as environmental factors (regulatory requirements, government regulations, and audit task complexity). The complexity of the technology itself is also proven to be a significant factor when deciding on the use, as well as some individual characteristics such as risk acceptance. Notably, these findings are predominantly based on research conducted in developing countries, indicating a need for further development to standardise auditing practices on a global scale. Also, these results have significant implications for professional bodies and industry regulators and provide valuable findings for internal auditing in the public sector. Additionally, the focus has been on more straightforward tools rather than emerging technologies, suggesting an area for future research. This may be because the adoption level of emerging technologies in internal auditing is still relatively low globally.

Modern information technologies provide more advantages than disadvantages within internal auditing; that is, they provide a significant level of efficiency within the stages of the internal audit. Although, in the near future, emerging technologies will not replace the work of internal auditors when it comes to professional judgment, they will certainly pose a challenge to internal auditors' work.

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