The Role of Data Analytics in Enhancing External Audit Quality

Karlien Dempsey and Vanessa van Dyk

Abstract Due to corporate failures, audit quality concerns and the rapidly changing IT environment in the financial reporting value chain, more auditors are using data analytics tools to enhance audit quality. However, researchers have not made significant progress in establishing the extent to which the Big Four audit firms in South Africa incorporate data analytics into the external audit process and whether this enhances the quality of the audit. The study investigated the role of data analytics in enhancing external audit quality in South Africa, the relationship between external audit, audit quality and data analytics and the impact of the latest technological advancements, commonly known as the Fourth Industrial Revolution, on the way firms perform audits. The study also explored whether audit firms in South Africa utilise data analytics, on which engagements and during which stages of the audit process, what the benefits and challenges of using data analytics are, and what the impact of using data analytics is on audit regulatory inspection results. This was achieved through a literature review and an empirical study conducted using a questionnaire. The study revealed strong evidence that there are notable audit quality concerns in South Africa, which have been attributed to a failure in audit quality, and that auditors are using data analytics to overcome these concerns. Based on the study's findings, it was concluded that using data analytics in an audit enhances external audit quality.

Keywords External audit · Audit quality · Data analytics · Audit process · Information technology

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1   Introduction

An external audit of financial statements (hereafter "an audit") is a significant contributor to the overall economy (Etim et al., 2020). It is performed with the sole purpose of reporting whether financial statements were prepared in accordance with the financial reporting framework (International Auditing and Assurance Standards Board, 2014). When these financial statements lack accuracy, contain errors or omissions, or are even misleading, the public that relies on these financial statements may make misinformed and/or incorrect economic decisions (Salih & Flayyih, 2020).

Despite its significance, the auditing profession has experienced several difficulties worldwide (Kueppers & Sullivan, 2010). These challenges include advancements in technological developments and, most importantly, the decline in audit quality, which has caused stakeholders to doubt the audit profession and the audit process as a whole (Aziza & Agus, 2019).

Numerous corporate failures have also been experienced in South Africa, partly attributed to audit quality failure. This is echoed by Harber (2016), who states that there have been several known corporate failures in South Africa in the past, with the collapse of the African Bank being one of them. According to (Marchant & Mosiana, 2020), corporate failures in South Africa, include VBS Bank, whose investors, largely stokvels and municipalities, suffered a great loss due to KPMG's failure to raise red flags in the bank's financial statements and KPMG issuing a falsified regulatory report.

Etim et al. (2020) describe how the effects of corporate failures are often felt by stakeholders, investors or shareholders, as billions are lost in the financial value chain when these companies collapse. This statement is echoed by Cole et al. (2021), when they state that financial instability or scandals cause company failures, which have severe negative effects on all parties involved, including the general public, workers, auditors, creditors, business partners, capital markets, investors, and regulators.

The corporate failures noted above clearly indicate that both internationally and in South Africa, there is evidence of poor audit quality, which severely impacts the stakeholders. A question of why audit quality is important may arise. An audit assures the credibility of financial statements and, as such, a quality audit contributes greatly to this credibility (EY, 2019; Haapamäki & Sihvonen, 2019; Kilgore et al., 2011; Soyemi et al., 2021).

In its Global Competitiveness Report, the World Economic Forum has previously ranked the IRBA as the best standard-setting and regulatory body in the world (Issirinarain, 2016). This statement is echoed by the Business Day (2020) in an article titled *How a Mighty Profession Has Fallen*, which states that the South African auditing standards were recognised as number one out of 141 globally in the World Economic Forum's (hereafter WEF) 2016 Global Competitiveness Report, holding that position for seven preceding years in a row. However, South Africa's auditing profession is no longer considered the best in the world

(Independent Regulatory Board for Auditors, 2019). The WEF's 2019 Global Competitiveness Report, which was the latest to list countries by rank, listed South Africa as number 49 out of 141 for the strength of its auditing and accounting standards (World Economic Forum, 2019). This shows an evidence for the deterioration in the audit quality in South Africa. Over and above the regulator's inspection results and the drop in the IRBA's ranking as the best standard-setting and regulatory body in the world, there are numerous instances of corporate failures which have been witnessed previously, which have been attributed to a lack of audit quality, as discussed above.

To respond to corporate failures, audit quality concerns and the rapidly changing IT environment in the financial reporting value chain and to improve audit quality, more auditors are utilising data analytics techniques (Earley, 2015). This statement is echoed by International Auditing and Assurance Standards Board (2018) and Appelbaum et al. (2017), who states that there has been a change in how audits are performed over the years due to a change in the technological landscape in which organisations are operating. This can be seen by organisations' use of the cloud and the internet of things, among other things, as part of their accounting systems.

As organisations are changing the tools they use to account for transactions, external auditors have also been exploring innovative ways to effectively and efficiently audit these transactions over the years. The International Auditing and Assurance Standards Board (2018) supports this by stating that the change in how companies operate has necessitated the need for auditors to consider new or different ways of performing audits of financial statements. This is echoed by Association of Chartered Certified Accountants and Chartered Accountants Australia and New Zealand (2019), which states that nearly all businesses are on the front lines of disruptive innovations that impact their auditors. Auditors must equip themselves accordingly to keep up with the changes in technology. One way auditors stay relevant is by introducing data analytics (Chartered Professional Accountants of Canada, 2016).

Auditors are using data analytics tools to, among other things, obtain an extensive understanding of their clients' businesses (Earley, 2015). Similarly, Krieger et al. (2021, p. 1) note that "audit firms are increasingly engaging with advanced data analytics to improve the efficiency and effectiveness of external audits through the automation of audit work and obtaining a better understanding of the client's business risk and thus their own audit risk". Additionally, as a result, auditors broaden the scope of the items they audit. Botez (2018) supports this by stating that using traditional sampling methods to obtain audit evidence as required by auditing standards changes due to application of data analytics. This is because using data analytics for audits raises the quality of such audits (Alsahli & Kandeh, 2020; Gao et al., 2020).

It is imperative to understand how IT landscape developments impact audit quality. The Centre for Audit Quality (2018) explains this by stating that it is less likely for auditors to design traditional substantive procedures (like tests of details or substantive analytical procedures) that, if executed exclusively, would provide

sufficient appropriate audit evidence to address identified assertion-level risks as the use of emerging technologies in the financial reporting process increases.

It is evident that auditors are introducing more data analytics into their audits, as there is a growing need for auditors to enhance audit quality. However, the result of using data analytics by auditors is a topic that needs to be explored further (Wang & Cuthbertson, 2015). This is supported by Earley (2015), who states that even though academic research on data analytics has gained momentum, research on this topic is still lacking due to auditing and accounting firms not providing researchers with feedback on their experiences in using data analytics.

Over the years, the world has witnessed instances where external auditors have issued unqualified or "clean" audit opinions for entities which collapse afterwards due to irregularities and/or fraud which is subsequently revealed in these entities, a term Etim et al. (2020) defines as "audit failure". This definition of the term is elaborated on by Smith and Marx (2021), who state that audit failure is frequently linked to company failures and dishonest financial reporting. In many cases, it is thought that the auditors violated their obligation to serve as the "watchdog" for those who utilise financial statements by allowing fraudulent acts to go unnoticed (Smith & Marx, 2021). Audit regulators worldwide, including the Independent Regulatory Board for Auditors (hereafter IRBA), South Africa's regulator, have blamed these failures on the poor quality of audits (Huang et al., 2019).

The fundamental research question of the study is to understand what role data analytics plays in improving the quality of external audits in South Africa. Furthermore, the link between data analytics, audit quality, and external audit is explored as well as the impact of the latest technological advancements, commonly known as the Fourth Industrial Revolution, on the way firms perform audits. The study also considers the benefits and challenges of using data analytics by audit firms in conducting audits.

2   Literature Review

The audit function has become incredibly important over the years. This can be attributed to what the mandate of an audit is, which is to give the financial statements that are being audited credibility (Harber, 2016). The responsibility of providing credibility to these financial statements does not solely rest with the auditor, but is also dependent on other factors including the quality of the financial statements, the oversight role played by those charged with the governance of the entity, and regulatory requirements (Accounting and Corporate Regulatory Authority & CPA Australia, 2015).

Despite its significance, the auditing profession has experienced several difficulties worldwide (Kueppers & Sullivan, 2010). These challenges include advancements in technological developments and, most importantly, the decline in audit quality, which has caused stakeholders to doubt the audit profession and the audit process as a whole (Aziza & Agus, 2019).

2.1 The Audit Function

The IRBA, the national standard-setter and audit regulator in South Africa, defines an external audit as:

"'audit' means the examination of, in accordance with prescribed or applicable auditing standards

- financial statements with the objective of expressing an opinion as to their fairness or compliance with an identified financial reporting framework and any applicable statutory requirements; or
- financial and other information, prepared in accordance with suitable criteria, to express an opinion on the financial and other information;" (Republic of South Africa, 2005, p. 8)

In the past, auditing's primary responsibility was to verify that there was no fraud occurring in government organisations and that the state's income and expenses were accurately recorded (Teck-Heang & Ali, 2008). According to Kueppers and Sullivan (2010), this remains relevant, as some stakeholders recognise the true importance of an audit and believe that an audit was only successfully executed if no fraud and/or an error was discovered throughout the audit process.

Apart from audit being used as a fraud detection tool, Kumar and Mohan (2015) argue that the main objective of an audit is to reassure the stakeholders who use the financial statements of the accuracy of those financial statements. This is supported by the International Auditing and Assurance Standards Board (2021) in International Standards on Auditing (ISA) 200, *Overall Objectives of the Independent Auditor and the Conduct of an Audit in Accordance with International Standards on Auditing*, which states that the goal of an audit is to increase intended users' level of trust in the financial statements. This is done by the auditor judging whether the financial statements were produced in compliance with the appropriate financial reporting framework in all material aspects (International Auditing and Assurance Standards Board, 2021).

2.2 Audit Quality

Salih and Flayyih (2020) state that defining audit quality remains challenging for both professional organisations and academics. This statement is supported by (Hosseinniakani et al., 2014), who states that the numerous different aspects that might impact quality make it difficult to define audit quality.

This statement is confirmed by the International Auditing and Assurance Standards Board (2014), which argues that there is no universally recognised definition or measurement of audit quality due to its complexity. According to Knechel et al. (2012), academics have performed various studies to define audit quality with no success. Similarly, Rainsbury (2019) mentions that regulators and standards-setters

have also dedicated time and agendas to develop a universal definition of audit quality. However, these attempts have also been unsuccessful. According to Christensen et al. (2016), audit firms have also been involved in fruitless talks to develop a definition of audit quality. In addition to being a challenging term to define, audit quality is also challenging to measure (Christensen et al., 2016; Kilgore et al., 2011). Knechel et al. (2012) support this statement when they state that there is still no agreement over how to define, let alone quantify, audit quality despite more than two decades of studies.

Based on a detailed review of the available definitions of audit quality, the most common definition is that by DeAngelo, as cited by most academics in their recent studies on audit quality (Harber, 2016). According to DeAngelo (1981), audit quality is the likelihood that an auditor would discover and disclose misstatements in the auditee's financial statements to the appropriate stakeholder. This concept is echoed by Xiao et al. (2020), who explains that the probability that an auditor will uncover and report an existing major misstatement in line with the audit objective is known as audit quality. The International Auditing and Assurance Standards Board (2014), in its *Framework for Audit Quality* (hereafter the Framework), defines audit quality as an audit performed by a team that illustrates appropriate values, ethics, and behaviours by teams that were adequately qualified, competent, and experienced, and had sufficient time allocated to perform the audit work.

The International Auditing and Assurance Standards Board published the Framework in 2014 to promote what constitutes audit quality, putting the notion of audit quality on the agendas of important stakeholders and prompting key stakeholders to consider how audit quality might be enhanced. The Framework lists the following as elements of audit quality (International Auditing and Assurance Standards Board, 2014):

- Inputs – This includes the auditor's ethical behaviour, skills, knowledge and experience required to perform an audit;
- Process – this entails how detailed both the audit process and quality controls are that will be utilised in the audit;
- Outputs – outputs are items, such as the auditor's report, distributed to the appropriate parties following an audit.
- Key interactions within the financial reporting supply chain refer to the type of relationship and communication that an auditor has with management and the business owners.
- Contextual factors include, for example, laws and regulations and corporate governance frameworks that need to be adhered to by the auditor as part of the audit.

In its *IRBA Public Inspections Report on Audit Quality 2021*, the IRBA (Independent Regulatory Board for Auditors, 2021) highlighted that audit quality might be achieved if audit firms and individual auditors can work on improving on deficiencies noted by regulators during firm and individual file inspections. On the other hand, audit quality may be attributed to having individuals with the required skills,

knowledge, competence and ethical values as part of the audit team (Accounting and Corporate Regulatory Authority & CPA Australia, 2015; Alsughayer, 2021; Centre for Audit Quality, 2018). In addition, Garcia-Blandon and Argiles-Bosch (2018) point out that firms and individual auditors possessing the required knowledge or specialisation in the industry in which the auditee operates may result in higher audit quality. EY (2019) further stated that an essential component of audit quality is the use of technology and the digitisation of the audit process, as technology and digitisation allow auditors to perform audits more efficiently. This allows auditors to channel their resources towards focusing on the more important sections that require the auditor's judgement.

2.3 Data Analytics

Over the past 10 years, auditors have increasingly used data analytics tools in audits (EY, 2015). Murphy and Tysiac (2015) echoes this when highlighting that over the past 20–30 years, auditors have been using more technology in an audit. (Earley, 2015) stated that this debunks the myth that audit and accounting firms do not employ data analytics throughout the external auditing process.

Data analytics is an instrument that an auditor can use to gather audit evidence through the identification and analysis of relationships between data, formulating expectations, combining data from different sources, and also using graphics or visualisations to reach conclusions (American Institute of Certified Public Accountants, 2015; Botez, 2018). This can be done at different stages in the audit, from pre-engagement activities to planning and executing the engagement and reporting (Botez, 2018).

Data analytics is classified into four types: descriptive analytics, diagnostic analytics, predictive analytics, and prescriptive analytics (Harvard Business School, n.d.). According to Tschakert et al. (2016) and Al-Dalabih (2018), descriptive analytics use past information to provide insights into what is happening. An example of descriptive analytics is an analysis of percentage changes in data and year-on-year financial statement analysis (Al-Dalabih, 2018; Tschakert et al., 2016). On the other hand, diagnostic analytics answers why something happened (International Federation of Accountants, 2018). Tschakert et al. (2016) mention that diagnostic analytics provide answers as to why the results came out the way they did. Variance analysis, explaining historical outcomes, is one example of diagnostic analytics (Tschakert et al., 2016). Harvard Business School highlights that diagnostic analytics are more detailed than descriptive analytics in explaining why something happened. Another type of data analytics, predictive analytics, uses patterns identified in historical data to predict what the future will or should look like, when something will happen and why it will happen (Al-Dalabih, 2018). Harvard Business School mentions that predictive analytics uses results of past trends and assumptions to make predictions possible. Tschakert et al. (2016) mention that an example of predictive analytics would be predicting how much of a trade receivable balance will
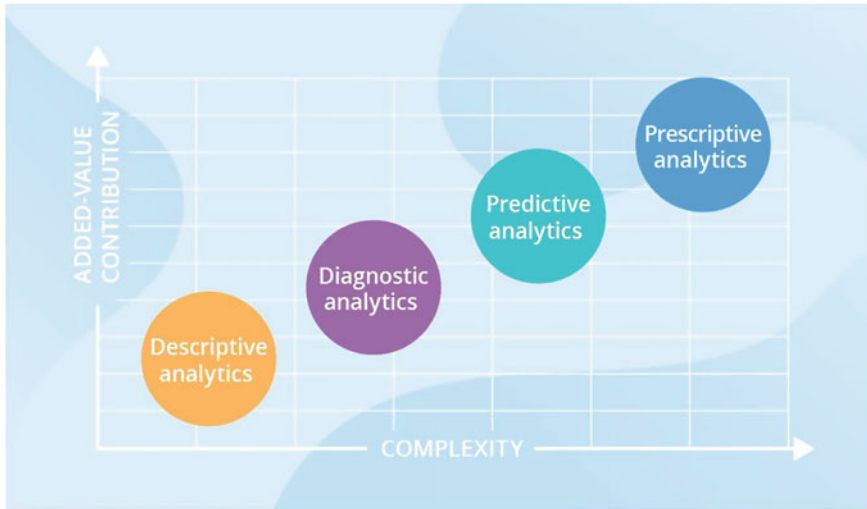
Fig. 1 Complexity of data analytics versus value-add. Source: (Bekker, 2019)

be collected in the future using that specific trade receivable's payment history. Lastly, prescriptive analytics answers the question of what should happen (International Federation of Accountants, 2018).

(Bekker, 2019) argues that the more complex the type of data analytics is, the more beneficial it is and, as such, adds more value to the audit process, as can be seen in Fig. 1 below. In simple terms, prescriptive analytics, when utilised, provide more value than predictive, diagnostic and descriptive analytics due to the complexity thereof.

2.3.1 Benefits of Using Data Analytics

An auditor has several benefits when using data analytics at different phases of an audit. Data analytics during the audit planning stage provides the auditor with a comprehensive understanding of the business, allowing them to understand better the organisation and its operations (Eilifsen et al., 2020). Using anomalies, trends analyses, correlations, and fluctuations may help inform decisions about potential risks of material misstatement. This will ensure that auditors focus on significant items that matter and in ensuring that auditors obtain new in-depth insights about their clients (Earley, 2015; International Auditing and Assurance Standards Board, 2018; Murphy & Tysiac, 2015). According to (Zhu, 2021), data analytics also makes it possible to visually present the results of procedures performed to understand the entity, making it easy to spot the anomalies and where potential risks may arise.

Using data analytics during the execution stage of the audit results in efficiencies Liew et al. (2022) and Murphy and Tysiac (2015) supports this statement by stating

that data analytics guarantees that 100% of the population could be tested rather than testing account balances, classes of transactions, and disclosures on a sample basis. This eliminates the limitations of concluding the entire population based on audit evidence, or a snapshot obtained from a sample selected and tested (Huang et al., 2022). Another advantage of data analytics includes enabling quick and simple testing of the whole population by the auditor O'Donnell (2015) and may also help the auditor identify fraud risk indicators to develop appropriate responses to this risk (EY, 2015). Earley (2015) and International Auditing and Assurance Standards Board (2018) also highlight that data analytics give auditors more persuasive, relevant, and sufficient audit evidence, which serves as the foundation for the auditor's opinion, and that instead of performing the audit towards or at year-end, the utilisation of data analytics allows auditors to perform an audit throughout the year.

Murphy and Tysiac (2015) further mentions that achieving a higher degree of assurance at a similar cost, resulting in better audit quality for customers and investors and less audit risk and liability for auditors, would be the best benefit of utilising data analytics. This is supported by Raphael (2017), who states that using data analytics reduces auditors' time to gather the necessary information for the audit. Another benefit of using data analytics is that it provides useful insights that an auditor can share with the audit committee. In contrast, data analytics can be seen as the key differentiating factor between audit firms when it comes to audit tendering (Financial Reporting Council, 2017).

2.3.2 Challenges of Using Data Analytics

The use of data analytics in an audit has been gaining momentum. However, it presents unique challenges that auditors must address before it becomes a norm (Earley, 2015). According to a survey performed by KPMG in 2014, 85% of the respondents mentioned that the biggest challenge with using data analytics was the inability of the audit teams to analyse the data collected successfully. Al-Ateeq et al. (2022) mention that one challenge to adopting data analytics is that auditors have not received enough training on how to use data analytics. Wüsthoff (2017) states that both audit firms and universities are behind in terms of teaching trainee accountants and students, respectively, about data analytics.

Another challenge auditors' face in using data analytics is the quality of data received from their clients. According to Liew et al. (2022) and Earley (2015), auditors often struggle with obtaining data to analyse from clients, and when they do, they sometimes obtain incorrect or irrelevant data. This is echoed by Zhu (2021), who states that auditors face another challenge: clients often provide incomplete data to be analysed.

Literature also highlights the following as challenges faced by auditors in utilising data analytics in the audit process:

- Audit teams struggle with obtaining sufficient and appropriate audit evidence when using data analytics, or they fail to document work performed using data analytics per the ISAs (Financial Reporting Council, 2017; Huang et al., 2022).
- As audit teams obtain client data to analyse, they do not focus on ensuring that the client data remains secure from threats. This exposes the audit firms to a possible risk of reputational damage (Financial Reporting Council, 2017; Zhu, 2021).
- The initial cost of setting up and utilising data analytics is usually high. To save the audit budget, auditors resort to not utilising any data analytics in their audits (Huang et al., 2022; Wang & Cuthbertson, 2015).
- Some data analytics tests show "false positives", where the results are inaccurate based on the data analysed. Auditors struggle with properly evaluating and concluding in these circumstances (Brazel et al., 2022; Wang & Cuthbertson, 2015).
- There is an expectation gap between regulators and users of financial statements as they believe that utilising data analytics results in auditors providing absolute assurance on the financial statements, as opposed to reasonable assurance as required by the ISAs (Earley, 2015; Zhu, 2021).

2.4   The Relationship Between External Audit, Audit Quality and Data Analytics

As stated above, auditors have been using some form of analytics for some time. In the past, the environment in which companies operated was not as complicated as it is currently, and therefore there was no need to use automated processes in the audit (International Auditing and Assurance Standards Board, 2018). Since then, the world has experienced a change in the Information Technolofy (IT) landscape (Al-Ateeq et al., 2022), and auditors have used information technology tools in an audit since the companies being audited started using computerised systems to record their transactions (Financial Reporting Council, 2017).

Prior to advances in IT, companies used to record transactions manually, which unintentionally led to, among other things, monthly and/or yearly reporting being performed late, disorganised filing systems that were difficult to use and navigate, and several errors, omissions and misstatements being noted in the financial information. With advances in IT, there has been a shift in how companies record their transactions, which is now simplified and performed with the audit of IT systems. This resulted in monthly and/or yearly reporting being performed timeously and with fewer human errors, omissions and misstatements (Imene & Imhanzenobe, 2020).

Manita et al. (2020) note that digitalisation will improve the audit relevance and also improve the audit quality. Furthermore, they state that this will enable the culture of innovation within audit firms Specifically, traditional CAATs, which include ratio analyses, prior year versus current-year comparisons and trend analyses, according to SAB&T (2018) has been used by auditors for many different

reasons during the audit process. This is further supported by Wüsthoff (2017), who mentions that the Big Four has invested in technology that helps them perform tasks that may be tedious or those that do not provide significant benefit for the auditor and the client in the shortest time possible.

Coupled with the changing IT landscape, data analytics is increasingly being used in the audit process, and there are more auditors employing data analytics now than ever before (Krieger et al., 2021). According to O'Donnell (2015), the introduction of data analytics in an audit does not change the basics of what auditors do, as auditors have always collected, analysed, and issued conclusions on the analysed data since the auditing profession started. Furthermore, Verver (2013) states that throughout the preceding 20 years, auditors have integrated the use of data analysis into audits.

To improve efficiencies and effectiveness of audit procedures, auditors have over the years used technology not limited to Microsoft Excel, Audit Command Language, Interactive Data Extraction and Analysis or the internet to perform tasks including financial statements analysis (both with prior years or industry norms), journal entry testing (including an analysis of abnormal or missing journals) (American Institute of Certified Public Accountants, 2015).

A question may arise regarding the relationship between external audit, audit quality and data analytics. Many authors have concluded that using data analytics in the audit process enhances audit quality (Brazel et al., 2022; Dagilienė & Klovienė, 2019; Jacky & Sulaiman, 2022). As stated above, by applying data analytics, auditors may better identify risks, such as the likelihood of fraud, by developing a comprehensive picture of the client. Furthermore, data analytics allows the auditor to test the whole population rather than just a sample. The role of data analytics is emphasised by Earley (2015), who states that not only does the use of data analytics provide auditors with greater coverage in terms of sample sizes, but it also provides auditors with greater insight into the client's processes, resulting in enhanced audit quality. The role of data analytics in enhancing audit quality can be summarised by (De Santis & D'Onza, 2021), who state that data analytics may be a game changer in improving audit quality and revolutionising auditing practices.

3   Methodology

The study followed a qualitative approach in exploring the role of data analytics in enhancing external audit quality. This approach was used because it enables the researcher to delve into people's and groups' perspectives on an issue (Creswell, 2009). Criteria for selecting the study participants were developed, which included that the audit firm must use data analytics in performing its audits, and participants must thoroughly understand what data analytics, audit quality, and the audit function are. Purposive sampling was used to select the sample for the empirical study, allowing the researcher to have discretion in choosing audit firms that met the given criteria, South Africa's Big Four audit firms. The empirical study used the

survey method, consisting of a questionnaire sent to the heads of audit departments for each of the Big Four audit firms in South Africa. According to the (Independent Regulatory Board for Auditors, 2017), these firms also hold the largest market share of overall audit fees spent by JSE-listed companies. These participants are chosen because they have the required knowledge of data analytics, audit quality and the external audit function. Data received from the participants were analysed thematically to derive similarities from the participants to allow the researcher to reach conclusions on the responses.

During the research, ethical issues were considered to ascertain that participants did not suffer any physical or emotional harm. Ethical clearance for the study was also granted. All information was kept private and only used to generate aggregate results.

4   Findings

4.1   The Fourth Industrial Revolution's Impact on the Audit Process

4.1.1   Question

In your opinion, how considerably have the latest technological advancements, commonly known as the Fourth Industrial Revolution, affected how your audit firm performs audits of financial statements? Please justify your answer.

4.1.2   The Objective of the Question

This question aimed to establish the participants' perspectives of whether and/or how much information technology advances, commonly known as the Fourth Industrial Revolution, has affected the way audit firms perform audits of financial statements.

4.1.3   Presentation of Findings

The participants revealed the following in response to this question (Table 1).

4.1.4   Interpretation of Findings

From the review of the data, it is evident that the participants undoubtedly agree that the Fourth Industrial Revolution has affected the way that audit firms perform audits of financial statements. The participants noted that the Fourth Industrial Revolution

Table 1 The Fourth Industrial Revolution's impact on the audit process

Participant	Feedback from participant
Firm A	In my opinion, the latest technological advancements have had and continue to have a significant impact on the way that firm A performs audits of financial statements. To expand on this, audit tools externally sourced and/or are developed internally allow audit teams to assess balances more intently than previously allowed which caters for more insightful risk identification and consequently the performance of more concentrated substantive testing procedures. Further the existence of Robotic Process Automation (RPA) solutions allow for 100% testing of certain account balances, classes of transactions and disclosures which was previously not possible. A lot of the above has been initiated in response to clients moving away from paper based to paper less accounting and record keeping systems which has shifted the focus from manual controls to general and automated controls.
Firm B	The fourth industrial revolution has considerably impacted the way we perform our audits. Our entire audit process has evolved to become a data led and continues to evolve with a future vision of using more artificial intelligence. We also leverage the digital transformations that our clients are embarking on to build tools that can make the audit process more efficient and cover wider sets of data as opposed to traditional sampling.
Firm C	Broadly speaking, various technologies have had an impact on the way audits are performed. These include Cloud computing, Artificial Intelligence, Robotics, Data & Analytics, Blockchain etc. and each of them are at various stages of deployment and use on audits. Usage also varies from engagement to engagement depending on the client's IT maturity, ability to access data, date format etc. Due to the complexity of certain clients, dependency on IT systems and volume of transaction processing the audit with and of technology has become a necessity. Likewise, auditors have also had to enhance their capabilities, particularly in responding to the risk of fraud, going concern, related party relationships and transactions.
Firm D	Overall – considerably. This will continue to increase. Several new technologies have been introduced over the past few years that have increased the complexity in our client's technology and business process environments. These technologies are characterised by the continuous automation of traditionally manual processes and involve aspects such as AI, big data, internet of things, Blockchain and machine learning. Accurate identification of these new technologies and associated risks directly influences the scope and approach of audit firms.
	These technologies are also continuously evolving, and audit firms have introduced specialized training curricula that focuses on identifying and understanding these technologies as well as appropriate audit risk identification and mitigation when designing our audit approach. To effectively manage this, our audit teams and our IT specialists' teams work closer together and spend more time at the planning stages of the audit to gain in-depth understanding of the tech and associated IT control environments within these business processes and that support the financial statement line items.

Source: Author's own compilation from accumulated data obtained verbatim from respondents

allowed auditors to be more efficient in their audits. They are able to perform a robust risk assessment based on an in-depth understanding of their client's businesses and perform detailed, tailored procedures in response to these identified risks, which include testing 100% of the population instead of sampling. The above findings are consistent with the literature, where it was stated that the changes in the IT landscape

affect how audits are performed (ICAEW Chartered Accountants, 2018). The literature pointed out that introducing IT and digitisation allows auditors to perform audits more efficiently (American Institute of Certified Public Accountants, 2015; EY, 2019).

4.2   Benefits of Using Data Analytics

4.2.1   Question

In your opinion, what benefits does your firm enjoy when using data analytics as part of the audit process?

4.2.2   The Objective of the Question

This sought to understand the benefits the participants enjoy from utilising data analytics in the audit process.

4.2.3   Presentation of Findings

The following was revealed by the participants in response to this question (Table 2).

4.2.4   Interpretation of Findings

According to the literature presented, incorporating data analytics into an audit provides several benefits for firms. Some benefits included testing 100% of the population instead of sampling (Murphy & Tysiac, 2015), performing detailed risk assessments (Earley, 2015; International Auditing and Assurance Standards Board, 2018; Murphy & Tysiac, 2015), and obtaining more appropriate and sufficient audit evidence (Earley, 2015; International Auditing and Assurance Standards Board, 2018), among others. The findings above show that the firms are also enjoying the benefits of using data analytics in their audits. Firms C and D went as far as stating that they believe using data analytics results in a better-quality audit, which echoes the study's goal of investigating the impact of data analytics in improving external audit quality.

Table 2 Benefits of utilising data analytics

Participant	Feedback from participant
Firm A	The benefits that the firm enjoys using data analytics as part of the audit process includes but is not limited to the points below: • More refined risk assessment procedures (i.e. improved risk identification) and profiling. • Driver to completing substantive testing that appropriately addresses the risk. • Facilitates the ability to complete 100% recalculation (i.e. better comfort through more comprehensive testing). • Cleaning data so that it is in a format that can be used by the audit teams.
Firm B	Data analytics provides a far more robust set of audit results than traditional audit procedures. Whilst there is typically some investment time in year 1, the benefits over the medium term far outweigh this from a cost and quality perspective. Even during the planning and risk assessment phase, determining audit risk via data is far more beneficial than traditional procedures as the information is factual and not open to interpretation/ subjectivity as can be the case with traditional procedures. The power of predictive analytics is also becoming more apparent on areas of estimation and judgement where historically the audit was placed in a difficult position in trying to substantiate management's predictions regarding the future outcome of certain activities.
Firm C	Data analytics allows us to assess 100% of the client's data instead of using a sample approach. This allows us to provide a higher level of assurance and a better-quality audit. Data analytics also helps us to focus on risk and better align our audit procedures to these risks. We can more quickly identify outliers and more easily investigate these in detail. We can provide more value to our clients by sharing insights from the analytics.
Firm D	There are several advantages for audit teams and audit firms to use data analytics, most notably an improvement in quality, improved efficiencies, and a better client and people experience (which includes more insights and value to our clients). In a sense we are training the professionals of tomorrow today with teams learning about technology, data and the use of analytics tools to execute their work to provide insights and value. These analytical routines that are built can be repurposed for other client solutions and/or re-used. This allows our people to then spend more time on the judgmental parts of the audit. It also adds to greater efficiency and turnaround time in doing the audit now and in subsequent years. Teams should spend less effort in coming years performing the test area and more time spent analysing the trends/ exceptions.

Source: Author's own compilation from accumulated data obtained verbatim from respondents

4.3 Challenges When Using Data Analytics

4.3.1 Question

In your opinion, which challenges does your firm experience when using data analytics as part of the audit process?

4.3.2   The Objective of the Question

The objective of this question was to learn about the challenges organisations' face when applying data analytics in the audit process.

4.3.3   Presentation of Findings

The participants revealed the following in response to this question (Table 3).

Table 3   Challenges when using data analytics

Participant	Feedback from participant
Firm A	• Navigating Enterprises resource planning (ERP) systems: Clients may have multiple ERP systems which means data from different data source which creates added complexity. • Clients' ERP systems being very outdated. • Clients do not understand their own data and how to get it. • Tone at the top: Some managers/partners don't see the benefits of using the data analytics.
Firm B	The most common challenge remains being able to obtain data from client ERP systems and once obtained there are often challenges with data format and then ensuring the completeness and accuracy thereof. There are also challenges at times with teams not being sufficiently experienced to work with large data sets. Lastly, there are certain situations when the client is so reliant on their system to an extent where they are unfamiliar with their own data.
Firm C	The biggest challenge is the execution of the change management process for both our clients and our people. Following a data analytics approach requires a fundamental change to the way in which we work with our clients and complete the audit process. The management of this change requires substantial upfront investment time from both our clients and our people.
Firm D	Changing the way we perform the audit will always lead to challenges on the journey to become a data driven audit. From a people perspective, equipping our audit teams with the right technology and tools requires a well-coordinated change management plan that not only provides our teams with a view of the power of data and how this will transform the way they will work going forward, but also introducing a training plan so that the teams can learn this new capability and the associated tools and technologies. Another challenge is how we interact and connect with clients to bring them on this journey of sharing data as part of the audit process, and also how we acquire that data in an efficient and secure method that does not add complexity to the audit, but rather produces insight and efficiency. Further challenges are around working with dirty and unstructured data which we solve through our advanced data engineering and analytics techniques.

Source: Author's own compilation from accumulated data obtained verbatim from respondents

4.3.4 Interpretation of Findings

The findings reveal that one of the biggest challenges with using data analytics in the audit process is obtaining good quality and well-structured data in the right format to be analysed by the auditors. The reason why auditors experience the above challenge is either due to the clients' IT systems being outdated, clients having multiple IT systems that interface which may produce different reports of the same data, clients not understanding their own data, or clients providing auditors with inaccurate and incomplete data. This is consistent with the literature which revealed that auditors often struggle with obtaining data to analyse from clients or obtain data that is incorrect or irrelevant (Earley, 2015; Liew et al., 2022).

Interestingly, the findings also revealed that auditors face another challenge when using data analytics, where both the audit firms and the clients are still resistant to the change brought by data analytics in the financial value chain. Firm C and Firm D believe that changing the mindset around data analytics will result in much more utilisation of data analytics in an audit.

4.4 Improvement Required in the Utilisation of Data Analytics

4.4.1 Question

Are you of the opinion that there is room for improvement in how audit teams utilise data analytics in the audit process? If you answered yes, please provide suggestions.

4.4.2 The Objective of the Question

This question aimed to determine whether participants felt there was an opportunity for improvement in how audit teams use data analytics.

4.4.3 Presentation of Findings

The participants revealed the following in response to this question (Table 4).

4.4.4 Interpretation of Findings

Figure 2 indicates that 100% of the participants provided a definitive answer to the question, stating that they, without a doubt, believe there is room for improvement in how audit firms utilise data analytics in their audits. In the literature it was noted that auditors default to not using any data analytics tools when they are presented with a

Table 4 Improvement required in the utilisation of data analytics

Participant	Feedback from participant
Firm A	Yes definitely. Looking back at when I was a trainee, the changes have been exponential. However, with the direction that the firm is moving in (i.e. data driven audits), there is still room for improvement. This would include getting bespoke analytics more broadly adopted, getting complete buy in from leadership and just general improvement in analytic tools and applications available.

Firm B	Yes. There needs to be a bigger shift away from traditional procedures which typically rely on statistical and non-statistical sampling to DA [data analytics] routines however this is only possible if the following are in place:
	    • The risk assessment process needs to be data led with traditional procedures supplementing this. If the right risk is identified, it is easier to design an appropriate audit response.
	    • The client needs to understand their data and be able to provide it in an appropriate format.
	    • The auditing standards need to provide more guidelines on how to deal with stratified populations and outliers identified when using DA routines.
	    • Audit teams need to be more familiar on how to work with data and perform D&A routines.
	    • Audit regulators need to understand and treat the performance and evidence obtained from DA routines with the same level they do traditional audit procedures. This will in turn give confidence back to the audit teams and enhance and proliferate the use of D&A in the audit.

Firm C	Yes. The extent to which data analytics is used can be improved. We have the ability to create analytics to suit all types of risks, but this is not always identified. Audit teams can challenge themselves more around building custom analytics for different clients.
Firm D	There is always room for improvement. With more data becoming more regularly available, you can create even more efficiencies on the audit and vastly automate the audit further. The short-term focus is on the extraction of even more data from clients. We call this creating a data platform through "hooking up the pipes" to our clients. This area is receiving a lot of focus within the form both locally and globally. Many more standardised data acquisitions/transformation routines and digital assets are being built in a coordinated way that lends itself to quick insights, audit automation and longer-term efficiency gain in executing the audit. At firm D we focus on this as our client's technology changes. Our audit teams are becoming more equipped in building bespoke client analytic solutions using the tools they have been trained on. Although many solutions are produced, the initial time investment is significant, and teams are learning how to design and build the solutions in a shorter timeframe.

Source: Author's own compilation from accumulated data obtained verbatim from respondents

wide range of data analytics tools to choose from (Brazel et al., 2022; Huang et al., 2022; Krieger et al., 2021). The participants indicated that one way in which audit firms can improve on how they adopt data analytics is by ensuring that tailored data analytics are created to suit the different types of engagements and that when these data analytics tools are made available by the firms, audit teams do utilise them in their respective audits.

As the literature and findings suggest, one of the difficulties firms encounter when using data analytics is struggling to obtain good quality data to analyse from clients
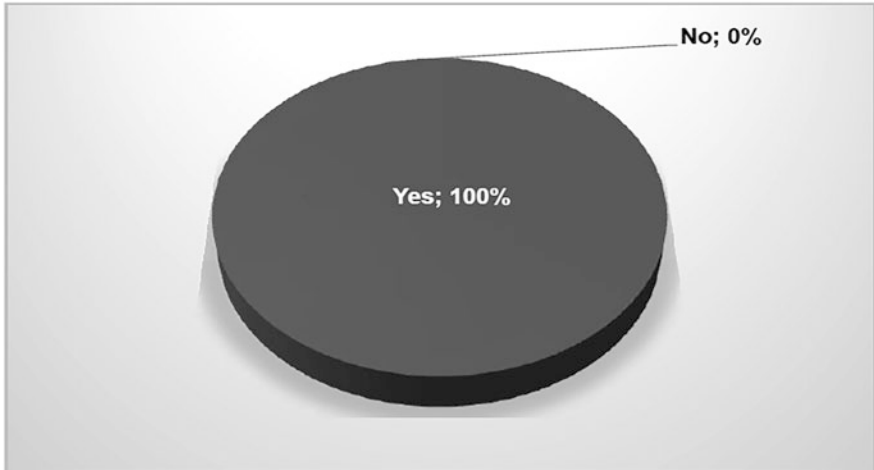
Fig. 2 Definitive response to question: Is there improvement required in the utilisation of data analytics? Source: Author's own compilation

or obtaining data that is incorrect or irrelevant (Earley, 2015; Liew et al., 2022). One of the suggestions on improving how firms utilise data analytics, Firm B revealed that "clients need to understand their data and be able to provide it in an appropriate format."

4.5 Impact of Data Analytics on Audit Quality

4.5.1 Question

Do you think that using data analytics to audit financial statements enhances audit quality? Please justify your answer.

4.5.2 The Objective of the Question

This was important, as it sought the participants' views about whether they believe utilising data analytics in the audit process enhances audit quality.

4.5.3 Presentation of Findings

The participants revealed the following in response to this question (Table 5).

Table 5 Impact of data analytics on audit quality

Participant	Feedback from participant
Firm A	It is my opinion that data analytics enhances audit quality. This is because data analytics gives us a much more holistic understanding of our clients (the composition of transactions and balances), their data as well as their processes. Through this you are able to get far greater comfort that sample based testing can provide. Further through our improved understanding of the composition of the respective balances we are more in tune with where the actual risk lie (this is because we are able to look more into the composition of the actual balance, and consequently can adopt better profiling and identification of our risks).
Firm B	Yes, refer to the comments above
Firm C	Yes. The use of data analytics also allows us to assess 100% of the population instead of a sample. This allows auditors to provide an improved level of assurance. Analysis of trends also allows for better risk identification.
Firm D	Yes. Firm D strives to continue to improve quality and that is why we continue to make greater use of data analytics. Simplistically, greater coverage is achieved, leading to deeper discussions with clients through appropriate visualisations.

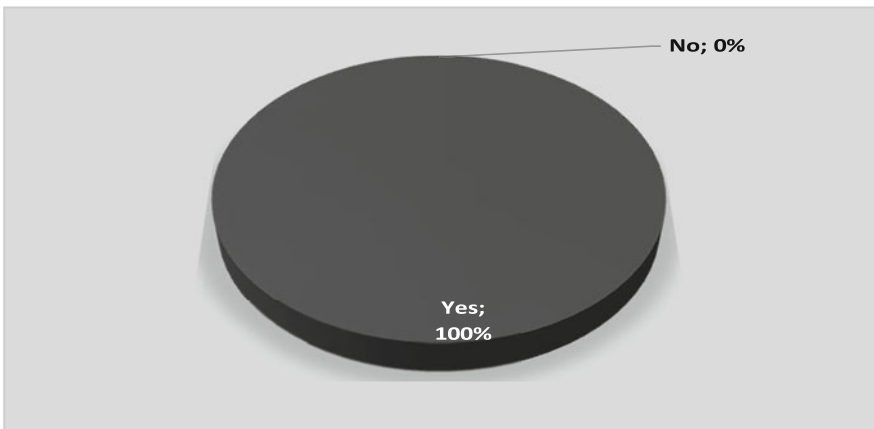Source: Author's own compilation from accumulated data obtained verbatim from respondents

Fig. 3 Definitive response to question: Does the use of data analytics enhance audit quality? Source: Author's own compilation

4.5.4   Interpretation of Findings

The findings, similar to what was found in the literature reviewed, revealed that 100% of the participants (Fig. 3) unanimously believe that using data analytics in auditing financial statements enhances audit quality. Firm A and Firm C elaborated on their responses and stated that data analytics enable auditors to detect and analyse misstatement risks, leading to a better-quality audit. Firms C and D also stated that because data analytics make testing 100% of the population possible, auditors perform a better-quality audit than traditional sampling methods. This result agrees

with literature presented, where it was reported that using data analytics in an audit increases audit quality (De Santis & D'Onza, 2021).

5 Conclusion

The basis on which auditors perform their audits has not fundamentally changed, even with the introduction of data analytics and the Fourth Industrial Revolution. The literature review and empirical data found that there is a noticeably growing trend of auditors utilising data analytics in audits and that all phases of the audit process can incorporate data analytics. Data analytics provide various benefits to the auditor and that even though the use of data analytics provides benefits, it also provides unique challenges. Furthermore, the study highlights that The Fourth Industrial Revolution, a term used to describe recent technology breakthroughs, has impacted how audit firms conduct financial statement audits.

It was determined that data analytics provide various benefits to the auditor and that even though the use of data analytics provides benefits, it also provides unique challenges that auditors need to overcome. Similarly, the study found a positive link between the use of data analytics and the outcomes of regulatory inspections. The empirical study revealed strong evidence that there are notable audit quality concerns in South Africa, which have been attributed to a failure in audit quality, and that auditors are using data analytics to overcome these concerns. The study concluded that using data analytics in an audit enhances external audit quality.

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