The impact of remote auditing on audit quality: the moderating role of technology readiness

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Abstract

Purpose – This study aims to investigate the impact of remote auditing on audit quality and explore the moderating role of both the client's and the audit firm's technology readiness in this interaction.

Design/methodology/approach – Data was collected through a questionnaire survey distributed to 360 audit professionals in Jordan, resulting in 208 valid responses. The data was analysed using SmartPLS – structural equation modelling.

Findings – The results showed that remote auditing significantly and positively affect audit quality. This study found that the technology readiness of both the audit firm and the client greatly influences audit quality. Notably, the technology readiness of the client positively enhances the relationship between remote auditing and audit quality, while the technology readiness of the audit firm does not play such a role.

Practical implications – The findings are of value to policymakers in terms of the positive impact of remote auditing on audit quality, and the role of technology readiness in this regard. In particular, they allow policymakers and regulators of audit profession to make informed and relevant decisions pertaining to the adoption of remote auditing. The findings also indicate the significance for audit firms and business institutions to pay special attention to developing their technology capabilities to keep abreast of rapid technology advancements, ensuring the maximum benefits for auditing profession, thereby enhancing their efficiency and effectiveness.

Originality/value – The importance of this study lies in its unique contribution to bridging the research gap related to understanding the pivotal role of technology readiness in enhancing the relationship between the use of remote auditing and the achievement of high audit quality.

Keywords Remote auditing, Audit quality, Technology readiness, External audit, Jordan

Paper type Research paper

1. Introduction

Since technological advancements and innovations are applied in every aspect of business, the auditing field has created its e-audit tools, so-called remote auditing (RA) (Putrevu, 2021). RA can be undertaking without the auditor's physical presence since the acquisition of all the

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evidence required for audit is effected through the use of contemporary technological tools (Kljajić *et al.*, 2022). Various ICT applications have been documented as in use in Big4 audit firms to enable RA, including data exchange, teleconferencing for video and audio, material assessment, remote sharing or streaming of audio and video from remote locations, and recording of audio, video, still images and screenshots from videos (Serag and Daoud, 2021).

RA saves time and money by providing more flexible work hours, eliminating access barriers, widening audit scope, improving audit team performance and double-checking data, producing reliable results (Serag and Daoud, 2021) and bringing greater harmony between work and life (Grant *et al.*, 2013; Lorentzon *et al.*, 2024). As a result, the auditor has worldwide access to all clients and data. However, these benefits, the audit quality (AQ) and the auditor's ability to provide a reasonable assurance of the reliability and validity of financial reports under this new paradigm, remain questionable. Especially, research findings in this regard have been contradicted and are inconclusive.

Many researchers argue that RA has a positive impact on audit effectiveness and quality. For instance, Saputro and Mappanyukki (2022) mention several advantages of RA which might boost the quality of audit processes, such as increased production, lower expenses, flexible work schedules and the promotion of equilibrium between personal and work life, which engenders job satisfaction. It also raises the auditor's professional scepticism owing to the lack of personal interaction with the client. Hawkins (2017) particularly observes that while conducting a remote audit, auditors are more critical, and the ability to use the required tools while working remotely further improves their efficiency (Serag and Daoud, 2021). Furthermore, RA ensures the reliability and continuity of internal governance, especially the internal audit function (Barretto *et al.*, 2022). Consequently, this has a positive impact on the AQ (Farcane *et al.*, 2023).

In contrast, the auditor's ability to detect material misstatements depends critically on the effectiveness of the audit process (Lenz and Hahn, 2015). The loss of physical contact may raise the possibility of fraud; there is a greater chance of presenting altered records, and omitting important details. All of this might have a negative impact on AQ (Picciotti, 2020). In this context, Serag and Daoud (2021) point out several disadvantages of RA which might make impact negatively on the overall quality, such as potential high costs and the need to use advanced technology, and gather complete, trustworthy and relevant audit evidence. In addition, they note auditors' inexperience and inadequate training, and the difficulty of communicating with clients, as factors which elevate the risk of fraud. RA also increases work pressure, time and effort (Barretto *et al.*, 2022). Thus, report completion and delivery delays may result in obsolete or incomplete data, which in turn may decrease AQ (Saputro and Mappanyukki, 2022). Albitar *et al.* (2021) assert that using RA, due to COVID-19 necessity, has negatively influenced several auditing factors such as the auditor's psychological well-being, diligence, staffing resources, audit fees, satisfaction, employees' salaries, going concern assessments, all of which potentially undermine the quality of audit work.

Thus, the apparent contradiction in research findings regarding the impact of RA usage on AQ confirms the importance of engaging in more research on this issue; and this underpins the first question of the study, which is as follows:

Q1. Does RA usage positively or negatively impact upon AQ?

Conducting a remote audit requires the audit parties to possess the technological capabilities – IT infrastructure and expert human resources (Farcane *et al.*, 2023). In this regard, Picciotti (2020) argues that using advanced technology for RA can be expensive and demands special skills. Hannon (2020) further added that to provide effective remote audits, companies must

establish policies for private and secure agreements for remote workers, and employees must have the required technical skills and knowledge, as well as the necessary equipment and training. Thus, one of the factors that might affect RA quality is the readiness of auditors and clients to use technology in remote audits. Therefore, it is expected that technology readiness for both auditor and auditee is imperative if RA is to be applied successfully and the maximum level of quality ensured (Agustin, 2021). However, there is a lack of evidence of the moderating role of technological readiness on the relationship between RA and AQ, and this absence creates an urgent need for additional studies to investigate how RA affects AQ. Furthermore, a need exists to investigate the impact wielded by the client's and audit firm's technological readiness in this relationship, to determine whether that readiness catalyses or exacerbates issues related to RA. Hence, the second question of study is presented as follows:

Q2. What is the moderating role of the technology readiness of audit firms and clients on the relationship between RA usage and AQ?

Auditors' adoption of RA has grown rapidly and become common due to the rising use of technology as well as its numerous benefits. This shift to RA has resulted in changes in the way auditors work. Consequently, more research is required to identify the impact of these developments on the quality of the audit process (Beau and Jerman, 2024), in addition to the role of technological readiness of audit firms and clients in this interaction. In response to that and to fill in the previous research gap, a survey was conducted among audit professionals in Jordan. Drawing on the TAM model, TOE framework and agency theory, a questionnaire was designed which collected 208 valid responses. The findings indicated that using RA in a situation where both the audit firm and the client demonstrated an appropriate level of technology readiness, significantly and positively affects AQ. Remarkably, the technology readiness of the client positively moderates the relationship between RA and AQ, while the technology readiness of the audit firm does not play such a role.

The study contributes to the development of a comprehensive understanding of the effect of RA and technology readiness on AQ, which to date has been lacking in the context of both developed and developing countries. In addition, it investigates the moderating role of the technological readiness of the audit firm and the client in this relationship, thereby providing new information which is considered a novel scientific contribution to the subject of RA. This contribution will serve to incentivise audit companies, particularly those in developing countries, to make technological investments, thus enhancing the quality and procedures of RA. Furthermore, the research emphasises the criticality of the audit firm having a focus on the client's technological readiness. Policymakers and regulators of audit profession are also assisted in their ability to assess the impact of RA on AQ, and the part played by technology readiness in facilitating RA. With this increased understanding policymakers and regulators can bring more intelligence to their decision-making in relation to the adoption of RA in the audit profession.

The rest of this paper is organised as follows. Section 2 presents a review of the relevant literature and introduces hypotheses. Section 3 explains the study methodology, sample and data collection procedure. In Section 4, the data analysis is presented and the findings discussed. Finally, Section 5 offers a conclusion to the study, highlighting its contributions and limitations and offering suggestions for further research.

2. Theoretical framework and hypotheses

2.1 Theoretical framework

While RA is an interdisciplinary topic, the current study integrates agency theory, the TAM and the TOE model to provide a holistic theoretical underpinning from which to investigate the impact of remote audit use on AQ, considering the role of technology readiness of audit

agent and client. By integrating agency theory, the TAM and TOE model in one dynamic framework, a structured approach to the investigation of the relationships between RA usage, technology readiness of audit agents and clients, and AQ in RA contexts is obtained. Empirical research can subsequently validate and refine and test research hypotheses, thereby contributing to a deeper understanding of remote audit practices, technology readiness and their implications for AQ.

Agency theory draws upon the information asymmetry problem ensuing from the separation between management and capital providers, known as the principal–agent problem (Jensen and Meckling, 1976). The principal–agent relationship is characterised by the information asymmetry that results through clients possessing detailed knowledge of corporate conditions, while auditors rely on information provided by the clients (Lin, 2018; Komal *et al.*, 2022; Usman *et al.*, 2022). The external audit process can play a significant role in mitigating the agency problem by providing third-party assurance on compliance, reliability and the integrity of reported information (Raimo *et al.*, 2021). However, what is of paramount importance is ensuring a high level of assurance and AQ (Salem *et al.*, 2023; Usman *et al.*, 2023). AQ itself pertains to the reliability, accuracy, and integrity of audit outcomes. It is also defined by Knechel *et al.* (2013) as the ability of the auditor to reasonably assure that there are no errors or mis-statements in the financial statements and that those statements are prepared in compliance with generally accepted accounting standards. In the context of RA, the known challenges posed by it may threaten AQ and consequently, there is a strong need for effort synergy and alignment of interest between audit teams and auditee personnel to facilitate a maximum level of AQ, and the subsequent confidence in financial reporting (Castka *et al.*, 2020). When the interests of the audit agent and client align, it is more likely that auditors working remotely are inclined to leverage technology effectively to secure higher levels of AQ (Farcane *et al.*, 2023; Figa *et al.*, 2023). When managements believe that RA will reduce information asymmetry and hence, the agency problem, they will do their best to avoid conflicts of interest with auditors in order to enhance the quality of auditors' work.

The TOE model (Tornatzky and Fletscher, 1990) offers a framework for understanding the impact of the dynamics of technology readiness within organisations on the quality of RA. Technology readiness involves the readiness of both audit agents and clients to use platforms and technological tools to undertake practices of remote audit effectively. This includes the readiness of qualified Human resources who are proficient in the use of remote communication tools including the aspects of data security and analysis software. Furthermore, the availability of IT, resources enables the successful conduct of RA, considering software and cybersecurity and privacy protocols to safeguard audit integrity and confidentiality.

Based on the premises of the TOE theory, when audit firms are equipped with advanced technology infrastructure and IT skilful auditors, they can encounter the challenges brought by RA effectively efficiently, thereby promoting higher AQ (Manita *et al.*, 2020). Likewise, technologically prepared audit clients are able to communicate successfully with auditors via online platforms, providing accessibility to accurate financial data, boosting audit reliability, effectiveness and quality (Siew *et al.*, 2020; Li *et al.*, 2018; Awa *et al.*, 2015).

RA usage is referred to as the process of conducting audits electronically by the use of information and communications technology, eliminating the need for the auditor to physically visit the site (Li *et al.*, 2023). The TAM proposes that users' perceived usefulness and perceived ease of use of new technology influences their intentions to use or reject it, and in the case where the intention is to use it, to move to immediate actual use (Davis, 1989). Thus, given the growing tendency in the auditing field to conduct audits remotely and the

various advantages that brings to the audit process, it is expected that more use of RA will be made, and that as auditors perceive RA to be useful and easy to use, this will lead to auditors themselves becoming more familiar and experienced with RA techniques and competences. Thus, it is proposed that the increased use of RA will lead to an enhanced level of AQ in terms of guaranteeing the reasonable assurance of financial reports.

However, owing to the significant role that technology plays in RA, it is presumed that RA will significantly impact upon AQ for audit agents and clients who are already technologically ready to engage with RA. Hence, it is predicted that the achievement of an enhanced quality of audit work resulting from greater engagement in RA is dependent on the technological readiness, as moderating factor, of the audit firm and the client.

The proposed relationships among variables in the study are depicted in the following conceptual framework (Figure 1).

2.2 Literature review

2.2.1 Remote auditing and audit quality. A review of previous studies on RA and its effect on AQ reveals a mismatch in their findings and confirms that this issue is not clarified in the literature.

Many studies have reported on the advantages of conducting audits online, identifying improved AQ and efficiency. For example, Li *et al.* (2023) and Saputro and Mappanyukki

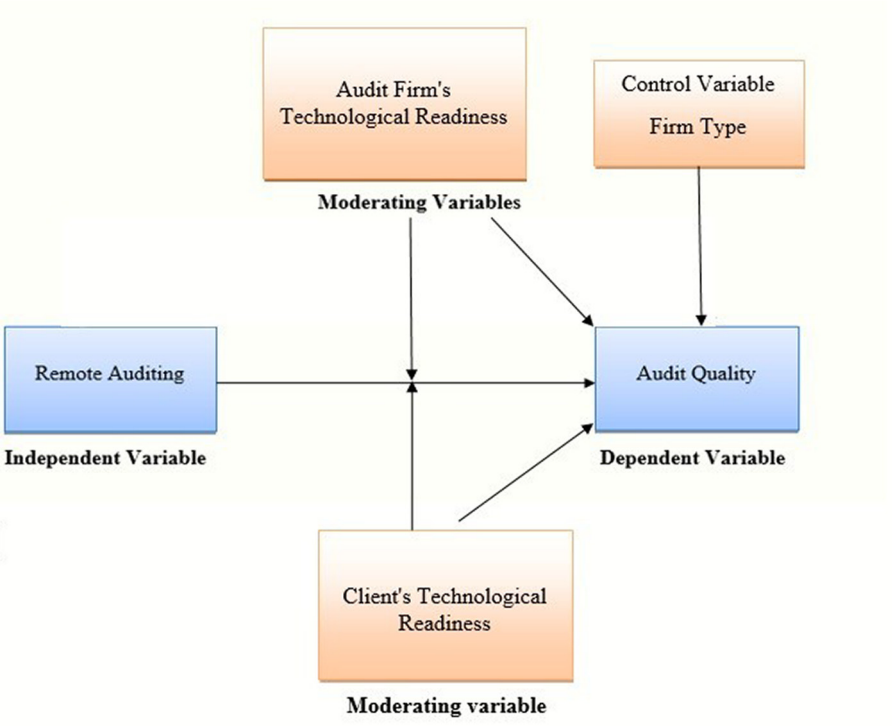

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Figure 1.
Research model

(2022) found that RA improves the efficiency of audits; and Christ *et al.* (2021) found that the transition to RA had no negative impact on internal auditing quality. Furthermore, Butarbutar and Pesak (2021) and Lorentzon *et al.* (2024) demonstrated that remote work offers flexibility, job satisfaction and a balance between auditors' professional and private lives, as it reduces auditors' overall effort and working hours – it improves the performance process and the audit process quality. At the same time, remote work provokes more effective time management, lowers the expense of audits, and minimises travel, which has a positive knock-on effect on the environment (Hannon, 2020). Additional support for RA comes from both Maharaja *et al.* (2022) and Rachmad *et al.* (2023), who show that RA has a positive impact on AQ, and Suhendri *et al.* (2022) specifically demonstrate that the quality of the audit is positively impacted by independence of the auditor brought by RA.

It is argued that working remotely increases job productivity (Farcane *et al.*, 2023); this is due to eliminating meal breaks and shortening transportation and travel time (Barretto *et al.*, 2022). In this context, Mizdraković *et al.* (2021) and Kljajić *et al.* (2022) illustrate that during the COVID-19 pandemic, there were substantial savings in time and transport costs, while the quality of the audits conducted either rose or remained the same, as did management's confidence in the audit.

It is obvious that auditors prefer and are gradually becoming more interested in RA. Lois *et al.* (2020) found that the RA approach is attractive to auditors; this could be due to the increased accessibility of audit evidence in RA. The ability of the auditing company to operate independently and provide results similar to in-person audits is one of the reasons why companies select RA (Castka *et al.*, 2020). This improves their adaptation to work as well as their job satisfaction (Farcane *et al.*, 2023). Tsutsumi *et al.* (2021) argue that the auditee company has no influence over the auditor during RA. Indeed, Figa *et al.* (2023) assert that the remote auditor is more objective and seeks independent sources of evidence to support the assertions stated in the financial statements. Thus, when an audit is carried out remotely, its quality is likely to increase.

It has been advocated that the advantages to RA outweigh the disadvantages (Serag and Daoud, 2021; Mizdraković *et al.*, 2021; Kljajić *et al.*, 2022). The modern business environment could be used to facilitate digital transformation and subsequently strengthen the role of internal auditing by using communication technologies (Mizdraković *et al.*, 2021; Kljajić *et al.*, 2022). This would also improve administrative supervision and control (Manson *et al.*, 2001). In addition, Serag and Daoud (2021) demonstrate that RA improves efficiency while performing internal audit activities, thereby overcoming the challenges faced by the internal auditor. Hence, the external audit tasks can be easily accomplished and the challenges that auditors usually encounter can be overcome (Mizdraković *et al.*, 2021).

In contrast to the above studies, however, some researchers argue that no differences exist between traditional and remote audits in terms of how well and efficiently stakeholders trust their findings (Eulerich *et al.*, 2022). In this vein, professional scepticism and ethics associated with AQ are neither mitigated nor enhanced by RA (Julianti and Muhyarsyah, 2023). According to Castka *et al.* (2021), participants in their study claimed that compliance reports were not affected by RA during the pandemic. However, perspectives on the usefulness of RA remained mixed. Jin *et al.* (2022) report that because all relevant auditing procedures are accomplished when adopting RA, its efficiency is the same as the efficiency of on-site auditing. Moreover, after analysing the influence of digital transformation on audit firms, Tiberius and Hirth (2019) concluded that no major shifts are anticipated in the next few years. Saputro and Mappanyukki (2022) find the influence of professional scepticism on AQ to be unaffected by RA, neither strengthening nor weakening it. Likewise, it was discovered that communication between the auditor and the client whether done in person or

by email has no impact on their connection or their future interactions (Saiewitz, 2018). Nevertheless, Ovaska and Murphy (2022) pointed out that staff turnover in on-site operations is more likely to have an effect on AQ than when changes in staff operating remotely happens.

However, several studies have concluded that when audits are undertaken remotely, their efficiency actually declines as does the AQ. For example, Thompson (2022) and Jin *et al.* (2022) find that working remotely negatively affects AQ. This occurs because working remotely places an auditor under time pressure, which might result in lower AQ since there are numerous records and data that the auditor must review (Castka *et al.*, 2021). Furthermore, Saleem (2021) has found that the restrictions on travel and mobility during the COVID-19 pandmeic presented a challenge to auditors in respect of their ability to collect sufficient audit evidence from their customers and in such a scenario auditors may make false assumptions.

Working on-site, as opposed to remotely, allows for the observation of non-verbal cues that improve overall communication and the ability to effectively comprehend and draw conclusions about the client company. In RA, these opportunities do not exist and the auditor fails to read client behaviour which may include signs of deception, such as failing to make eye contact, stuttering, acting aggressively and speaking loudly (Bennett and Hatfield, 2018). Fears have also been raised concerning the danger of hacking, diminished communication with the customer and the lack of electronic records (Hannon, 2020).

Furthermore, research reveals a number of consequences resulting from the need to work remotely during the COVID-19 pandemic: these include effects on audit fees, audit engagements, human capital, audit effort, business continuity assessment and audit staff wages, all of which may have a substantial impact on AQ (Albitar *et al.*, 2021). Thompson (2022) advises auditing companies to take precautions to guarantee that their AQ is not affected by the flexibility that accompanies remote working. And Agustin (2021) recommends a comparison of the quality, expenses and benefits of remote audits with on-site audits be made.

Based on the above discussion on the relationship between RA and AQ, the following hypothesis is proposed:

Ha1. Audit quality is significantly influenced by remote auditing.

2.2.2 Technology readiness, remote auditing and audit quality. Several studies have underlined the need for both parties' technological readiness for remote working; for instance, the availability of the proper technological infrastructure along with the availability of tools, equipment and software are two crucial factors determining the success of RA (Eulerich *et al.*, 2022). Hannon (2020) also has emphasised the availability of technological skills, as well as technical training and familiarity with this technology, as important requirements for the success of RA. Thus, technological efficiency plays a significant role in improving AQ (Li *et al.*, 2023). The adoption of new technologies while working remotely, promotes improved audit results and audit efficiency but for the parties involved to benefit from such technological advancement they must be knowledgeable and competent (Castka *et al.*, 2020; Farcane *et al.*, 2023) and the infrastructure must be appropriate. The correct technology infrastructure lowers staff mistakes, thereby improving the accuracy of auditing and accounting activities (Saleem and Oleimat, 2020). Moreover, the audit process is less stressful for both the auditor and the company when it benefits from sophisticated technology systems and is technically prepared.

Nonetheless, RA presents numerous challenges for organisations and their auditors when there is only limited technology development (Castka *et al.*, 2021). KPMG (2020b)

recommends that all the technology that will be used during a remote audit should be tested for capability ahead of time and that all those involved should be familiar with the functionality of the technology. In this respect, prior to the audit, auditors and clients should choose the video technology that will be used and the type of data that must be included (Litzenberg and Ramirez, 2020; Picciotti, 2020), and they must ensure that the required data is gathered before the audit (Picciotti, 2020). Furthermore, they must ensure that any data sent electronically can be secured and encrypted (KPMG, 2021), and that an initial video meeting is held to inform the client about the next steps and due dates, introducing any common innovation and describing how the auditors will work (Ovaska and Murphy, 2022).

The technology used to conduct the remote audit is affected by a variety of factors, such as purchase and operating expenses, what is most suitable for the client and ensures their comfort with the process, how data is to be obtained and stored, confidentiality and security (ISEAL, 2021). If the technologies are not applied properly, there is a significant increase in audit risks and the auditor's responsibility (Li *et al.*, 2023). Hence, any negative impact on the AQ will diminish if the technology is utilised optimally when conducting a remote audit (Jin *et al.*, 2022).

The use of cameras and video calls is advised in the remote operation since this equipment can enable virtual tours and the collection of more audit evidence (ISEAL, 2021; Castka *et al.*, 2021), as well as facilitating the monitoring of a company's physical assets and comparing them to reports on those assets (Li *et al.*, 2023). However, auditors must retain their professional scepticism when using video conferences to interact with clients, because they will be relying on the evidence they gather during this connection, and the implication here is that they must be properly trained and experienced in the use of these technologies (Carlisle *et al.*, 2023).

When compared to organisations with poor technological structures, and which must convert their paper documents into digital format, the ability of high-tech businesses to share information improves the process of RA which becomes less onerous (Bremer *et al.*, 2021). This capability to share easily enables the auditor to request the client to provide the required documents before the audit date so there is ample time for them to be reviewed (Picciotti, 2020). Saleem (2021) advises auditors to have complete access to all relevant records. Meanwhile, to comply with the requirements of the remote audit, the client must digitise any existing paper files and consequently, the entire procedure can take longer than expected. Therefore, the audit team must be flexible and use other options for transmitting the required information (KPMG, 2020b).

When achieving audit goals, one must consider the constraints and dangers that ICT faces (IAF and ISO, 2020). IT resources such as a screen, keyboards, and other tools that employees need at home must be provided by the employer (Hannon, 2020). Hence, the client may need to raise investment in the remote audit. Consequently, it has been advised to carry out the audit in two parts during the year (KPMG, 2021).

When undertaking a remote audit, the auditor might face challenges in gaining access to sensitive information, communicating with clients and confirming the reliability of documents (KPMG, 2020a), and there is a risk associated with the processing of data on an online platform through a storage site. Furthermore, the accessibility of the crucial data to be reviewed during the remote audit procedure represents another difficulty and indeed involves risk (Putrevu, 2021). Hence, information and data must be transferred through a security system on which both parties have agreed, such as a cloud network, a virtual private network or other file-sharing systems. The auditor is also responsible for securely deleting any data that is no longer required after the audit's completion (IAF and ISO, 2020). In addition to privacy violations and fraud, there are various other technological hazards,

such as information loss, tool malfunctions, incorrect technology selection and others (Saleem and Oleimat, 2020). Due to the need to maintain work confidentially while working remotely, organisations should additionally establish protocols for confidentiality and security contracts. These processes and policies should outline the necessary approach to working from home (Hannon, 2020), and both the auditor and the client must agree to use ICT in compliance with the protocols (IAF and ISO, 2020). To ensure the security of the firm's IT system, asset protection, and the efficiency and effectiveness of its internal controls, the company must audit its IT system (Saleem and Oleimat, 2020). Using methods like "audit command language", fraudulent activity can be quickly detected (Putrevu, 2021). Besides, auditors must use the ERP system to analyse the organisation's planning processes to identify hazards in the records system that may be exposed to the threat of hacking, system failure or inadequate records (Saleem and Oleimat, 2020).

After a critical review of the literature, the relationships among the study variables, namely: RA, technology readiness of the auditor and the client, and AQ, it can be proposed that technology readiness might directly affect the AQ in RA or play a moderating role between the two. Therefore, the following hypotheses are formulated to empirically test these propositions:

Ha2. The client's technological readiness has a significant impact on the audit quality.

Ha3. The audit firm's technological readiness has a significant impact on the audit quality.

Hb1. The relationship between RA and AQ is significantly moderated by the client's technological readiness.

Hb2. The relationship between RA and AQ is significantly moderated by the audit firm's technological readiness.

3. Methodology and design

A quantitative approach was adopted in this study, using a questionnaire survey to collect the data from external auditors in Jordan. The data was analysed using SmartPLS – structural equation modelling (SEM).

3.1 Population and sampling

Due to their experience and ability to understand and answer survey questions, auditors working in auditing firms based in Jordan comprised the research population. This population included respondents in the positions of audit managers, audit partners, senior auditors, auditors, and assistant auditors. Three hundred and 60 (360) such individuals were identified, and received the questionnaire via two modes, namely, in-person, and online using Google Forms, links to which were sent through email and other social media groups such as WhatsApp. Of these 360 individuals, 208 responded giving a 58% retrieval rate. All returned responses were subject to preliminary sorting to ensure their appropriate completion, and all were free from problems, meaning that all 208 responses were valid for further data analysis.

3.2 Study tool: questionnaire development

The questionnaire was initially developed as a tool for collecting the data after thoroughly reviewing the literature associated with the topic. Face validity was achieved by asking several academics and professionals to check the questionnaire for any ambiguity and/or problems in the content and wording of the questions. The advice obtained resulted in a

second version of the questionnaire, which was then piloted with 11 individuals, who were asked for their feedback on the ease of understanding and completion of the instrument. Subsequently, some modifications were made, thereby establishing initial validity. The final questionnaire includes the following main sections:

Section A: requests the demographic attributes of respondents such as position, professional qualifications, experience period and firm type.

Section B: includes a set of questions about RA in terms of usage levels and the techniques used within it.

Section C: measures technology readiness for the audit firm and the client, and AQ. Technology readiness questions (11 items) were developed drawing upon prior studies (e.g. those conducted by Picciotti, 2020; Saleem and Oleimat, 2020; Hannon, 2020; Castka *et al.*, 2021; Chan *et al.*, 2018; Farcane *et al.*, 2023). The development of an AQ scale consisting of 15 items is based on Saiewitz and Kida (2018), Castka *et al.* (2021), Wojcak *et al.* (2016), Jin *et al.* (2022), Lugli and Bertacchini (2023), Farcane *et al.* (2023), Serag and Daoud (2021), Albitar *et al.* (2021) and Figa *et al.*, 2023). Necessary refinements and modifications were made to the statements in the previous studies, to be aligned with the precise objectives of the study.

Two types of rating scales were deployed to identify the respondents' perspectives accurately. The semantic deferential sale was used for the independent variable RA usage, with nine anchors ranging from 1 less frequently to 9 most frequently. A five-point Likert scale, ranging from 1 strongly agree to 5 strongly disagree, showing the level of respondents' agreement with the related questions was used to determine technology readiness and AQ.

4. Analysis and findings

4.1 Demographic characteristics

Table 1 displays the demographic characteristics of the study participants. Statistics regarding the position of respondents show that 34% were senior auditors, followed by auditors and auditor assistants, at 27% and 18% respectively. The lowest percentage of the sample was audit partners at 7% and audit managers at 14%, and this is not surprising due to their proportionate status in the population and the nature of their position. In respect of the professional certification of the respondents, the highest professional certificate was the local certification JCPA (Jordan Certified Public Accountant) held by 16% followed closely by the CPA (15%). A further 21% held other professional certificates such as the ACCA, CMA and CFE, CFM, Dipifr, CERT IFR, and CFA. However, nearly half (47%) of the participants were without any professional certification.

Statistics regarding experience indicate that more than a half (55%) of respondents were junior auditors with experience ranging between 1 and 5 years, while 28% had between 6 and 10 years' practice, meaning that most of the participants had no more than 10 years of experience. This was expected as the study was limited to those auditors dealing with RA, and unlike junior auditors, the old generation of auditors tends to avoid involving technology in their audit work. Most respondents were employees in the Big4 firms (44%) and local big firms (43%) with only a much smaller proportion (13%) being affiliated with local small and medium firms. This indicates the less likelihood of small and medium audit firms taking advantage of digitisation in their audit processes, a fact that aligns with the findings of Lugli and Bertacchini (2023).

4.2 Descriptive statistics

4.2.1 Level of remote auditing engagement. Respondents were asked to indicate their level of engagement in RA on a scale ranging from 1 less frequently to 9 most frequently. From

Variable	Classification	Frequency	%
Position	Auditor	56	27
	Assistant auditor	38	18
	Senior auditor	70	34
	Audit manager	30	14
	Audit partner	14	7
Professional certification	CPA	32	15
	JCPA	34	16
	ACCA	8	4
	CMA	6	3
	None	98	47
	Other: e.g. CFE, CFM, dipifr, CERT IFR, CFA	30	14
Experience	1–5 years and less	114	55
	6–10 years	58	28
	11–15 years	26	13
	More than 15 years	10	5
Firm type	Big4	92	44
	Local big firm	90	43
	Local medium and small firms	26	13
Total		*208*	*100*

Source: Authors' own work/creation

Table 1. Demographic profile of participants

Table 2 it is seen that this was slightly above the average, as the value of the arithmetic mean reached 5.24. However, there was a clear high variation among participants as is obvious from the standard deviation value of 2.35. This shows that RA is not yet a fully integrated practice in Jordan, and that varying degrees of application and implementation are in evidence, a fact which might correlate with audit firm size and capabilities.

4.2.2 Techniques used to conduct remote auditing. As reported in Table 3, Video-conferencing was the most used technology in RA at a rate of 82%, followed by email at a rate of 13%, and lastly, Clouding Platforms at a rate of 5%. This outcome is due to the high interactivity obtained in video-conferencing and its ability to serve the audit purposes well.

4.2.3 Client's technological readiness. Table 4 shows that participants estimated that their clients possessed a medium level of technological readiness to engage in RA, the overall mean score being 3.12 with a standard deviation of 0.635. Implementing protocols to safeguard the security and privacy of data was the highest, mean value 3.28, while the clients' anxiety about RA was the lowest with a mean of 2.83. This indicates that companies are less technologically prepared for performing audit tasks remotely, and that their staff are generally less motivated to switch to the online processes required to perform audit missions in this mode.

Variable	Mean (Max value = 9)	SD
Level of engagement in remote auditing	5.24	2.35

Source: Authors' own work/creation

Table 2. Level of engagement in remote auditing

4.2.4 Audit firm's technological readiness. Statistics in Table 5 indicate that participants perceive their firms' technological readiness as advanced - the overall mean value was 4.04 with a standard deviation of 0.849. Similar to clients' technology readiness, implementing protocols to safeguard the security and privacy of data appeared as the highest with a mean score of 4.25, and a standard deviation of 0.876. Investing adequately in technology to enhance RA processes was the lowest with a mean of 3.89, suggesting that audit firms should focus more on technology investment to boost their RA processes.

4.2.5 Audit quality. Table 6 provides descriptive statistics on the quality of RA. In general, results indicate that research participants rated the quality of RA as average with an overall mean value of 3.29 and a standard deviation of 0.496. This might be attributed to the fact that RA is still in its infancy and not yet fully leveraged by audit teams. Specifically, the statement that RA does not compromise the credibility of auditing outcomes came the highest, with a mean value of 3.96 and was followed closely by statements about the ability of RA to enhance auditor performance and bolster effective audit team communications. Conversely, participants tended to disagree with statements concerning increased fraud risks (such as manipulation, deletion, and forgery) in electronic audit evidence collection,

Table 3. Techniques used to conduct remote auditing

Techniques used to conduct remote auditing	Frequency	%
Videoconferencing (e.g. Skype, Team, Zoom)	170	82
Email	28	13
Clouding platform	10	5
Total	208	100

Source: Authors' own work/creation

Table 4. Descriptive statistics for client's technological readiness

Item code	Item	Mean	SD	Rank
CTR.1	Technological proficiency in RA	3.19	0.891	3
CTR.2	Technological infrastructure for RA	3.27	1.01	2
CTR.3	Protocols to safeguard data security and privacy	3.28	0.958	1
CTR.4	Anxiety to perform audit tasks remotely	2.83	0.916	5
CTR.5	Network strength and stability	3.06	1.04	4
Overall mean		*3.12*	*0.635*	–

Source: Authors' own work/creation

Table 5. Descriptive statistics for the audit firm's technological readiness

Item code	Item	Mean	SD	Rank
ATR.1	Adequate technology investment for RA	3.89	1.06	5
ATR.2	Audit team technological knowledge and skills for RA	4.08	0.929	2
ATR.3	Effective use of technology that improves the audit's outcomes	3.95	0.916	4
ATR.5	Protocols to safeguard the security and privacy of data	4.25	0.876	1
ATR.6	Network strength and stability	4.06	0.981	3
Overall mean		*4.04*	*0.849*	–

Source: Authors' own work/creation

Item code	Item	Mean	SD	Rank
AQ.1	The risk of fraud (manipulation, deletion and forgery) is increased when obtaining audit evidence electronically	2.79	1.10	12
AQ.2	RA boosts the auditor's level of professional scepticism, in comparison to in-person audit	3.11	1.02	10
AQ.3	The ability of auditors to detect fraud and errors improves with the digitisation of audit work	3.13	1.01	9
AQ.4	RA brings an increase in the likelihood of fraud due to a lack of face-to-face interaction that limits the observation of non-verbal cues and body language	2.57	1.13	13
AQ.5	RA decreases time pressures on the auditor, which minimises the likelihood of behaviours that lower audit quality	3.02	1.09	11
AQ.6	RA boosts objectivity as the auditor asks for evidence from external sources	3.25	0.990	5
AQ.7	RA strengthens the auditor's independence due to the lack of personal interaction	3.15	1.11	8
AQ.8	The auditor's scepticism increases in RA because there is no personal interaction between the auditor and the client	3.17	1.08	7
AQ.11	Adopting technologies enhances auditor performance	3.87	0.940	2
AQ.12	Integrating email, telephone, or web conferencing as a means of engagement significantly streamlines the audit process	3.76	0.895	4
AQ.13	RA tools facilitate effective communication among audit team members	3.86	0.997	3
AQ.14	Auditors' reliance on technology does not compromise the credibility of auditing outcomes	3.96	0.821	1
AQ.15	Utilising RA methods results in more reliable outcomes	3.22	0.942	6
Overall mean		*3.29*	*0.496*	–

Source: Authors' own work/creation

Table 6. Descriptive statistics of AQ

and because of the lack of face-to-face interaction and the consequent loss of non-verbal cues from the clients.

4.3 Partial least squares structural equation modelling analysis

The partial least squares structural equation modelling (PLS-SEM) methodology applied in the current study, focused on testing hypotheses through two successive stages. In the first stage, the measurement model was evaluated to build sufficient perceptions about its reliability and validity in terms of construct validity and its two components of convergent and discriminant validity. Thereafter, the hypotheses were evaluated and tested using the structural model procedure (Hair *et al.*, 2019).

4.4 The measurement model

In the measurement model stage, reliability and validity were evaluated in the usual way, by the use of two psychometric tests: firstly, composite reliability (CR) coefficients and Cronbach's alpha coefficients, which are usually used to determine the level of internal consistency among items that measure the variable; and secondly, convergent validity and discriminant validity were assessed.

4.4.1 Reliability assessment. Reliability was evaluated through the PLS-SEM methodology by calculating CR coefficients and Cronbach's alpha coefficients. The cut-off point for both tests is 0.70 (Hair *et al.*, 2019). Appendix 1 reports the reliability results which indicate that all values meet the statistical threshold (0.70) for both tests, thereby confirming that reliability was achieved for the measure (Hair *et al.*, 2017).

4.4.2 Convergent validity. Factor loadings and average variance extracted (AVE) were utilised to measure the convergent validity. According to Hair *et al.* (2019), the assumptions

of convergent validity can be accepted if the AVE values are higher than 0.50 and the loading coefficient values are higher than 0.70. As displayed in Appendix 2, items ATR.4, AQ9 and AQ10 were discarded at this stage since their factor loadings were below the cut-off point. All other variables satisfied the test for convergent validity as they recorded values higher than 0.50, and all factor loadings values were higher than 0.70, thereby indicating acceptance of these measurement items as the means to analyse and test the hypotheses.

4.4.3 Discriminant validity. After verifying and accepting the indicators of reliability and convergent validity, a further test to establish discriminant validity was conducted (Hair *et al.*, 2019). Discriminant validity was measured through the method of Fornell and Larcker (1981), which requires the square root of the AVE values within variables to be higher than all the values of the correlation coefficients with other variables. Results implies, in Appendix 3, that the discriminant validity was established for all variables, as all the values in bold, which represent the square root of the values of the AVE, were greater than the correlation coefficients shown under the diagonal, and this indicates that the discriminant validity indicators have been achieved.

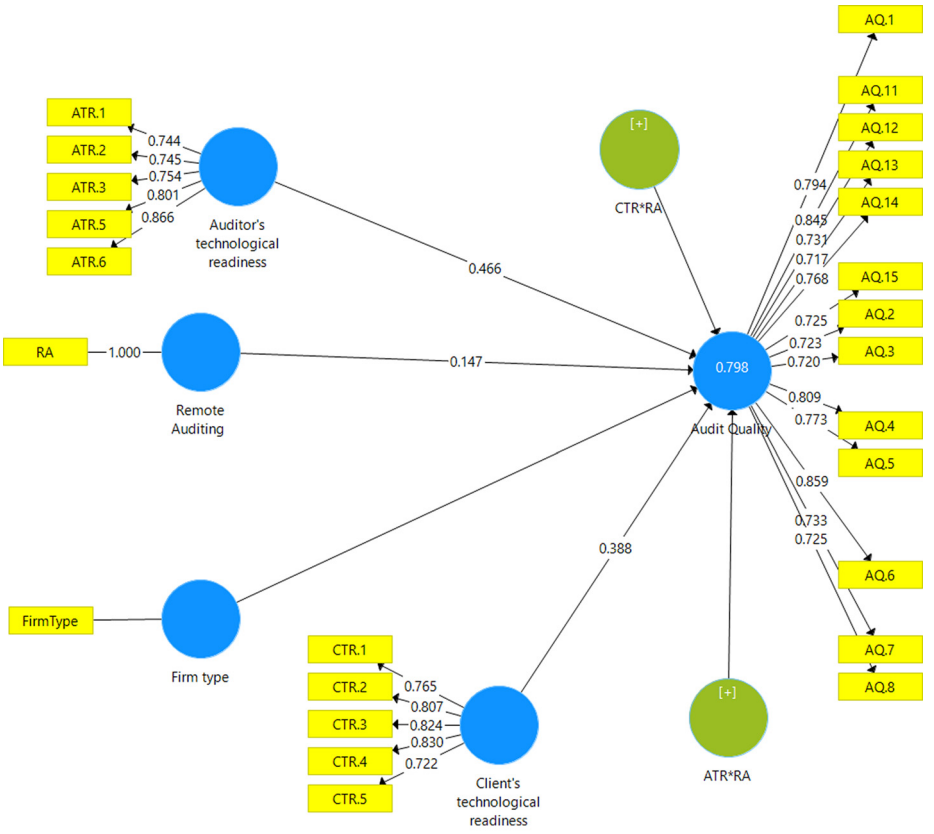
4.5 Hypotheses testing

4.5.1 Evaluation of the structural model. In PLS-SEM methodology, the step after accepting the measurement model is the evaluation of the structural model, through which the statistical significance of the paths of influence and relationships between variables is judged (Hair *et al.*, 2019). According to the PLS-SEM methodology, testing of hypotheses does not demand strict adherence to the traditional and classical statistical assumptions used in other estimation methods. Consequently, this methodology is considered to be more flexible than the other techniques for hypothesis testing (Hair *et al.*, 2014). Especially, it provides greater flexibility in estimation when multivariate traditional assumptions are not met, such as in the presence of outliers, missing values, or when the data are not normally distributed (Matthews *et al.*, 2018). However, despite scholars' beliefs that these assumptions are not important when applying PLS-SEM prior to evaluating the structural model, the normality and multicollinearity between variables were verified.

4.5.2 Hypotheses testing. When estimating the regression equation and evaluating the relationships between variables through PLS-SEM, the use of the bootstrapping method helps to estimate the relationships more efficiently by generating a random sample 5,000 times the real sample, which represents an advantage of this statistical technique. Figure 2 explains the path analysis for the research hypotheses.

Table 7 summarises the results of the hypotheses testing. From this it is seen that all the variables associated with RA usage, the client's technological readiness and the audit firm's technological readiness, with strong and direct effects, contribute significantly to explaining the variation occurring in AQ, since the value of the coefficient of determination was 0.820. This result indicates that a higher level (82%) of the variation occurring in AQ was due to exogenous variables (RA level of usage, client's technological readiness and audit firm's technological readiness).

The direct effects of variables were tested revealing that all the variables of RA level of usage ($\beta = 0.090$, t-values $= 2.514$, P-value $= 0.012$), the client's technological readiness ($\beta = 0.277$, t-values $= 5.619$, P-value $= 0.000$) and the audit firm's technological readiness ($\beta = 0.431$, t-values $= 9.311$, P-value $= 0.000$), added significantly to the explanatory power of the model and positively affected the AQ. This indicates that AQ is enhanced both as the degree of auditor engagement in RA increases, and as the degree of advanced technology readiness



Source: Authors' own work/creation

Figure 2.
Structural model

Path	R^2	Beta value	S.E.	*t*-statistic	*p*-value	Result
RA → AQ	0.820	0.090	0.036	2.514	0.012	Significant
CTR → AQ		0.277	0.049	5.619	0.000	Significant
ATR → AQ		0.431	0.046	9.311	0.000	Significant
Moderating effects						
*RA*CTR → AQ*	0.820	0.183	0.043	4.278	0.000	Significant
*RA*ATR → AQ*		0.094	0.049	1.908	0.056	Insignificant
Firm type → AQ		−0.019	0.028	0.654	0.513	Not significant

Source: Authors' own work/creation

Table 7.
Hypothesis testing results

for RA possessed by the client and the auditor increases. These findings indicate that *Ha1*, *Ha2* and *Ha3* were upheld.

Having tested for the moderating effects of the technological readiness for RA of both the Audit client and the Audit firm on the relationship between RA usage and AQ, the results

showed that the effect of the interaction between RA usage and the client's technological readiness on AQ was positively and statistically significant ($\beta = 0.183$, t-values $= 4.278$, P-value $= 0.000$), and the increase of technological readiness of the client enhanced the impact of usage of RA on the AQ. This result supports *Hb1* regarding client technology readiness moderating the relationship between RA and AQ. However, the effect of the interaction between the RA level of usage and the audit firm's technological readiness on AQ, whilst positive, was not statistically significant ($\beta = 0.094$, t-values $= 1.908$, P-value $= 0.056$). This might be attributable to the fact that as was indicated from the descriptive statistics, audit agents do not suffer from deficiencies in IT readiness in contrast to clients who generally do. This result means that *Hb2* was rejected.

Regarding the control variable, the firm type (big4, big local firm and medium local firm), this did not have a statistically significant impact on AQ ($\beta = -0.019$, t-values $= 0.654$, P-value $= 0.513$).

4.5.3 Discussion. The main objective of the current study was to identify the impact of RA on AQ, in addition to examining the moderating role of the technology readiness for RA possessed by both the audit firm and the client; and the findings obtained contribute to a greater understanding of this relationship.

Specifically, the results confirmed the presence of a positive impact of RA usage on AQ, meaning that greater implementation of RA improves the quality of auditing. This might be explained using the TAM's perceived usefulness and ease of use criteria, which justify greater implementation of RA by auditors that in turn fosters greater auditor familiarity and experience, which in themselves lead to enhanced audit efficiency and quality. When compared with the traditional method, RA helps auditing firms enhance their AQ by increasing auditing process efficiency, streamlining tasks, enabling them to gather and analyse more data, increasing productivity, making it easier to obtain audit evidence and offering convenient and flexible work schedules. These findings align with those of Farcane *et al.* (2023) and Li *et al.* (2023). In addition, the absence of interaction or contact between the auditor and the client increases the auditor's independence and professional scepticism, as the auditor is more suspicious of the reliability of the evidence gathered electronically and imposes more checks and balances. This result is consistent with the findings of Hawkins (2017), Saputro and Mappanyukki (2022) and Jin *et al.* (2022). At the same time, these ideas correlate with those presented in agency theory since managements can mitigate the problems with stakeholders by reference to the third-party assurance provided by external auditors in respect of compliance, reliability and integrity of the information declared. Moreover, when the audit company and the client have common interests, the auditors are more inclined to use technology effectively to obtain increased levels of AQ (Farcane *et al.*, 2023; Figa *et al.*, 2023). Likewise, management's opinion that RA will deal appropriately with the information asymmetry and agency issue is likely to foster the attitude that conflicts of interest with the auditor are not conducive to AQ, so co-operation is forthcoming.

Moreover, in line with the TOE framework (Tornatzky and Fletscher, 1990) regarding the significance of technology readiness in terms of presence of sufficient organisational, human and IT resources for adopting and ensuring high quality implementation of new technological innovations, the results showed that both the audit firm's and the client's technological readiness play an important and positive role in improving AQ, outcomes that are consistent with those of Hannon (2020) and Farcane *et al.* (2023), thereby confirming that several technical requirements, such as the availability of technical skills, training, and familiarity with the technology, play a major role in the success of RA. Indeed, any deficit in these requirements might cause problems throughout the auditing process (Picciotti, 2020). Thus, apart from the specific technological skills of auditors and accountants, the whole

infrastructure of the audit firm and the client carries paramount weight in enhancing the quality of RA. These findings are in alignment with those of Hannon (2020), Farcane *et al.* (2023) and Saleem and Oleimat (2020), thus indicating that an organisation's technological capabilities as well as the availability of the proper tools and equipment increase audit efficiency. Similarly, policies related to privacy and confidentiality help to improve the audit's effectiveness and quality. Hence, any shortcomings in the network render the technology useless and serve to degrade the AQ.

When testing for a modifying influence from the client's and audit firm's technological readiness on the relationship between RA and AQ, it became clear that advancements in the client's technological readiness further improve the positive impact of using RA on AQ. This is consistent with outcomes established by Castka *et al.* (2020), Farcane *et al.* (2023) and Li *et al.* (2023). This finding suggests that audit firms in Jordan have already done their homework and bridged technology gaps with each other in terms of technology readiness, and that enables them to engage in RA. Especially, since the majority of survey participants were from the big4 audit firms and large local firms. However, audit clients' corporations usually show high variations in their technological readiness. Thus, only those clients with higher technological readiness contribute positively to enhancing the effect of RA on the AQ.

5. Conclusion

Many auditing duties require the auditor's presence in the workplace and therefore on-site auditing would seem to be necessary at some point in the process. However, RA is gaining ground and popularity because of the several advantages associated with that practice, and it appears to be the future for the auditing profession. That said, there do remain certain issues that need to be examined and resolved, and given the rapid and widespread implementation of RA spurred by the COVID-19 pandemic, it is has become crucial for all parties to the audit to fully understand the effect of RA on the quality of the audit process.

Moreover, because this model of auditing is largely reliant on technology, it is essential to fully investigate the role of technology in the relationship between AQ and RA, and RA, and this is particularly important in the developing country context where IT infrastructure may not be adequate. In this study, Jordan was the case in point, thereby contributing towards the current understanding of this whole issue by confirming the positive impact of RA on AQ, with the role of technological readiness acting as a moderator in this relationship.

The study found that RA has a direct, significant, and positive impact on AQ, which may be attributable to various changes brought by RA such as the flexibility of working hours, the facilitation and acceleration of audit tasks, the increase in objectivity, independence, and professional scepticism among auditors, and the positive impact of digitising audit work on detecting errors and fraud and improving the auditor's performance and productivity. All of these developments help to improve the quality and efficiency of auditing.

The findings also demonstrate that there is a strong positive direct effect of technological readiness on AQ and this effect is seen for both the client and the audit firm. This confirms the need for clients to invest in the appropriate technological infrastructure, skills and technological knowledge necessary. It also demonstrates the need for the audit company to possess a robust technological infrastructure, and the appropriate tools and equipment, which enable it to conduct RA missions successfully. Furthermore, auditors themselves should develop the required experience and technical knowledge necessary to undertake online audit tasks. In this regard, training and educational programmes are recommended to improve auditors' technological skills for RA.

In addition, it was discovered that the interaction between RA and AQ is significantly positively impacted by the moderation of the client's technology readiness. However, the

audit firm technology readiness does not seem to have such a moderating role. This indicates that the effective use of technology by the audit agent strengthens the positive impact of RA on AQ, thereby suggesting that the auditing company must examine the client's technological capabilities, expertise and knowledge, before deciding to engage in RA.

Having accomplished its aim, the study has yielded useful and valuable information. Nonetheless, the parameters of the study must be emphasised. Specifically, the study was designed to target only those participants who had experience of engaging in RA and this had the knock-on effect of skewing the demographics towards individuals working with the big4 and big local audit firms rather than small and medium ones. Consequently, the generalisability of the findings to small and medium firms may be limited and future research is advised to explore the technological barriers to RA that might exist for small and medium firms, especially in developing countries. Additionally, as the study focuses on external auditors, the viewpoints of internal auditors, accountants and other client actors were not considered. Future research might usefully address the perspectives of these different individuals.

There is also scope for a different methodological approach which would examine clients' and other stakeholders' perspectives in a qualitative manner using interviews to obtain a deeper understanding of the issues surrounding RA. And finally, the influence of RA on sustainability and the environment may be investigated, given its role in decreasing travel and its reliance on digital platforms, which reduces the consumption of paper, and provides access to many distant areas without the need for physical presence.

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Appendix 1

Constructs	Composite reliability values	Cronbach's alpha values
Client's technological readiness	0.893	0.850
Auditor's technological readiness	0.888	0.842
AQ	0.948	0.940

Source: Authors' own work/creation

Table A1. Composite reliability

Appendix 2

Construct	Item code	Factor loading	AVE
Remote auditing	RA	1.00	1.00
Auditor's technological readiness	ATR.1	0.744	0.613
	ATR.2	0.745	
	ATR.3	0.754	
	ATR.4	–	
	ATR.5	0.801	
	ATR.6	0.866	
Client's technological readiness	CTR.1	0.765	0.625
	CTR.2	0.807	
	CTR.3	0.824	
	CTR.4	0.830	
	CTR.5	0.722	
AQ	AQ.1	0.791	0.585
	AQ.2	0.721	
	AQ.3	0.719	
	AQ.4	0.811	
	AQ.5	0.773	
	AQ.6	0.859	
	AQ.7	0.735	
	AQ.8	0.724	
	AQ.9	–	
	AQ.10	–	
	AQ.11	0.845	
	AQ.12	0.731	
	AQ.13	0.719	
	AQ.14	0.768	
	AQ.15	0.726	

Source: Authors' own work/creation

Table A2. Convergent validity

Appendix 3

Table A3. Discriminant validity: Fornell–Larcker criterion

Variable	AQ	ATR	CTR	RA
AQ	*0.765*			
ATR	0.631	*0.783*		
CTR	0.621	0.742	*0.791*	
RA	0.622	0.526	0.592	*1*

Source: Authors' own work/creation

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