



## Research Article

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# IT Knowledge Requirements of an External Auditor

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## Abstract

The growing use of Information Technology (IT) systems in businesses necessitates the hiring of auditors who have IT knowledge and abilities. An external auditor's competence in IT ensures that the audit is run professionally and effectively. Consequently, the objective of this study was to ascertain the current state of IT knowledge among external auditors. This study followed a quantitative descriptive research design. Data was collected using a questionnaire, and analysed using descriptive statistics. A total of 62 external auditors from three small to medium-sized audit firms completed the questionnaire. The results reported in the study show that the respondents believed that the IT proficiency of external auditors is currently low, including the identification of IT technologies (cognitive technologies, data analytics, smart digital platforms, and blockchain systems) that are growing in importance for external auditors. The results of this study are important, as they provide insight into the perspectives of external auditors with regards to their IT knowledge and skill when conducting audits. As such, a number of recommendations are provided to audit firms, regulators, and professional accounting bodies.

**Keywords:** External auditor, Information Technology, auditing, skills, audit firms, South Africa

## 1. Introduction

The audit profession's ability to adjust to the economic and social evolution of companies, as well as the requirements of the users of financial information, has been crucial to its sustained relevance (Salijeni, 2019). Investments in IT are highly valued by businesses to enhance the operational efficiency and financial reporting of an entity (Haislip *et al.*, 2016). The organisation's use of IT systems does not alter the audit objective (Moorthy *et al.*, 2011). However, the auditor must consider the organisation's IT landscape, since this will directly affect the auditor's risk and control evaluation (Tucker, 2001). As Wessels (2004) notes, the environment within which auditors work is constantly changing, creating new demands.

Auditors are being urged by practitioners and regulators to become more knowledgeable about IT in relation to financial reporting (Haislip *et al.*, 2016). In South Africa, emphasis is placed by the Independent Regulatory Board for Auditors (IRBA) on IT for enhancing audit quality (IRBA, 2018). From an international regulatory perspective, an unsatisfactory finding reported by the Public

Company Accounting Oversight Board (PCAOB) United States indicated that audit firms rely on third party reports for the valuation of digital assets; however, the auditor did not perform sufficient testing on the relevance and reliability of the report (PCAOB, 2019). The International Auditing and Assurance Standards Board (IAASB) issued a request for input on the effective and appropriate use of technology with a focus on data analytics, as it has recognised that auditors need a thorough comprehension of technology (IAASB, 2016). The 2025 South African Institute of Chartered Accountants (SAICA) competency framework places more focus on digital capabilities as part of the CA 2025 project, which strives to help its members get ready for their role in changing times (SAICA 2021 Competency Framework).

Auditors face challenges when having to conduct audits in highly automated environments (ICAI, n.d.). According to Al-Hanini (2011), improving audit quality is hampered by the auditor's inability to use IT. Auditors with more IT expertise can evaluate the effectiveness of the internal controls built into the IT systems more accurately (Haislip *et al.*, 2016). In Kuwait, Al-Duwaila and AL-Mutairi (2017) performed research to determine the perceptions of auditors about their degree of IT knowledge. The findings of the study in Kuwait demonstrate that although auditors concur that IT is crucial to the audit process, their proficiency of IT is lower than what they believed was necessary for their audit role. Ebimobowei *et al.* (2013), examined the use of IT tools by administering a questionnaire to auditors practicing in public accounting firms in Nigeria. The researchers discovered that auditors working in challenging business landscapes are increasingly favouring the use of IT solutions. According to the recommendations made by Ebimobowei *et al.* (2013), professional accountants should make an investment in expanding their IT knowledge, and this includes formal tertiary education as well as support from professional bodies that make pertinent IT training courses available to their members.

Under the SAICA competency framework, it is currently not an expectation for external auditors to possess highly specialised IT knowledge (SAICA 2021 competency framework). ISA 620: Using the Work of an Auditor's Expert, particularly, permits auditors to make use of someone with knowledge in a subject other than auditing (IAASB, 2018). However, the external auditor cannot appropriately rely on the IT specialist report to correctly manage the audit risk if they do not have sound IT knowledge (Haislip *et al.*, 2016). Currently, there aren't enough conversations between IT professionals and external auditors to properly determine the level of assurance that the IT specialists' work provides (Curtis *et al.*, 2009).

What is clear from discussions in the preceding paragraph is that the importance of IT skills for auditors cannot be overemphasised, and there has been convergence among authors regarding this aspect. It is therefore important that auditors have the requisite knowledge and tools to carry out their audit objectives in a corporate environment that relies on IT (Magablihi, 2019). However, little is visible in the literature regarding the actual IT knowledge that auditors ought to possess in order to conduct effective audits. An important question arises, which is: "What IT knowledge and skills are required by the external auditor when conducting audits of financial statements?" Taking this into account, the objective of this study is to ascertain the current state of IT knowledge among external auditors in the South African context. This study is significant, as it builds on existing theory by shedding light on the IT knowledge and skills required of external auditors. It will also make practical contributions to regulators and professional bodies, as it may assist them in developing and implementing IT knowledge and skills competency requirements for qualified and prospective external auditors.

The remainder of this article includes the literature review in section 2. The methodology is detailed in section 3, while the results are presented in section 4. A discussion of the results and their implications are provided in section 5, while section 6 presents the conclusions of the study.

## 2. Literature Review

### 2.1 Agency Theory

The agency theory serves as a foundation for the significance of the external audit function (ICAEW, 2005). According to the agency theory, managers act as agents for the company's principals, also known as business owners, and manage the owners' assets by fulfilling a stewardship role (Glinkowska and Kaczmarek, 2015.). The agent-principal role, however, could result in a conflict of interest and information asymmetry (Ittonen, 2010). A conflict of interest could arise in which managers pursue their own interests at the disadvantage of the business owners (Cohen *et al.*, 2017). A manager's interest is focused on remuneration, financial reward, and risk diversification to ensure job security (Ittonen, 2010; ICAEW, 2005). Business owners are interested in increasing shareholder value and returns on their investments (Sherman, 2020). Because of the agent's daily engagement and consequent access to knowledge that the principal may not have, information asymmetry can occur (Ittonen, 2010). The agent has the opportunity to use this information for their own personal advantage. To preserve confidence and trust in the financial reporting, the external audit offers an unbiased check on the activity of the agents and the information they have given (Ittonen, 2010). This study relies on the agency theory, because it is crucial that external auditors ensure that they are adequately prepared to continue to address the agency theory problems in advanced and complex corporate systems that grow and function using technology (Rajeev, 2021).

### 2.2 Importance of IT for the External Auditor

The external auditor must first comprehend how IT affects the audit process in order to appreciate the significance of IT in an audit (Aboumoussa, 2004). Incorporating IT in the audit process creates an opportunity for the improvement of audit quality (Walker, 2019).

Given that IT may increase the efficacy and efficiency of an audit, IT proficiency for external auditors is of utmost significance (IFAC, 1996). Han *et al.* (2016), cite digitization as evidence that the audit profession should become more effective and efficient. However, Greenstein and McKee (2004) pointed out that the use of IT tools is linked more towards efficiency rather than effectiveness. For example, using Robotic Process Automation (RPA) can boost audit efficiency, as auditors are able to work for a longer period of time, need less monitoring, and have a smaller tolerance for error (PWC, 2018). Dickey *et al.* (2019), also discussed efficiency as being the biggest outcome when using IT in external audit, and indicate that allowing a machine to perform routine-based tasks not only makes the audit more efficient, but also allows the auditor to focus on exceptions and anomalies.

Auditors have been urged to change from using conventional audit techniques to more computer-assisted audit techniques (Bierstaker *et al.*, 2014). Research from 2013 to 2020 repeatedly shows that auditors still favour using conventional audit techniques when generating an audit conclusion (Ahmi and Kent, 2013; Bierstaker *et al.*, 2014; Siew *et al.*, 2020). However, the old audit trail is disappearing, making it challenging to continue using traditional audit procedures in the technological age (Rosli *et al.*, 2013). Janvrin *et al.* (2008), report that IT is not extensively utilised in an audit, despite it playing an important role for the following phases of the audit: pre-engagement, planning, fieldwork, and concluding the audit.

### 2.3 IT Knowledge Required of External Auditors

KPMG in Canada has chosen to adopt the route of concentrating on improving the external auditors' skills, so they can use technology and customise it to fit their clients' needs (KPMG, 2022). It is crucial that auditors advance their skills and understanding in digital technologies, data analytics, and other IT-related areas (Stumke and Swart, 2020). It's challenging to characterise the auditors' specific digital requirements, because they would rely on the auditees' IT environment (Bowyer and Tsiligris,

2021). According to KPMG Insights (2018), technologies such as cognitive technology, data analytics, smart digital platforms, and blockchain will alter how auditing is done, and are further explored below.

### 2.3.1 Cognitive Technology

Cognitive technology falls within the computer science field. This technology uses techniques such as natural language processing, data mining, and pattern recognition to carry out tasks that the human brain can do (Techopedia, 2018). Deloitte Review (2015) further investigated cognitive technologies, and included artificial intelligence, machine learning, and RPA to these concepts. These are discussed below:

*Artificial Intelligence (AI)*: relates to the development of computer programmes to do tasks that would otherwise need human intellect (Owen-Hill, 2021). With the use of AI, large data sets may be evaluated to spot trends or abnormalities (ACCA and CA ANZ, 2019).

*Machine learning (ML)*: provides predictions or judgement that are based on a statistical examination of large historical data (ACCA and CA ANZ, 2019; Dickey *et al.*, 2019). With the help of previously learnt variables, ML algorithms can analyse large volumes of data, and identify anomalies or questionable transactions. This technology may give instantaneous insights into a company's operations, and rule out exceptions that should be taken into account when conducting a risk analysis (Dickey *et al.*, 2019).

*Deep learning (DL)*: is a sub-class of ML. This technology employs neural networks to do more complex tasks such as visual object identification, which is more like human learning (ACCA and CA ANZ, 2019). An example of how DL can be used in an audit is the analysis of unstructured data, such as recordings and emails (Ernst & Young, 2018).

*Natural language processing*: is a branch of AI, which focuses on interfacing humans and computers (Fisher *et al.*, 2016). A substantial number of contracts, such as leasing and insurance contracts, are quickly scanned using this AI technology (Zhou, 2017).

*Robotic Process Automation*: is a way for automating routine business operations by automating the user's interactions with different programmes or analysis via a user interface, as well as following a code to come to a decision (Deloitte, 2022).

Activities that were previously carried out by humans are now made possible by cognitive technologies, enabling audit firms to increase productivity, reduce expenses, and improve audit quality (Deloitte Review, 2015). To enhance the audit process, audit firms have invested in AI tools, such as Argus by Deloitte, Halo by PricewaterhouseCoopers (PWC), and IBM's Watson by KPMG (Kokina and Davenport, 2017). Large audit firms are researching and developing these costly technologies (PWC, 2019). In 2021, PWC global pledged to invest \$12 billion in technology over the next five years (PWC, 2021). In South Africa, PWC is looking to encourage increased investment in technologies such as AI (Buthelezi, 2021).

### 2.3.2 Data Analytics

Auditing has historically employed statistical sampling methodologies (AICPA, 2015). Using data analytics tools, auditors may now examine the entire population instead of just a sample, quickly identifying exceptions and areas of concern (PWC, 2019). One of the main points of the report released by the Association of Chartered Accountants (ACCA) and New Zealand Chartered Accountant (NZ CA) in 2019, was that the majority of audit firms employed data analytics (ACCA and CA ANZ, 2019). According to literature, risk assessment and journal testing are the main uses of data analytics in audit, as well as the extraction and selection of samples; however, there is limited use of data analytics in the review stage of an audit (Eilifsen *et al.*, 2020). Walker (2019) adds that data analytics technology is not often used when auditors review the audit work performed.

### 2.3.3 Smart Digital Platforms

Cloud-based technology enables auditors to use smart digital platforms, as they can work together remotely and in real time. The use of data analytics is also included in the smart digital platforms, along with automation and visualisation (KPMG Insights, 2018).

Virtual Reality (VR) is rapidly replacing traditional training methods using visualisation. IBM investigated the use of VR for teaching field technicians through 3D representations (IBM, 2020). A similar idea may be applied to the training of auditors, putting them through simulations of real-world audit scenarios to enhance their understanding (PWC, 2021).

### 2.3.4 Blockchain

Blockchain is a distributed, unchangeable ledger that allows for recording transactions and managing assets in a corporate network (IBM, 2021). It works by making use of a mathematically complex software code (Pratap, 2020). Distributed ledger technology (DLT) is an element of blockchain (IBM, 2021). It assures that all participants see the same set of records (ACCA, 2017). DLT serves as a universal bookkeeping solution for auditors, as it eliminates the need to reconcile various databases of records, and gives a clear audit trail as historic entries cannot be changed. It is also immutable, meaning that only a visible correcting entry can be processed to effect any changes required (ACCA and CA ANZ, 2019).

## 2.4 Drivers of IT in Audit

Walker (2019) indicated that the sophistication of the client's IT environment, pressure from professional bodies, and the necessity to use technology to free up resources at the audit firm, were the primary drivers of the use of IT in auditing. The drive to use IT in audit from audit firms, professional bodies, and developments in auditing standards, is explored in detail below.

### 2.4.1 Audit Firms

Audit firms are responsible for fostering skills, knowledge, and attributes of auditors (Siriwardane *et al.*, 2014). ISA 220 (Revised): *Quality management for an audit of financial statements*, specifically the engagement resources section in paragraphs 25-28, requires that the engagement partner ought to ensure that the engagement team members have the appropriate competence and capabilities (IAASB, 2020b). If it is discovered that members of the engagement team lack the necessary competencies to deploy the IT resources planned to be used in the audit, appropriate measures must be followed by the engagement partner and appropriate individuals in the firm to address this (Financial Reporting Council, 2020). Audit firms will battle to handle the obstacles in the technologically-driven corporate environment if they don't keep up with technological advancements (Al-Ansi *et al.*, 2013). Alsabahi *et al.* (2021), investigated the factors affecting IT proficiency in external auditors in Yemen, and the findings indicated that factors such as on-the-job training, learning motivation, self-efficacy, and organisational culture might affect an auditor's readiness to advance their IT proficiency.

### 2.4.2 Professional Bodies

The Institute for Chartered Accountants in England and Wales (ICAEW) has partnered with Deloitte to develop an online learning platform, which focuses on supporting its members and students to increase their knowledge of digital technologies (ICAEW, 2022). In February 2022, the Association of International Certified Professional Accountants (AICPA) issued a journal on ways for Certified Professional Accountants to improve their technology skills. This included recommending

programmes or courses such as the Certified Information Technology Professional, and the Certified Information System Auditor Certification (Bishop-Monroe and Phillips, 2022). As a result of advances in technology, the ACCA has identified two main issues for external auditors: (1) IT skills as audit processes are becoming more automated; and (2) the external auditor must comprehend how their clients employ technology in order to understand the entity and its environment (ACCA, 2022). The ACCA has partnered with Columbia Business School to provide technology support for its members by offering a 12-week course on data analytics, which assists auditors in understanding and implementing data analytical procedures in an audit (ACCA, 2022). SAICA promotes continuous learning, and specifies that understanding IT is a necessary skill to enable critical assessments (SAICA, 2021). SAICA partnered with the University of Johannesburg, and offers numerous IT-focused short learning programmes. In 2020, for example, a short course titled “Embracing 4IR – Upskilling Accountants for the 21st Century” was introduced. This course is aimed at Chartered Accounts (CA (SA)), Associate General Accountants (AGA (SA)), and trainee accountants. It focuses on AI, ML, natural language processing, and blockchain (SAICA, 2020).

### 2.4.3 *Developments in Auditing Standards*

The revised ISA 315: *Identifying and assessing the risks of material misstatements* is effective for audits of financial statements for the period beginning on or after 15 December 2021 (IAASB, 2019). The ISA 315 standard was revised in order to keep abreast with the rapidly-changing corporate environment, particularly in regard to IT (Accountancy SA, 2021). The standard mandates robust considerations for an entity’s use of IT, and how that use affects the audit (KPMG, 2020).

With effect from December 2022, ISQM 1, Quality management for firms that perform audits or reviews of financial statements, or other assurance for related service engagements, replaces International Standard on Quality Control, Quality control for firms that perform audits and reviews of financial statements and other assurance and related service engagements. One of the key changes relates to technological resources. Section 32 (f) of ISQM 1 requires that “Appropriate technological resources are obtained or developed, implemented, maintained, and used, to enable the operation of the firm’s system of quality management and the performance of engagements.” (IAASB, 2020). Dowell (2021) also reiterates the importance of the IT guidance as contained in ISQM 1, by stating that audit firms need to ensure that they have appropriate IT systems in place to communicate and report reliably.

## 3. Methodology

This study adopted a quantitative descriptive research design. Quantitative research methods involve collecting and analysing structured data that can be expressed numerically (Goertzen, 2017). The quantitative descriptive research design was selected for this study, because it enabled the researchers to determine and quantify the prevalence and extent of proficiency of the identified IT technologies of relevance to the external auditor.

The current study targeted external audit managers in two small and one medium-sized audit firm located in South Africa (SA). These firms were selected as they service both the public and private sector, including a broad range of clients with varied levels of IT sophistication. These firms are also in the early stages of incorporating more advanced technology into their organisations, and have representation or service clients in various provinces in SA, meaning that they have a wide reach and interaction with different types of clients and industries. The ACCA (2020) noted that to better service and support clients, external auditors – particularly those in small-to-medium-sized sectors – need to become more data literate. The big four auditing firms were excluded from this research, because they are ahead of the game with strategic IT plans to upskill external auditors (Kapoor, 2020). The total population for the study included 85 external audit managers from the three audit firms. The researcher relied on purposive sampling when selecting the sample. Purposive sampling

entails using the researcher’s judgement regarding who to include in the study (Moser and Korstjens, 2018). The research followed the intentional inclusion of a respondent because of the traits they possess (Etikan *et al.*, 2016). The inclusion criteria that guided the researcher was that one had to be registered with SAICA as a chartered accountant; and employed as an external audit manager in one of the three selected audit firms.

The research instrument used for data collection was a questionnaire. The questionnaire comprised of two parts, for instance part one asked the respondents about their job title and experience, while part two – which included eight close-ended statements about the respondent’s IT knowledge – was developed taking into account the literature as covered in section 2 of this study. The questionnaire made use of a five-point Likert scale, ranging from strongly agree to strongly disagree, including an option for neutral responses. The questionnaire was uploaded onto Survey Monkey, a cloud-based survey tool. A link giving access to the questionnaire was sent to respondents. A period of one month, starting in July 2022, was allowed for the completion of the questionnaire. A total of 62 out of the 85 respondents engaged in the study, 57 of whom were from the medium-sized audit firm, and five were from the small audit firms, accounting for a 73 percent response rate.

The data was extracted from Survey Monkey into Microsoft Excel. Descriptive analysis was used in undertaking data analysis in the study. The frequency and percentage were the statistics of interest, because they give an indication of the most prevalent views to enable the researcher to deduce meaningful results (Welman and Kruger, 2001). The results from the data analysis are presented and discussed in the section that follows.

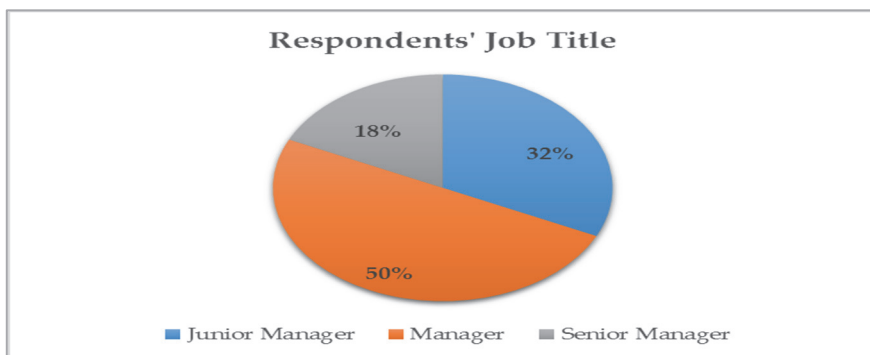
#### 4. Results

The results are presented in two sections. First, in section 4.1, the job title and experience of respondents are discussed, and thereafter, section 4.2 presents the results regarding the respondents’ perceptions about the IT knowledge of external auditors in South Africa.

##### 4.1 Job Title and Experience of Respondents

All 62 respondents gave their consent to participate in this study, and approval was obtained from the managing partners of the respective audit firms taking part in this study. Figure 1 shows that out of the 62 respondents, 32 percent are junior managers, 50 percent are managers, and 18 percent are senior managers.

Figure 1. Respondents’ Job Title



Source: Compiled by authors

The years of experience of the respondents is displayed in Table 1, and shows that the majority (65 percent) of respondents have between one and five years' experience, while 27 percent of respondents have between six and 10 years of experience as an external audit manager. The profiling indicates that the respondents in the study have varying levels of seniority in terms of audit manager roles in the selected audit firms. Also, the respondents' years of experience demonstrates that data was obtained from an experienced group of individuals, which increases the quality of information collected.

**Table 1.** Years of audit manager experience

Years of experience	Less than 1	1-5	6-10	Greater than 10	Total
Frequency	3	40	17	2	62
Percentage	5%	65%	27%	3%	100%

**Source:** Compiled by authors

#### 4.2 IT Knowledge of External Auditors

This section presents and discusses the results related to the research objective developed for this study, which was to ascertain the current state of IT knowledge among external auditors. The results are presented below.

##### 4.2.1 IT proficiency

The respondents were asked "Do you believe that the IT proficiency among auditors is low?" The results are shown in Table 2.

**Table 2.** IT proficiency

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	0	1	24	30	7	62
Percentage	0%	2%	39%	48%	11%	100%

**Source:** Compiled by authors

The results in Table 2 show that 48 percent agreed, and 11 percent strongly agreed. This is a total of 59 percent of respondents who agreed that the IT proficiency of auditors is low. Furthermore, 39 percent of respondents were neutral, and only 2 percent disagreed with the statement. These results therefore suggest that there is still a need to improve the IT proficiency of the external auditor. This result also answers the question posed by Stoel *et al.* (2012), regarding the level of IT proficiency of the external auditor. This result is also supported by previous studies, which reported a low level of IT competency among auditors (Al-Duwaila and AL-Mutairi, 2017; Greenstein and McKee, 2004; Strong and Portz, 2015).

##### 4.2.2 Understanding beyond generic IT systems

The respondents were asked "Do you believe that there is a low understanding beyond the generic IT systems used by clients among external auditors?" The results are shown in Table 3.



**Table 3:** Understanding beyond generic IT systems

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	0	3	3	48	8	62
Percentage	0%	5%	5%	77%	13%	100%

**Source:** Compiled by authors

The results in Table 3 show that 77 percent of the respondents agreed, and 13 percent strongly agreed. This is a total of 90 percent of respondents who agreed that there is a low understanding beyond the generic IT systems used by clients. This result suggests that, although there are external auditors with some knowledge of IT, it does not go beyond the generic IT systems used by clients. Having knowledge of the information system used by clients increases comprehension and management of potentially complicated issues (Bravo *et al.*, 2015). It is therefore important for external auditors to be upskilled with knowledge of the IT systems specific to their engagements (AICPA, 2015).

#### 4.2.3 Industry-specific IT systems

The respondents were asked “Do you believe that external auditors require knowledge of industry-specific IT systems?” The results are shown in Table 4.

**Table 4.** Industry-specific IT Systems

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	1	1	1	46	13	62
Percentage	1.6%	1.6%	1.6%	74%	21%	100%

**Source:** Compiled by authors

The results in Table 4 show that 74 percent agreed, and 21 percent strongly agreed. This is a total of 95 percent of respondents who agreed that external auditors require knowledge of industry-specific Information Technology. This result suggests that auditors are interested and see value in relevant IT skills that are industry/client-specific. This result also confirms the assertions by AICPA (2015) that auditors need to focus on upgrading their IT skills to enable them to use technology and customise it for their clients’ needs.

#### 4.2.4 Cognitive Technology

The respondents were asked “Do you believe that knowledge of cognitive technology in place at certain firms and industries is necessary for external auditors?” The results are shown in Table 5.

**Table 5.** Cognitive Technology

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	0	1	6	43	12	62
Percentage	0%	2%	10%	69%	19%	100%

**Source:** Compiled by authors

The results in Table 5 show that 69 percent agreed and 19 percent strongly agreed. This is a total of 88 percent of respondents who agreed that knowledge of cognitive technology is necessary for external

auditors. The result suggests that external auditors are aware of cognitive technologies, and believe that knowledge of these technologies is important. Cognitive technologies bring technology to jobs that were previously handled by people, allowing the audit firm to increase productivity, reduce expenses, and enhance audit quality (Deloitte Review, 2015). This result lends support for the external auditor's intention to derive the stated benefits when using cognitive technologies.

#### 4.2.5 Data Analytics

The respondents were asked "Do you believe that external auditors also require data analytics knowledge?" The results are shown in Table 6.

**Table 6.** Data Analytics

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	0	0	2	19	41	62
Percentage	0%	0%	3%	31%	66%	100%

**Source:** Compiled by authors

The results in Table 6 show that 66 percent strongly agreed, and 31 percent agreed. This is a total of 97 percent of respondents who agreed that external auditors require data analytics knowledge. This result suggests that external auditors view data analytics as an important IT skill to have. Interestingly, most audit firms employed data analytics, as it is the most developed technology (ACCA and CA ANZ, 2019). Data analytics techniques also allow the auditor to identify exceptions and problem areas, thus improving efficiency on the audit (PWC, 2019).

#### 4.2.6 Smart Digital Platforms

The respondents were asked "Do you believe that knowledge and understanding of smart digital platforms is essential for external auditors?" The results are shown in Table 7.

**Table 7.** Smart Digital Platforms

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	0	0	6	47	9	62
Percentage	0%	0%	10%	76%	14%	100%

**Source:** Compiled by authors

The results in Table 7 show that 76 percent of respondents agreed, and 14 percent strongly agreed. This is a total of 90 percent of respondents who agreed that knowledge and understanding of smart digital platforms is essential for the auditor. This result revealed that auditors deem the use of smart digital platforms as important, especially because of the need to work remotely during the COVID-19 pandemic, which accelerated the need for and use of smart digital platforms. These results also concur with the statement that cloud-based technologies enable the auditors to utilise smart digital platforms as they can work together remotely and in real time (KPMG Insights, 2018).

#### 4.2.7 Data Mining

The respondents were asked "Do you believe that digital data mining skills are an essential IT skill for external auditors?" The results are shown in Table 8.

**Table 8.** Data Mining

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	0	0	4	29	29	62
Percentage	0%	0%	6%	47%	47%	100%

**Source:** Compiled by authors

The results in Table 8 show that 47 percent agreed, and 47 percent strongly agreed. This is a total of 94 percent of external auditors who believe that data mining is an essential skill for an external auditor. This finding suggests that, with the increase in the use and amount of data, external auditors find it important to be able to sort through large data sets to identify trends and relationships. These results are further supported by the literature, as IT tools can assist with processing large amounts of data, and can detect outliers or suspicious transactions (AICPA, 2015).

#### 4.2.8 Blockchain

The respondents were asked “Do you believe that external auditors need knowledge and understanding of blockchain systems?” The results are shown in Table 9.

**Table 9.** Blockchain

Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Frequency	1	3	8	44	6	62
Percentage	2%	4%	13%	71%	10%	100%

**Source:** Compiled by authors

The results in Table 9 show that 71 percent agreed, and 10 percent strongly agreed. This is a total of 81 percent of respondents who believe that knowledge and understanding of blockchain is important for the auditor. This finding suggests that external auditors are aware of blockchain, and that importance needs to be placed on ensuring that external auditors have knowledge and an understanding about how blockchain systems impact their audit procedures. This result supports current efforts to upskill external auditors, as educational courses on understanding blockchain systems are being rolled out to chartered accountants locally in SA (SAICA, 2020).

## 5. Discussion and Implications of Results

The research objective for this study was to *ascertain the current state of IT knowledge among external auditors*. The respondents (59 percent) believed that IT proficiency of external auditors is currently low. This result is supported by previous studies, which reported a low level of IT competency among auditors (Greenstein and McKee, 2004; Strong and Portz, 2015). For example, Al-Duwaila and AL-Mutairi (2017) received 70 responses from auditors in Kuwait, and report that IT knowledge is generally low relating to audit automation, accounting firm office automation, e-commerce technologies and system design, and implementation. Similarly, the respondents in this study were of the opinion that external auditors have a low understanding of sophisticated IT systems (90 percent), and that external auditors required industry-specific IT knowledge (95 percent). Greenstein and McKee (2004) highlighted that since external auditors are required to handle several customers using various information systems, they have greater IT proficiency requirements than other accounting professionals. In agreement with this, the results of this study show that a majority of the respondents believed that cognitive technologies (88 percent), data analytics (97 percent), smart

digital platforms (91 percent), data mining (94 percent), and blockchain systems (87 percent) are important industry-specific IT technologies for the external auditor to have knowledge of in carrying out their duties. Moreover, the literature indicates that automation is increasing during the audit process (Raji and Buolamwini, 2019). The study by Azima *et al.* (2022), found that in the United Arab Emirates, cognitive technologies, particularly AI, is a useful tool in assisting the external auditor to identify any threats or fraud, thus improving audit quality. The IAASB (2020a) has recognised the limitations of external auditors as it relates to the use of IT in audits, and have subsequently provided non-authoritative guidance on the use of automated tools when conducting audits. The results of this study, including the measures taken by standard-setting bodies such as the IAASB, show that external auditors require knowledge of IT systems to effectively and efficiently conduct audits where clients have advanced IT systems.

The results of this study provide some insights when considered in light of the agency theory. First, this study highlights the current state of IT knowledge among external auditors in selected small to medium-sized audit firms in SA. The results indicate that auditors have inadequate IT competencies, and therefore these results extend previous research which has observed this phenomenon in North America and the Middle East (Al-Duwaila and AL-Mutairi, 2017; Strong and Portz, 2015). Second, this study provides detail on the IT expertise required for an external auditor, thereby providing an answer to the plea made by Haislip *et al.* (2016) for more guidance on the types of IT skills required by external auditors to increase their IT expertise. developments in IT are changing constantly, and it is important for the auditor to continuously adapt to appropriately execute their duties. In consequence, it can be deduced that auditors who lack IT knowledge and skills increase the agency problem as a result of the conflict of interest and information asymmetry between management and owners of organisations.

Organisations are investing in advanced technologies, and it is expected that auditors are able to audit within these environments. However, the study revealed a low proficiency of IT among external auditors. The following recommendations are proposed, based on the research results. Audit regulators should require that once an IT report is relied upon, the external auditor should be required to clearly document how they as the audit team have addressed the matters identified in the IT report that is used as audit evidence. Continuous Professional Development declarations required by professional accounting bodies should include IT as part of the core required reflective plans to monitor, track, and encourage progress of external auditors upskilling themselves in IT. Learning and development programmes by audit firms should include an IT learning strategy that is tailored for all levels, including trainee, manager, and partner. Audit firms should provide support, both financial and time off, to enable external audit managers (and audit partners) to partake in courses aimed at upskilling the external auditor in IT.

## 6. Conclusion

This study investigated the state of IT knowledge and skills of the external auditor in the South African context. This study lends support to the existing literature, as it concurs with the pleas for external auditors to be upskilled with IT knowledge. The key results of the study show that the IT proficiency of external auditors is currently low. The study also identified IT technologies that are growing in importance for the external auditor. Despite these results, there were a number of limitations to this study, and therefore the researchers offer the following areas for future research.

The data was collected from three audit firms in the small to medium-sized sector in South Africa. It is recommended that future studies include a wider sample, as well as extending the study to the big four audit firms. The sample was limited to external audit managers, so it is recommended that future studies include audit trainees, audit engagement partners, and academics. This study followed a quantitative descriptive design, and as such it is recommended that future studies incorporate inferential statistical techniques and/or qualitative techniques in order to provide greater insight into the significance of findings or the reasons for the selections made by respondents.

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