
A Review of Literature to Derive Best Practices for Big-Data Audits in Saudi Context

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Abstract

In 2014, leading scholars in the field of big data auditing outlined a research agenda to explore these impacts, setting the foundation for further investigation. This paper explores the impact of big data on audit evidence, particularly in the context of Saudi Arabia's transition to a more diversified economy under Vision 2030. This paper also seeks to synthesize current research and establish best practices for auditors in Saudi Arabia, emphasizing the importance of adapting audit processes to a growing economy that increasingly generates vast amounts of data. In recent decades, auditing practices have undergone substantial transformation by broadening the scope of audit goals and incorporating diverse, non-traditional sources of evidence, such as unstructured data from social media or IoT devices. These new data sources, while increasing audit accuracy and depth, pose challenges regarding data reliability and integrity. Over the past decade, many of these research questions have been addressed, particularly in relation to how big data enhances auditors' abilities to detect fraud, improve audit quality, and provide more accurate risk assessments.

By implementing AI algorithms and advanced analytics, auditors can gain deeper insights while also addressing key concerns such as data veracity, compliance with International Financial Reporting Standards (IFRS), and the guidelines set by the Saudi Organization for Certified Public Accountants (SOCPA). As Saudi Arabia's

economy diversifies and becomes more data-driven, understanding and integrating big data into audit practices will be essential for maintaining high audit standards and supporting economic growth.

Keywords: Auditing, Big Data, Saudi Arabia, Literature Review, Best Practices.

1. Introduction

Big data and auditing have become increasingly important in the modern world, providing businesses with many new opportunities for development and growth. While many organizations have embraced the power of big data, it has also resulted in a host of new safety and compliance risks. Auditing is an integral part of the business community, particularly in this era of big data. As firms gain more data, the need for accurate and secure audit processes has grown exponentially. Also, auditing is the process of reviewing and verifying the accuracy of data and model outputs, and it can be used to ensure that a company's data is correct and dependable. Data-driven auditing is becoming increasingly important in the modern business world. Auditors are now focusing more on understanding the data and its implications as opposed to simply verifying accuracy. By showing potential risks, auditors can help organizations protect their assets, reputation and results.

The first major change to auditing was the emergence of a new type of audit, a Business Risk Assessment (BRA). To mitigate risk, auditors began focusing on understanding and analysing data. Whereas a traditional audit merely verified the accuracy, and to some extent, precision, of an organization's financial statements, auditors began attempting, when organizations requested, to provide companies with risk assessments that analysed their projections for revenue and net profit. Auditors began to expand the types of data that they used: data external to an institution that included such things as market research, surveys and current reports. In effect, what BRA hoped to achieve was an audit of projections, using market research and

profit/loss modeling. With such information, organizations could refine their strategies for growth and by showing potential risks; auditors could help organizations protect their assets, reputation, and results (Gray & Debrecenay 2014, 362-363; Robson et al., 2007).

The second, and more recent change, is a further expansion of the types of information available for auditors to use. Now, for many companies and industries, much more data is available to the auditor, because increases in computer processing ability and memory along with the expansion of internet and wireless communications allow organizations to gather and store vast caches of data (Euerlich et al., 2023). The acquisition and retention of large caches of data provides more evidence for auditors to substantiate the assertions made in an entity's financial statements and create more accurate and reliable risk assessments. With big data and software tools to find trends and anomalies in the data, modern auditors can learn more about an organization and provide better recommendations to improve an organization's models and plans for growth (Salijeni et al., 2018).

Audit evidence is the information that auditors use to substantiate assertions made in an entity's financial statements. These can be external, External evidence, such as third-party confirmations, is typically more reliable than internal records, but relevance depends on how closely the evidence relates to the specific audit purpose (PCAOB, 2021), such as third-party records, and internal, such as records management. The levels of audit evidence are based on the auditor's risk assessment and the nature of the audit. In general, the higher the issues, the more evidence is needed. Examples of evidence include bank statements, internal management records, bills, contracts, etc. The auditor should also consider the relevance, reliability and completeness of the evidence. Auditors classify the evidence that they use into various levels, based upon the reliability of the information and its relevance to the purpose of the audit (PCAOB, 2021). Because auditors now perform a variety

of tasks for organizations, the criteria by which auditors evaluate the relevancy and reliability of data have changed. The more complex the audit, the more evidence that the auditors require to ensure that their risk assessments are correct.

(Vasarhelyi et al. 2015) discussed the meaning of Big Data differs across various domains: what is considered as Big Data by a small accounting practitioner may not be that big for a Big 4 public accounting firm, and what a Big 4 public accounting firm considers to be Big Data is likely not that big from the point of view of, say, NASA. Whether some data is large or not is decided by whether that data pushes the limits of the capabilities of the information systems that work with that data. Our approach to Big Data will emphasize the perspective of medium to large enterprises and the corresponding accounting and auditing research. In this context, the term Big Data refers to data volumes that meet or exceed the capacity of relevant information systems to store and/or process effectively. As noted by Zhang, Yang and Appelbaum (2015), the unique features of big data that challenge the capabilities of modern information systems include: Known as 4V. which have come to define Big Data as: Huge Volume, High Speed, Huge Variety, and Uncertain Truthfulness. The growing relevance of continuous auditing (CA) stems from its ability to enable automated, real-time analysis of data, particularly given the immense volume and rapid velocity of such data Vasarhelyi et al. 2010. However, huge volume and high speed can also create gaps between existing audit analyses and requirements for big data analysis. In addition, wide variety and uncertain veracity may present challenges beyond the ability of current batch-based systems in CA. Whether a dataset has high volume is relative and depends on the capabilities of the information system. These capabilities are generally categorized by storage and processing size. So, can be defined big data as a term used to describe the vast amount of data generated and collected from various sources. This is a collection of data points from various

sources which, once analysed, can provide valuable information on trends, customer preferences and other valuable information.

Initially, big data was predominantly utilized for analyzing customer data with the goal of improving customer service and enabling more precise customer segmentation. As technology evolved, it became possible to collect and analyze data from diverse sources such as sensors, social media, and enterprise applications, leading to deeper insights that were previously unattainable. Recent academic studies confirm this progression and highlight the critical role of big data in customer behavior analysis and decision-making processes.

For instance, Wu and He (2017) explored the significance of big data in extracting actionable insights from social media, emphasizing how it helps businesses enhance decision-making and customer engagement through analyzing vast datasets. Another study by Holmlund and McColl-Kennedy (2020) proposed a strategic framework for customer experience management, highlighting how big data analytics enables companies to map customer journeys and optimize engagement across various touch points. Kunz (2017) also discussed the transformation of customer engagement in a big data environment, illustrating how real-time data analysis improves customer retention and service personalization.

Moreover, the use of big data has expanded beyond customer analytics, becoming integral in sectors like marketing and public health, where organizations utilize it to predict trends, identify at-risk customers, and enhance long-term retention strategies.

Today, big data is utilized in almost every industry, ranging from healthcare to retail, for diverse applications such as product development, understanding customer behavior, improving operational efficiency, and detecting trends. Research has demonstrated the crucial role that big data plays in predicting customer needs and preferences, as well as detecting fraud and security threats (McAfee & Brynjolfsson,

2012). Furthermore, big data is critical in enhancing customer satisfaction and service through real-time analytics, enabling businesses to respond swiftly to customer issues (Holmlund et al., 2020). The evolution of audit processes parallels the advancements in data usage. Initially, audits focused on ensuring the accuracy of financial transactions and protecting assets through traditional record-keeping. Over time, audit processes incorporated digital technologies, with an emphasis on verifying digital records and evaluating internal controls (Vasarhelyi, Kogan, & Tuttle, 2015). Recently, data analytics and artificial intelligence (AI) have transformed the audit landscape by enabling auditors to analyze large datasets quickly, detect anomalies, and provide more relevant insights. Studies highlight that modern auditing involves leveraging a wide range of data sources, such as financial, operational, and external data, to offer comprehensive insights and recommendations (Alles, 2015). Auditors must now consider additional factors such as third-party risk, outsourcing, application controls, and data privacy. Research also underscores the increasing importance of cybersecurity in auditing processes, urging auditors to continuously update their methodologies in line with technological advancements (Earley, 2015).

This paper will examine the new types of audit evidence that the era of big data presents to auditors by a review of literature to Derive Best Practices for Big-Data Audits and effect in Saudi Context over the next several years. In 2015, the Council of Economic and Development Affairs for the Kingdom of Saudi Arabia presented their “Vision2030” plan: a set of goals for the economic, social and cultural development of the Kingdom by the year 2030. The focus is to make the Saudi economy more diverse and less dependent on oil exports. The goals include attracting foreign investment, improving Saudi Arabia’s economy so that it ranks among the largest 15 economies in the world, improving the nation’s score on the World Economic Forum’s Global Competitive Index from 25th to the top 10, improving the

nation's ranking on the Global Logistics Index from 49th to 25th, improving the government's ranking on the Government Effectiveness Index from 80th to 20th, reducing the unemployment rate from 11.6% to 7%, increasing the role of the private sector in the economy from 40% to 60% of GDP, increasing the share of gross domestic product (GDP) that small and medium enterprises (SMEs) contribute from 20% to 35%, and increasing the contribution of non-profit organizations from 1% to 5% of GDP (Council of Economic and Development Affairs 2015).

Despite the vast potential of big data, many audit firms in Saudi Arabia encounter significant challenges when attempting to integrate it into their practices. These challenges are mirrored in global research on the integration of big data into auditing, where the lack of technical infrastructure and expertise in data analytics has been consistently highlighted as a key barrier (Alles, 2015). Firms struggle to build the necessary technical infrastructure and ensure that their staff possesses the required skills to analyze large datasets effectively (Vasarhelyi, Kogan, & Tuttle, 2015). Furthermore, concerns about data protection and compliance with local regulations, such as Saudi Arabia's strict data privacy laws, add complexity to big data adoption. This issue is especially pertinent in the context of International Financial Reporting Standards (IFRS) and the guidelines provided by the Saudi Organization for Certified Public Accountants (SOCPA), which require strict adherence to auditing standards while balancing innovation (Al-Moataz, 2018).

The evolving standards in auditing also demand a careful balance between adopting new technologies, such as big data analytics, and complying with traditional regulatory frameworks. Studies have shown that while big data offers significant opportunities for improving audit quality and efficiency, auditors must also navigate complex regulatory environments to ensure compliance (Earley, 2015). In Saudi Arabia, the evolving standards set forth by SOCPA and IFRS add an additional layer

of complexity, as audit firms must innovate while adhering to both local and international standards (Alharthi, 2016).

Study Objectives

The study aims to extract best practices for audits using big data through a literature review focusing on the Saudi context.

Study Contribution

This study contributes to the existing body of knowledge by exploring the practical implications of big data in auditing and in general in the Saudi context. It also provides a general analysis of the challenges faced by audit firms and offers practical solutions to facilitate the effective use of big data in auditing. Furthermore, the study contributes to the enrichment of knowledge and future literature related to the use of big data in auditing.

The paper is structured as follows: Chapter 2 Method Chapter 3 reviews the literature on big data and its application in audit evidence. Chapter 4 discusses and presents the results and discusses the findings in relation to the objectives of the study. It concludes the study by summarizing the main findings and provides recommendations for future research and practical application.

2. Method

To conduct the study, an exploratory research design was utilized by analyzing secondary data collected from relevant papers published between 2014 and 2024 on various aspects of social media, social media marketing, and consumer behavior. This 12-year period was specifically chosen because it marked the emergence of the use of big data in auditing. The reviewed papers were selected based on several criteria. First, papers focusing on the intersection of big data and auditing were chosen. Second, the study included papers that explored how big data is analyzed

and its relationship to audit evidence, particularly those published by regulatory bodies such as the Capital Market Authority and the Saudi Organization for Certified Public Accountants (SOCPA). The findings from this secondary data analysis are discussed in the following literature review section.

3. Literature Review

A review of the literature relevant to the problem addressed in this research provides the basis for this study. The researcher distinguished between three groups: studies that dealt with big data and audit evidence, levels of audit evidence, big data as audit evidence, big data and auditing in the Saudi context and finally a brief overview of the challenges and consequences.

3.1 Big Data and Audit Evidence

While there are diverse ways of defining the term “big data,” its primary meaning first relates to its sheer size (Moffitt and Vasarhelyi 2013). In addition to “large” volume, other characteristics of big data include speed (on a real-time basis), versatility, and validity (Buhl, Roßglinger, Moser, and Heidemann 2013). Diversity refers to diverse types of data sources, such as GPS metrics, blogs, streaming video, site traffic, audio files, and so on. Various sources have different formats, and the data itself is often unstructured. Accuracy is about removing noise and getting honest information from big data. Sophisticated data mining techniques, such as visualization, predictive modelling, correlation, and clustering, are needed to analyse big data effectively. In a business context, big data can be analysed through these methods of managing inventory and predicting customer sentiment (Waller and Fawcett 2013).

Although professional standards have tried to codify evidentiary requirements, the convincingness of evidence collected is a matter of professional judgment.

According to professional standards, audit evidence should be “sufficient and appropriate,” with “appropriate” standing for “reliable” and “relevant” (IESBA).

According to Wang and Cuthbertson (2015), the potentially key role played by big data BD and Big Data Analytics (BDA) in innovative audit practice is evident. Quite a few studies have discussed and analyses broad areas of BD and BDA in external auditing by explaining and providing context to researchers, bringing it to their attention in terms of general issues (Allies and Gray, 2016; Allies, Arnaboldi et al., 2017) and emphasizing that the use of the BDA is appropriate and valuable to ensure audit quality (Dubey and Gunasekaran, 2015; Brown-Liburud et al., 2015; Vasarhelyi et al., 2015). Business Development Association (BDA) may improve the efficiency and effectiveness of financial statement audits (KPMG, 2017; Cao et al., 2015; Yoon et al., 2015; Gepp et al., 2018) but added competencies and technological capabilities are necessary to implement a (BDA).

Realistically, the Boeing 747 is equipped with several sensors which can record a variety of data, including flight load data such as weight and distance. The Boeing 737 generates 20 terabytes of engine data per hour, crucial for performance monitoring and predictive maintenance. With an average of 87,000 flights in the skies of the United States each day, this means that a significant amount of data is generated by these planes (Jones 2005). This data can certainly be used to improve future travel and economic experience, reduce costs and, most importantly, provide reliable audit evidence. For example, big data analytics are particularly valuable for client audit aims (Russom, 2011).

3.2 Big Data as Audit Evidence

Theoretically, auditors should have access to all necessary information about the firms (Dunn, 1996). Indeed, the scope and quality of audit evidence collected is affected by technology (that is, whether the evidence is in computerized form), cost/benefit constraints, and social interactions with clients (Bennett and Hatfield 2012). Relevant external big data 432 Yoon, Hoogduin and Zhang Accounting Horizons June 2015 can complete internal customer information that is not easily accessible to auditors. For example, when verifying a manufacturing concern, auditors may ask for branch sales projections because they can be used to understand production volumes and inventory levels.

Big data can provide support when legacy evidence is lacking, as can be the case with fraud. Obtaining evidence of fraud is difficult because evidence of motivation and justification-related components is related to an individual's lifestyle, behavior, and ethics (IESBA), and none of them are necessarily observable. The main advantage of sufficiency is the richness of the information that various forms of data are provided in mass quantities. The basic cost is the data processing effort needed to achieve a specific audit assertion. Fortunately, advanced data analytics are available, and these analytical tools are more powerful for large data sets and suitable for unstructured data (Russom 2011). Auditors can also set up their own data warehouses to achieve economies of scale among customers to reduce data processing costs and make rational decisions.

Also, some types of big data can help assess the reliability of traditional evidence. For example, shipping documents are used to verify shipments, but GPS data provides a more reliable and tamperproof source of data for verification. In a traditional audit, documents are checked manually to check

commercial transactions. In a big data environment, auditors may use text analysis techniques, such as grouping, to automatically analyze and summarize documents (Dhillon and Modha, 2001). This approach is more effective and eye-opening than manual analysis.

The use of non-financial information as part of analytical procedures may provide an independent standard for evaluating financial statements. In this line, big data from external sources, such as news articles, analyst reports, and government reports, can provide independent criteria for assessing both internal and external trends of financial accounts. An analysis of consumer satisfaction (Ittner and Larcker 1998) or daily weather conditions (Engle, Granger, Rice, Weiss 1986; Starr-McCluer 2000) may help in understanding sales levels. For example, if a particular product's reputation on social media is negative, but sales of the product have increased, auditors may view this discrepancy as a "red flag". One of the main sources of reliability of big data is that it is exceedingly difficult to manipulate the data due to its sheer size, especially when the data is generated in real time from external sources. Data quality is a major concern. Reliability is reduced when noise in big data results in an increase in false positives. Also, big data from social media sites, such as Twitter, can be biased because their users are not representative of the entire customer group.

In addition, the auditor must consider the appropriateness of the evidence by understanding the technological reality of the evidence. The content of news articles is likely to show a company's future earnings and stock price prospects (Tetlock 2007; Tetlock, Saar-Tsechansky, & Macskassy 2008), but traditional audit work is often of an ex post facto nature. Auditors can analyze prompt news reports to assess changes in their clients' financial performance and business planning.

Professional standards also require that auditors perform a risk assessment of internal control weaknesses and fraudulent statements (IESBA). Earlier documentation has presented various methods of assessing client risk (Johnstone, 2000), and management disclosures may be particularly helpful in this task. (IESBAI) points out that "overly optimistic press releases or annual report letters" are possible fraud risk factors. Therefore, textual analysis of management disclosures is relevant for assessing management's risk of fraud.

In contrast, the auditor needs to consider the relevance of the evidence by understanding the technological reality of the evidence. The content of news articles is likely to show a company's future earnings and stock price prospects (Tetlock 2007; Tetlock, Saar-Tsechansky, & Macskassy 2008), but traditional audit work is often of an ex post facto nature. Auditors can analyze current reports on a prompt basis to assess changes in their clients' financial performance and business planning.

Professional standards also require auditors to perform a risk assessment for internal control weaknesses and fraudulent reporting (IESBA). Earlier documentation has outlined various methods of assessing client risk (Johnstone, 2000), and management disclosures may be particularly useful for this task. (IESBA) notes that "overly optimistic press releases or annual report letters" are risk factors for potential fraud. Therefore, textual analysis of management disclosures is relevant for assessing management's risk of fraud. The nature of e-commerce offers a unique opportunity to use data-driven audit techniques. There has been a huge shift in the retail industry from physical sales to Internet sales. Although the expectations of e-commerce sales in the Kingdom of Saudi Arabia were in 2015, the Chamber of Commerce in the Eastern Province organized the "Sharqia Trade Forum 2015" and the expected growth volume for the year 2018 AD is only 7.8% annually. And with the rapid digital

transformation of the government and the private sector during the period of covid-19, and quarantine, e-commerce accounted for 87.93% of total Saudi retail sales in the first quarter of 2022 than other traditional types of retail sales. Obviously, it grows more rapidly with technological advances and Big Data that help analyze customer behavior and improve the product promotion experience with customers.

Auditors will increasingly meet with clients with quite diverse types of business operations, which will require the collection of different forms of audit evidence. For example, auditors can compare data on a customer's website visits to competitors with similar customers in the same period. Any inconsistencies should be given special attention, even when a customer's sales history shows no issues. The big data approach is relevant as it provides unique evidence that is sometimes timelier than the traditional audit approach.

3.3 Levels of Audit Evidence

Audit evidence can be categorized into three levels: the financial statements, the individual account, and the audit aim (Srivastava and Shafer 1992). Audit efficiency can be greatly improved if audit evidence at the financial statement level is supplemented with big data regarding the possibility of misstatement, because auditors tend to collect redundant evidence at detailed levels without thoroughly analysing evidence at the financial statement level (Srivastava and Shafer 1992).

Auditors utilize the examination of conference call transcripts and company records to better estimate the probability of financial misrepresentation. (Humpherys et al. 2011; Larcker and Zakolyukina 2012). At individual account and audit target levels, big data analytics can reduce false positives and further find anomalies of interest for further investigation (Issa and Kogan 2014; Cao

et al. 2015). Big Data from news articles, product discussion forums and social networks is helpful in assessing sales.

3.4 Big Data and Audit in Saudi Context

In 2015, the Council of Economic and Development Affairs for the Kingdom of Saudi Arabia presented their “Vision2030” plan: a set of goals for the economic, social and cultural development of the Kingdom by the year 2030. The focus is to make the Saudi economy more diverse and less dependent on oil exports. The goals include: attracting foreign investment; improving Saudi Arabia’s economy so that it ranks among the largest 15 economies in the world; improving the nation’s score on the World Economic Forum’s Global Competitive Index from 25th to the top 10; improving the nation’s ranking on the Global Logistics Index from 49th to 25th; improving the government’s ranking on the Government Effectiveness Index from 80th to 20th; reducing the unemployment rate from 11.6% to 7%; increasing the role of the private sector in the economy from 40% to 60% of GDP; increasing the share of gross domestic product (GDP) that small and medium enterprises (SMEs) contribute from 20% to 35%; and increasing the contribution of non-profit organizations from 1% to 5% of GDP (Council of Economic and Development Affairs, 2015; Saudi Press Agency, 2015).

Auditors’ analysis of big data will play a crucial role in helping the Kingdom meet its objectives. A more diverse economy requires more data. A larger private sector with more actors, more small-and-medium-sized businesses, will require more counter-party and third-party trust: trust that only professional auditors can provide. To attract foreign investment, financial information must be reliable and accurate (Asiri et al. 2024). Proper audits of both private and public sector organizations will provide accurate metrics for the government to

assess the progress of their Vision2030 and use good data to make decisions that ensure that the kingdom meets its goals (Impact ME. 2023, PwC. 2023) To provide more reliable and accurate risk assessments, auditors in Saudi Arabia must continue to expand their reliance on big data so that the kingdom can achieve its goals.

In Saudi Arabia, both large and small companies alike rely ever more on big data. Approximately 70% of the 96 goals that the kingdom set out in the Vision2030 plan pertain to data and artificial intelligence (AI). Between 2015 and 2020, the kingdom made progress in developing the infrastructure necessary for big data. Access to internet by private citizens and business investment in communications equipment, computer software and hardware, and information technology training increased significantly (Chaaben et al., 2023). To accelerate the progress, in 2019, the kingdom announced the formation of the Saudi Data and Artificial Intelligence Authority (SDAIA) to guide the kingdom's data and AI development through agencies such as The National Data Office and The National Information Center. The SDAIA estimates that Saudi Arabia can generate savings and revenue gains equivalent to an additional SR40 billion from the proper application of big data and analysis (Hassan & Al Zahrani, 2020). In July of 2021, the Saudi Ministry of Communications and Information Technology (MCIT) announced plans to invest \$18 billion USD in a network of data centers throughout the kingdom (Hussain, 2022).

The expansion of internet access and wireless cellular phone service permitted Saudi Arabia to shift suddenly toward e-commerce during the Covid-19 era. Online purchases accounted for 87.93% of total Saudi retail sales in the first quarter of 2022 (Al-Misbahi, 2022). Online sales allow for the accumulation and use of large volumes of data. The more e-commerce in an economy, the more data that that economy produces, and the more organizations seek to

analyse this ever-larger volume of data. E-commerce brings big data (Zhuang, 2021). Now that e-commerce accounts for the bulk of Saudi retail sales, the entire Saudi economy must adapt to the era of big data, including auditors .

Even as the Saudi economy becomes more diverse and complex, the professional ethics that have guided auditors from the inception of the profession, skepticism, integrity, impartiality, and objectivity, remain, for internal and external audits alike. Auditors in Saudi Arabia conform their work to International Financial Reporting Standards (IFRS), which has been beneficial to Saudi companies (Mohammad et al., 2022). The Saudi Organization for Certified Public Accountants (SOCPA) ensures professional standards and ethical conduct and recently adopt a revised “International Code of Conduct and Ethics for Professional Accountants (including International Independence Standards)” (SOCPA, 2023).

Joint-stock companies and limited liability partnerships require an independent audit annually. Banks and insurance companies must appoint two independent auditors annually. In addition to these external audits that the law mandates, organizations benefit from internal audits that are independent and that employ professionals with competence as auditors, rather than using internal audits to train managers (Abbott et al., 2016).

According to professional standards, audit evidence should be “sufficient and appropriate,” with “appropriate” standards for “reliable” and “relevant” (IESBA 2018). What is “sufficient” and “appropriate” has changed now that more information is available for many businesses in Saudi Arabia. In theory, auditors should have access to all necessary information about the firms that they audit (Dunn, 1996). In practice, however, access to technology, technological expertise, money, and social interactions with clients delimit the scope and

quality of audit evidence, especially for external audits (Alles & Gray, 2016; da Silva & Oliveira, 2022). As a result of these limits, both internal and external auditors have been slow to adopt technics to analyse big data and incorporate such analysis into their reports (Gepp et al., 2017; Patel & Shah, 2022).

Inexperienced or junior auditors interacting with senior officials, such as Chief Financial Officers (CFOs), at client firms can exacerbate all these problems because of the reluctance of junior staff to contradict or make demands of senior people (Bennett and Hatfield, 2012). Extracting a large volume of data that is not on the ledger from a business, especially for external auditors, can be difficult because many small audit firms lack the technical capacity and skill to extract large volumes of data in a variety of formats, convert this data to a homogenous form, and then analyse this data (Applebaum et al., 2018; EY Reporting 2015) .

Concerns about privacy further complicate the efforts of external auditors to access big data. In many cases, the data that organizations generate and the tools that organizations use to analyse the data are proprietary, and often, organizations are reluctant to allow third parties access to proprietary software and databases. Likewise, the privacy of their personal data is a concern for many individuals (Milberg et al., 2000), and respect for the privacy of individuals and their personal data should be an ethical concern for auditors (Michael & Michael 2013). For example, an auditor could use internal emails to detect employee malfeasance. However, employees may feel that external auditors' access to their communications is a violation of their privacy. If auditors gain access to a broader range of information including GPS data, video and audio files, these concerns will escalate. In Saudi Arabia, new legal conditions exist as well. A recent Saudi law that protects the data of individuals may complicate matters for auditors who wish to use big data in their risk assessments and analysis

(SADAIA 2023). More legal research is necessary to understand how this law will affect auditors who make use of big data.

Section 114 of the International Ethics Standards Board for Accountants states that (IESBA 2018) “a professional accountant shall comply with the principle of confidentiality, which requires the accountant to respect the confidentiality of information acquired as a result of professional and business relationships.” To mitigate concerns about privacy and comply with current law in the kingdom, Saudi audit firms should cooperate with their clients and inform employees in advance that any work-related data may be used for audit purposes. They should also communicate to employees that this data will be used only for a specific audit purpose. Personal information should remain anonymous unless fraud is detected.

3.5 Challenges and Consequences

In reviewing the challenges associated with integrating big data into auditing, especially in contexts like Saudi Arabia, similar challenges have been noted in global research. For instance, Stein Smith (2017) discusses the technological transformation occurring within the accounting profession due to the rise of digital data and advanced technologies such as blockchain and artificial intelligence (AI). These technologies, while promising, require substantial investments in both infrastructure and training, which can be a significant hurdle for audit firms. Smith also highlights how the lack of technical expertise in data analytics, and the need to comply with evolving regulatory frameworks, can complicate the adoption of these technologies.

Quayum (2021) identified four reasons why preparing for and conducting a manual audit became a barrier:

1. Manual auditing is prone to human error, which makes organizations vulnerable to fraud.
2. Providing audit evidence takes time and requires specialized ability.
3. Even if the internal audit team discovers an issue, it cannot always be certain that someone did not exploit it.
4. Audit teams must analyze all environments, not just the actual production instance.

Traditional evidence, such as assertions, documents and notes, continues to be a significant part of the audit process. However, big data can provide more robust and prompt evidence that can help complement or even replace traditional evidence. The challenge for auditors is to combine the two sources of evidence to increase their value.

Therefore, the integrity of the evidence is a challenging but critical factor in deciding the quality of an audit opinion (Moeckel, 1991). The integration of big data with traditional audit evidence is essential, as big data is often unstructured and may lack the organization required by relational databases to accurately identify specific transactions, customers, or products. For instance, auditors might rely on GPS location data to validate certain transactions. However, big data, such as pictures or GPS data, can be difficult to compare with traditional ledgers. Auditors must identify appropriate "gateway methods" to connect traditional audit evidence with current information to effectively integrate big data into the audit process. (Vasarhelyi, Kogan and Tuttle 2015). (Yoons et al. 2015) Auditors are less familiar with many sources of big data (than traditional sources) and their audit characteristics such as sufficiency, reliability and relevance. As a result, it is difficult to predict in advance the extent to which big data will be used for specific purposes. Moreover, the data sources may be

interrelated (such as social media and third-party news articles), so the incremental value of the data source may be limited, and the evidence obtained from multiple sources may be less than the sum of the evidence of each part. The weight of big data can also become an issue. Auditors manage the collection of a variety of forms of verification evidence from traditional sources. Based on experience, auditors are likely to have their own hierarchical system for evaluating such evidence (Louwers et al. 2007). However, traditional systems of weighing evidence of big data may not be easy to adhere to. Big data generally does not provide accurate information, and sometimes data from sources such as news articles can be affected by biases (Vasarhelyi 2008).

To address these challenges, auditors must evaluate big data evidence within the evidentiary requirements framework (Yoon et al. 2015). That is, auditors must estimate the total amount of audit evidence for each specific audit aim consistent with the requirements of adequacy, reliability, and suitability. The determination of the amount of evidence provided by big data can be made by evaluating both the advantages and disadvantages of big data for each evidentiary requirement, as well as considering the extent of the absence of traditional audit evidence. In the framework of working beliefs, the set of variables must be identified with the belief functions available in the evidence network (Srivastava 1995). To reduce detection risk, greater weight should be given to audit evidence generated by big data if it provides uncertain evidence (Fukukawa and Mock 2012). The answer to the problem of how much big data to use in an audit can also vary widely between different industry types and company sizes.

In theory, auditors should be turning to big data to help them gain insight into the performance of audit clients. With the increasing amount of available data, the challenge for auditors is to effectively and efficiently integrate the traditional

audit evidence with big data. Other point of view Although the Code of Professional Ethics prohibits auditors from divulging confidential information to a client without the client's specific authorization Article 114 (IESBA). general knowledge and experience gained through client involvement is transferable to other engagements. Thus, clients who fear passing information on to competitors may avoid hiring specialized auditors (Kwon 1996). While this is not a problem specific to big data, it can be intensified as external auditors seek access to a broader range of internal data sources.

Since there are higher costs of collecting and analysing big data, economies of scale may grow. Hence, specialized audit firms may use more big data as audit evidence than other firms, resulting in a higher barrier preventing competitors from entering specialized industries. Customers concerned about the spread of their information may also restrict access to proprietary data sources. To resolve the issue of information transfer, auditors must formally contract with clients about the use of internal clients' data, such as meeting minutes and website traffic. If one customer's internal data is used in an audit job for another customer, the key identification information must be omitted or hidden. In general, auditors should only use the highly synthesized information from big data for other audit tasks and limit access to the original, unprocessed data. On the other hand, in Section 114 (IESBA) “a professional accountant shall comply with the principle of confidentiality, which requires the accountant to respect the confidentiality of information acquired as a result of professional and business relationships.” Thus, Michael (2013) argues that information privacy, described by the relationship between data collection and dissemination, technology, the public's expectation of privacy, contextual information standards, and the legal and policy issues surrounding it. It is incredibly challenging to use big data as audit evidence. Smith, Milberg, and Burke (1996)

discuss the primary concerns of individuals with information privacy, such as unauthorized internal and external secondary use. Internal emails can be used to detect fraudulent behaviors of employees. However, once external auditors have access to employees' emails, employees may feel that the privacy of their information has been violated. If auditors gain access to a broader range of information including GPS data, video and audio files, these concerns will only be escalated. To mitigate these concerns, audit firms should cooperate with their clients and inform employees in advance that any work-related data sources may be used for audit purposes. They should also communicate to employees that work-related data will be used for a specific audit purpose only. Information should be anonymous unless fraud is detected.

4. Discussion and Conclusion

The purpose of this review paper was to analyze current work on "big data and audit evidence" and its impact in the Saudi context. Several existing studies on different aspects of big data and auditing procedures highlight the growing interest of academics, scholars, and professionals in this modern approach to auditing. This interest has prompted various researchers to explore the risks associated with big data auditing in unique and diverse ways.

While many researchers differ on the key concepts and other aspects of auditing procedures through big data, they all acknowledge the connection between big data as a form of audit evidence and audit quality. However, different researchers have examined the use of big data in auditing in detecting anomalies. The most commonly used variables in measuring are Audit Quality (Brown-Liburud & Vasarhelyi, 2015; Appelbaum et al., 2017), Audit Efficiency (Krieger & Drews, 2018) Auditor Expertise (Gandomi & Haider, 2015) Data Integrity and Reliability (Appelbaum et al., 2017) Regulatory Compliance (Brown-Liburud & Vasarhelyi, 2015). suggest that,

according to the findings of many of these studies, nations recognize the benefits of technological advancements and how they can improve the quality of operations through big data applications in audit evidence. Notably, in the Saudi context, steps have been taken to adopt and manage big data, which aids in making informed decisions.

Although big data is not available in most audit customers, it is important to manage big data in a more professional way. We think auditors should have huge databases consisting of all internal events (reports, correspondence, financial lists, etc.) and external events (stock exchange, magazines, literature. etc.) for the audit client entity. This eases the auditor's personal judgement and the process of gathering and evaluating evidence. Building an aim, impartial and relevant opinion on the financial statements. International auditing standards on audit evidence have defined what the auditor must do during the collection of evidence that must be relevant and integrated. In the light of big data, the auditor must practice analysing and managing big data and understanding its mechanisms, helping it to gather correct and correct evidence through artificial intelligence. At the same time, caution must be exercised in dealing with big data when analysing it, which can provide misleading and unhelpful information. Therefore, the audit team must have specialists in analysing and handling big data in a way that helps to conduct the audit at the lowest cost. About cost, big data eases the auditor's work in terms of reducing costs. Gathering evidence is easier than conventional scrutiny, as it reduces the time spent collecting audit evidence

Nevertheless, there is limited academic research on big data and audit procedures, particularly in the Saudi context. While the current study aims to explore this specific area of research, there is still a need for further work to examine and analyze the relationship between big data and various auditing procedures. For instance, future

research could focus on big data analytics and risk assessment through interviews or surveys with auditing firms in Saudi Arabia.

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