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Audit quality in the Environment of Big Data "A field Study"

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Abstract

This study investigates how Big Data affects an auditor's evaluation of evidence and professional judgments. In addition, the study examines the auditors' perception to the potential opportunities & implications of Big Data in the audit process. For achieving the study objectives and the study hypotheses, a questionnaire was developed to collect data from the respondents (academics and auditors). The findings of the field study indicate that:

1- There is a significant relationship between Big Data and audit quality.
2- There is significant statistical effect of Big Data on the audit quality.

Key Words: Big Data, Audit Quality, Field Study

المستخلص

تهدف هذه الدراسة إلي اختبار تأثير البيانات الضخمة علي تقييم المراجع للأدلة والأحكام المهنية. بالإضافة إلي ذلك، أن هذه الدراسة تختبر مدي إدراك المراجعيين للفرص والآثار المحتملة للبيانات الضخمة في عملية المراجعة. ولتحقيق أهداف الدراسة وإختبار فرضياتها، تم وضع استبيان لجمع بيانات الدراسة من المستقصي منهم (الأكاديميين ومراجعي الحسابات). وتشير نتائج الدراسة الميدانية إلي أن :

١- توجد علاقة قوية بين البيانات الضخمة وجودة المراجعة.

٢- يوجد تأثير قوي ذاو دلالة احصائية للبيانات الضخمة علي جودة المراجعة.

الكلمات الدالة: البيانات الضخمة ، جودة المراجعة ، دراسة ميدانية

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1. Introduction

Today, auditors are becoming more holistic in their risk assessment and examining evidence available from various sources either public data sources or smart data sources as well as effective judgment in order to decrease the probability of material misstatement, audit failure and thereby impacting the audit process as a whole. Also, the predominant view of the significance of Big Data for auditing is reflected in the following comment from a professional body (ACCA, 2015):

> *"The quantity of data produced by and available to companies, the replacement of paper trails with IT records, cloud storage, integrated reporting and growing stakeholders expectations for immediate information – any one of these alone would affect the auditing Process, but Big Data is bringing them all, and more, at the same time".*

In this regard, American Institute of Certified Public Accountants (AICPA) established the Assurance Services Executive Committee Emerging Assurance Technology Task Force to aid auditors in this endeavor, and this task force established the Audit Data Standards (ADS) working group to help developing new technologies that will contribute to the effectiveness, timelines, and efficiency of audit process, therefore enhancing audit quality.

Audit teams now include data analysts who assist auditors in writing scripts (which perform audit procedures such as; analytical procedures, recompilation etc.) for data collection and evidence gathering. Therefore, constrains related to expertise have seen auditors relying on data analysts to perform audit tests and produce reports which are then sent to auditors for further analysis.

Then, there is a jurisdictional challenge over who own audit evidence in data driven environment and in this regard, prior studies suggested that the implementation of audit technology has resulted in unintended outcomes as auditors have often been reluctant to use the technology. Then auditors will have no choice to embrace big data which becomes integral important part to the operation of the business of their clients. From this point, big data can be considered as an exogenous driver that will force auditors to adopt it to keep up with their clients (who depend on it in their business operations), so this will lead to impacting audit process and thereby audit quality.

Accordingly, this study can be presented in the following questions;

- Is there any relationship between Big Data and audit quality?
- Does Big Data affect the audit quality?

2. Research Objectives:

This study aims at:

- Examining the relationship between Big Data and audit quality.
- Studying the effect of Big Data on the audit quality.

3. **Research importance:**
   - The study contributes toward an improved understanding of the relationship between Big Data and audit quality.
   - The study examines the potential implications of Big Data toward audit quality.

4. Literature Review

4.1 Nature of Big Data

4.1.1 Big Data Definition

The term Big Data is fairly new, but seems to continue to spark interest among scholars and practitioners. And the conceptualization of this term has evolved rapidly. Hence, during the last few years, researchers have produced an impressive amount of research papers in an attempt to introduce various definitions of this term from different perspectives.

On the one hand, is from the content of Big Data and on the other hand from its dimensions and characteristics (Alles & Gray, 2015).

Big Data can be described by some of its features that include volume, variety, velocity, and veracity. Volume refers to massive data set. Variety refers to multiplicity sources of collecting data. Velocity is how rapidly the data is changing. Veracity is reliability & validity of data (Vasarhelyi et al., 2015; Zhang et al., 2015; Yoon et al., 2015).

Big Data is a relatively recent phenomenon that refers to (Cao et al., 2015);

> *"The product of a technological environment in which almost anything (numbers, texts, images, videos, and sound that require petabytes of storage capacity) can be recorded, measured, and captured digitally, and thereby turned into data."*

Similarly, Big Data can be regarded as an additional resource of information which has an effect on the understanding about the client's business & its environment and the performance of the audit, as well as, this inclusion of such data may contribute to changes in the audit process (Dagiliene and kloviene, 2019).

Besides, Big Data can be considered as the combination of various types of data as internal and external data, structured and unstructured data, traditional financial data and non-financial data, emails, telephone calls, sensor data, logistics data, blogs, RFID data and social media data (Alles & Gray, 2015).

4.1.2 Big Data Features

A popular description of Big Data is based on its attributes that many authors regard as its features. And these features ultimately constitute "V's" to describe the Big Data as follows (Wu et al., 2016; Heck, 2019);

- **Volume:**

The most commonly recognized characteristic of Big Data, referring to the massive size of data sets and depicts the vast ocean of data.

■ **Velocity:**

Denotes to the speed and frequency of data generation. Hence, velocity can be reflected as a measure of the rate of data flow.

■ **Variety:**

Indicates the multiplicity of data sources and formats as internal and external data and different types of data as structured data and unstructured data.

■ **Veracity:**

Relates to integrity of the data and implies reliability & validity of data which provides truthful information.

■ **Value:**

Is the most important feature because organizations which are able to extract valuable information from these data will be able to gain valuable benefits for their business (Enget et al., 2017; Gunther et al., 2017; Yu et al., 2019).

■ **Variability & Visibility :**

Variability reflects the change in velocity or structure, while the Visibility concentrates on a need for having a full picture of data that is necessary to make informative decisions (Wu et al., 2016).

4.2 Big Data Classifications

The classification can depend on providing different formats of these data that includes:

■ **Structured data:**

Includes pre-defined, standardized and well organized data in a tabular form and refer to texts or numbers that originates from typical business processes and systems.

■ **Unstructured data:**

Reflects a mess of loose data that can't be mapped to pre-defined data and can be represented in form of text, images, audios, or videos.

■ **Semi-structured:**

It is a form of the data structure that can be tracked on websites or software platforms in a log file by an application of Internet of Things (IoT) sensors.

4.3 Phases of Big Data Processing

Big Data has the potential to create value for the organizations which able to extract valuable information needed to drive decision making. And the current interest in Big Data is its Processes that can be considered as a necessary to convert it into useful information (Coyen and Walker, 2018). This can be reflected through the following table;

Table 1: Phases of Big Data Processing

Phases	Steps	Description
Creation Phase (first phase)	1. Needs Assessment	It is the foundation of Big Data Process that is responsible for identifying business requirements (data sources, information technologies, and employee training) needed to satisfy specific goals before gathering data.
	2. Collection	After identifying potential data sources, it is necessary to collect all of the data from each source.
	3. Sifting	This step is responsible for excluding of irrelevant data to prevent the retention of too much data (within the context of the organizational goals).
	4. Ingestion	It involves entering the data into organization's information system.
	5. Synchronization	It is the final step in the creation phase which serves as a bridge that link what an organization already knows to what it would like to know.
Maintenance Phase (Second Phase)	6. Storage	It is a valuable step as it not only accommodate variety, but also promote synchronization by storing Big Data & related traditional business data together in non-relational databases.
	7. Preprocessing	It involves removing duplicates, checking for integrity, and grouping appropriate data.
	8. Refreshing	The goal of this step is to update data stores with current data.
	9. Interpretation	This step is responsible for acquiring the hardware & software necessary to extract compiled data readable.
	10. Disposition	It provides free storage, satisfy privacy, and reduce exposure to potential breaches.
	11. Monitoring	It is a vital step which aims at finding message hidden within Big Data and responding accordingly.
Use Phase (Third Phase)	12. Analytics	This step reflects the use of software & programming tools necessary to enhance decision-making.

Phases	Steps	Description
	13. Reporting	Its responsibility is to convey information resulted from data analytics to decision-makers in a readable manner depending heavily on Big Data visualization.

4.4 Big Data Evolution

Big Data era has already been in the offing, and it is essential to capture its essence, origin, and history. Based on this reasoning, the first commonly cited use of the term "Big Data" was in (1997) at the USENIX (advanced computing systems association in the U.S.) annual technical conference by John Mashey in a Silicon Graphics slide deck with the title of "Big Data and the Next Wave of Infrastructures".

Then, Douglas Laney (2001) highlighted the core features of Big Data that are known as "3V's" of Big Data that are volume, variety, and velocity (Cockcroft and Russel, 2018).

While references to the term in the academic literature are common in computer science & statistics in the early 2000s, the interest in Big Data has begun in accounting and finance literature around (2011) as a result of deployment of Artificial Intelligence (AI) and Internet of Things (IOT) (McAfee and Brynjolfsson, 2012; Cockcroft and Russel, 2018).

Besides these factors, there are other prominent platforms which also paved the way to Big Data to be embraced as a new audit technology including, wide spread adoption of Enterprise Resource Planning systems (ERPs), the Internet of Things (IoT), Continuous Auditing (CA), and emerging technology of Extensible Business Reporting Language (XPRL) (Alles, 2015; Cao et al., 2015; Rezaee et al., 2018; Stensjö, 2020; Deniswara et al., 2020).

4.5 Challenges with embedding of Big Data

While the emergence of Big Data has a great significance in almost every sector all over the world, there are some challenges in harnessing the potential of Big data today (Jin et al., 2015; Brown-Liburd et al., 2015) as follows:

A. Challenges related to Big Data features (physical challenges):

Big Data represents an extension of the current analytic set of data bases, and due to its dynamic features and volume, it limits the capabilities of the current information system and creates a set of technical challenges (Vasarhelyi et al., 2015; Enget et al., 2017; Jin et al., 2015).

B. Challenges related to processing information in a Big Data environment (Yoon et al., 2015؛ Brown-Liburd et al., 2015);

- Information overload: Reflects receiving too much information that may cause false positives leading to lower reliability.
- Information relevance: Exposure to excessive information can lead to reducing the ability to identify relevant information.

- Ambiguity: This issue arises from variations and differences in the amount & type of information available.

C. Challenges related to Big Data management

Hence, this challenge is related to specific issues as presented (Idrees et al., 2019);

- Infrastructure set up

Big Data is as any new technology which its implementation requires investing in both human skills and IT capabilities that enable effective information sharing and data connectivity (Dubey et al., 2019).

- Governance of information

It is necessary to employ effective governance, polices, and procedures through organizations & regulators required for minimizing the risks associated with storing, disposing, processing this data and thereby maximizing Big Data value (Coyne and Walker, 2018).

4.6 Big Data Benefits:

Organizations are exploiting the growth of Big Data for the purpose of providing fruitful benefits to improve management reporting through comparing financial & non-financial measures of performance, and thereby, improving their own decision-making process. Recently, Big Data penetrates almost all organization' decision making and business strategies, as well as, more & more organizations are harnessing the power of Big Data to fully utilize it for gaining significant competitive advantages, as presented (Enget et al., 2017);

1. Introducing & development of new products/services by continuous monitoring of their performance indicators (such as sales and profits).
2. Hence, providing useful information in areas of; detection of buying patterns, segmentation of customers, and prediction of customers' preferences (McAfee and Brynjolfsson, 2012).
3. From this point, Big Data offers opportunities for building & improving relationships with their customers, identifying emerging threats and opportunities (Akhter et al., 2019; Batistic and Laken, 2019; Mikalef et al., 2019).
4. Moreover, Big Data has become an essential part of organizations' online strategies that can rely on to analyze, forecast, and monitor its financial stability.

4.7 Audit Quality

4.7.1 Audit Quality Definition

Audit quality has been and continues to be one of the most important topics in auditing, and there still little consensus on a definition that achieve universal understanding of audit quality, and this due to that audit quality, in essence, is a complex and multi-faceted. Hence, introducing different definitions of audit quality has historically been a challenge for regulators and academics.

Its perception relies on whose eyes one looks through (users, auditors, regulators, and other stakeholders in the financial reporting process) that can

have various views about audit quality (Knechel et al.,2013); users of financial reports may recognize that high quality audit means the absence of material misstatement, auditors consider audit quality as satisfactorily completing all tasks required by the firm's audit methodology, the audit firm can evaluate high audit quality as one for which the work can be defended against challenge in inspection or court of law, regulators may believe that high audit quality is related to compliance with professional standards, and finally society can view high quality audit to be a mean to avoid economic problems for a firm or the market.

4.7.2 Audit Quality Importance

Audit quality is searched through different angles from period to period, and it always has been critical for many stakeholders in the audit process besides the auditors, such as; shareholders, government, , potential private investors, analysts, suppliers, customers, management (of the audited company), regulatory bodies. Hence, its importance needs to be centered to meet the expectations of those stakeholders and can be presented as follows (Manita et al., 2020);

A. Importance to Audit Firm & Auditors

- It is advocated that audit quality can be a nonstop build that guarantees the high quality of financial statements.
- Producing quality audits can serve as a yardstick for the reputation of the audit firm which is recognized as an independent audit (Iskandar et al., 2010; Khudhair et al., 2018; Hai et al., 2019).
- This reputation could provide sufficient invective for auditors to become more efficient and more trusted in increasing the transparency of the information exposure to the public (Asthana et al., 2018).
- Audit firm that produce high quality audits has the ability to minimize the risk of audit failure, prevent fraud, reduce the earnings management, as well as alleviate the exposure to litigation risk. (Wijaya, 2020).

B. To Audit Clients

- Producing audit quality in the audit process has an important role in reducing information asymmetry problems between managers and other stakeholders.
- It has the ability to restrain opportunistic behaviors through; detecting & preventing errors and fraud (Yeung& Lento, 2018; Nguyen et al., 2019; Wijaya, 2020).
- Consequently, audit quality can be seen as a complementary mechanism and a key monitoring tool which bridges the gap between management and other stakeholders (Iskandar et al.,2010; Yeung & Lento, 2018;Bala, 2019; Diyanti&Wijaynti, 2019; Alhababsah,2019; Phan et al.,2020).

4.7.3 Audit Quality Proxies

Several attempts have been made to assess audit quality including among others; Audit Quality Framework released by International Auditing & Assurance standards Board (IAASB, 2014), Audit Quality Framework released by Public Company Accounting Oversight Board (PCAOB, 2015), and Audit

Quality Framework released by Centre of Audit quality (CAQ, 2016). Each of these frameworks attempted to provide a set of indicators that can be used as a proxy for audit quality. The framework that is going to be employed in this study is that of IAASB which is considered the most comprehensive one.

The main objective of this framework is to provide awareness about various elements of audit quality that can be considered as "key drivers" which maximize the likelihood that quality audits are consistently performed at different levels: engagement level, firm level, national level. This framework encompasses five elements that are used as indicators of audit quality. Besides, this framework aims at encouraging stakeholders to explore ways necessary to improve audit quality, and facilitating the dialogue between stakeholders. This framework encompasses five elements that are (IAASB, 2014);

- **Inputs:**

Consist of values, ethics, and attitudes of auditors (such as; objectivity, integrity, independence, and professional skepticism), as well as, their knowledge, skills, and experience (such as; judgments, understanding of the business & industry, and training of audit staff).

- **Processes:**

Focus on the audit process and quality control procedures (such as; performance of audit test work, use of information technology, compliance with auditing standards, and documentation).

- **Outputs:**

Consist of audit opinion, audited financial statements, auditor reports to management, and firm transparency reports.

- **Interaction:**

Relates to any relationships between stakeholders in the audit process (such as; auditors, management, regulators, and users).

- **Context:**

Concentrates on laws & regulation, business practices, information systems, governance, litigation environment.

4.7.4 Mechanisms for improving Audit Quality

There is variety of mechanisms for improving audit quality, some depend mainly on audit firms which should cope with changing business environment. And the others concentrate heavily on improvements to inputs, processes, outputs, interactions and contexts which represent key drivers that create an environment in which audit quality can be improved. And this can be presented as follows;

➢ **Mechanisms Related to Audit Firms**

According to (Phan et al., 2020), audit quality can be improved by audit firms depending on two mechanisms, one of them is the prominent role of the independent auditor for each audit. And the other one is the setting up of effective quality control systems which provide reasonable assurance that audit firm and its personnel comply with professional and legal requirements.

➢ **Mechanisms related to Audit Quality Environment**

As presented by the IAASB (2014) framework of audit quality, there are five key elements related to audit quality which are inputs, process, outputs, interactions, and context, and improvements in these elements can result in improving audit quality as follws(Montenegro & Brás, 2018);

■ **Improvements of inputs**

Improvements of inputs can be reflected on the auditors who perform the audit and the technology employed to conduct it. (Schuletz, 2017; Bradford et al., 2020).

A. Auditors

It is necessary to give the prominence to the auditors' independence, competence. And update specific expertise and knowledge (Pancawati et al. 2019).

B. Technology

The digital tools that could help the auditors accomplish audit work in accordance with the planned time (Cao, 2015; Majidah et al., 2018; Manita et al., 2020)

■ **Improvements of processes**

Involve applying effective audit process and quality control procedures for the purpose of obtaining sufficient & reliable audit evidence. Also, it is necessary for these processes to comply with laws, regulations, and applicable standards related to audit firms (Knechel et al., 2013; IAASB, 2014).

■ **Improvements in the outputs**

Data analytics can improve the quality of the audit report and the client's financial reporting system. And helping the auditors in gathering sufficient and appropriate evidence which support their opinion (Defond & zhang, 2014; Earley, 2015)

■ **Improvements in the interaction**

Advanced technology and data analytics can impact the interaction among the key stakeholders by providing the opportunity to the auditors to effectively communicate with management and the audit committee through the use of visualization tools to display such information in graphs and charts(Francis, 2011; Salijeni, 2018).

■ **Improvements in the Context**

Concentrate on laws & regulation, business practices, information systems, governance, litigation environment and they become more developed among countries as a result of complexity of developments and degree of a business growth. As well as they have an effect on audit risk, audit evidence. And these elements can have different impacts on audit quality (IAASB, 2014; Knechel et al., 2013).

4.8 Big Data & Audit

The study of Brown-Liburd and Vasarhelyi (2015) based on drawing a literature from psychology & auditing to present behavioral implications &

challenges of big data that auditors encounter when incorporating it. The study revealed that big data is a value-added proposition for auditors, but this doesn't come without challenges. Moreover, the study demonstrated that big data will have the potential to enhance audit judgment & audit quality, and to achieve this, new capabilities, new metrics, and new ways of thinking will be necessary.

Also, the study of Alles (2015) focused on examining the drivers, facilitators, and obstacles that may evolve for the use of big data by audit. The results of the study revealed that major facilitator for auditors is the openness of audit standards to source of audit evidence outside the traditional general ledger data. Whereas the most likely driver is the client use of big data. Thus, big data in this case is the exogenous driver that will force auditors to also adopt big data which is important to the operation of the business of their clients.

In the same way, the study of Zhang et al., (2015) aimed at introducing the gaps between Big Data & the current capabilities of data analysis in continuous auditing (CA).the study concluded that Big Data has four dimensions which contribute to the creation of challenges for current continuous auditing systems. As well as the study revealed that Big Data is a business phenomenon that is here to stay and continuous auditing need to adapt to its challenges.

Similarly, the study of Yoon et al., (2015) focused on examining the use of Big Data as complementary audit evidence. The study revealed that Big Data will play an important role in auditing as it complements traditional audit evidence with sufficient, reliable, and relevant information.

The study demonstrated that the change in the auditing environment brought by Big Data gives auditors unique opportunities to build first-mover advantage & achieve economies of scale as well as it will be used to decrease auditors' dependency on client data and as a result evaluating internal audit evidence. However, integrating Big Data with audit evidence reflects significant challenges with the use of Big Data.

Furthermore, the study of Dzuranin and Mălăescu (2016) aimed at providing insights into the current state & future directions of information technology (IT) audit research and practice. The results of the study concluded that (IT)) audit practice environment is in a state of constant innovation driven by technology and stakeholder demands. Also the study has begun in the area of Big Data by providing insights into emerging professional challenges and opportunities regarding IT audit.

Moreover, the study of Appelbaum (2016) concentrated on introducing a discussion about the challenge of provenance evidence verification facing the auditors in the current electronic Big Data business environment. The study also focuses on introducing a conceptual framework that can be proposed as a mean to achieve secure storage of Big Data provenance that can serve as reliable audit evidence. This study revealed that Big Data is now an important component of many businesses due to rapid development of social media, sensors, and internet of things (IOT), so these businesses or audit clients may be generating this Big

Data internally or accessing it from external sources.

Whereas, the study of Adrianto (2018) aimed at providing first insight regarding the development of big data& its impact on audit through reviewing a literature regarding its purpose. The study revealed that big data is an indispensable resource to many organizations and it has the potential to be an extremely valuable resource to auditors.

The study of the study of Salijeni (2018) focused on adopting an interpretive paradigm to capture the promotion, embedding and implications of big data in the auditing of financial statements. Data was collected from 27 semi-structured interviews. The findings of the study indicated that big data enables auditors to have implications for their professional judgments. Finally this study offer an opportunity for future research that could focus on conducting big data to enhance audit quality and this could be put to the test by establishing proxies of Defond & zhang (2014).

Likewise, Salijeni et al., (2019) explored the most recent episode in the evolution of audit technology. This study suggests at least three distinct analytical lenses through which developments in Big Data can be explored; one of these lenses is technical view which indicates that Big Data should be considered in auditing in terms of its impact on audit procedures, and in particular its capacity to provide a means to enhance audit quality. Finally, this study revealed that Big Data provides real tools to reconfigure contemporary audit practice. Equally these developments shouldn't be seen as golden ticket which is going to solve audit problem.

Accordingly, while there are challenges with embedding of Big Data, it has the potential to bring fruitful benefits especially for national development of countries which incorporate it & to businesses (that exploit its power for achieving their desired outcomes and thereby achieving their organizational goals). As well as, it offers promising opportunities for the audit as a new audit technology, therefore, it is essential to overcome these challenges in to fully utilize the Big Data.

5 Research Methodology

5.1 Data Collection

Data was collected through the questionnaire about the role of Big Data into audit for the purpose of supporting the audit process.

5.2 Study Population and Sample

5.2.1 Study Population

To achieve the objective of the study, the study population includes the following two categories;

- Academies related to auditing and Big Data in the Egyptian universities.
- Auditors in big-four with local partnership in addition to the local audit firms in Egypt.

5.2.2 Study Sample

The study sample is 200 subjects selected randomly from the study population.

5.3 Study variables

- Independent variable (X) is the Big Data Characteristics, including sub-variables X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}.
- Dependent variable (Y) is the Audit Quality including sub-variables Y_1, Y_2, and Y_3. The following table shows the study variables:

Table 2: the Study Variables

Variable	Coding
Big Data Characteristics	X
Big Data represents the data with high volume.	X_1
Big Data refers to the variety content of data.	X_2
Big Data contains financial data only.	X_3
Big Data velocity relates to the frequency of data generation.	X_4
Data Visualization is on feature of Big Data.	X_5
Big Data represents data that can be represented in a visualized charts.	X_6
Big Data includes structured and non-structured data.	X_7
Big Data reflects well organized data in a tabular form only.	X_8
Data variability is one feature of Big Data.	X_9
Big Data reflects multiplicity of data sources.	X_{10}
One feature of Big Data is its veracity.	X_{11}
Big Data denotes to validity of data.	X_{12}
Big Data concentrates on extracting valuable information to gain valuable benefits.	X_{13}
Audit Quality	Y
Inputs of the audit process	Y_1
Audit procedures & Audit evidence accumulation	Y_2
Outputs of the audit process.	Y_3

5.4 Study Hypotheses

1. "There is no significant statistical relationship between Big Data and audit quality".
2. "There is no significant statistical impact of Big Data on the audit quality".

5.5 Statistical Techniques

To test the study hypotheses and achieve their goals in order to ask the study questions, the following statistical techniques were used to analyze data:

- **Reliability and Validity Analysis**

The Cronbach's alpha test is used to test the degree of credibility in the questionnaire.

- **The Kruskal–Wallis Test**

It is a non-parametric method for testing samples originate from the same distribution, and don't follow a normal distribution. It is used when there are more than two independent samples of equal or different sample sizes.

- **Correlation Analysis**

Spearman correlation coefficient has been used to identify the significance, direction, and strength of the relationship between Big data and audit quality.

- **Regression Analysis**

It can be used to identify the most important predictive variables of the Big Data, as the independent variables appears in the model to illustrate its role in supporting the audit quality.

- **Descriptive Statistics**

Include the mean to describe the attributes of the study samples and standard deviation to analyze the views of two different categories, declare the most important variable and the least one.

- **One-Sample Kolmogorov-Smirnov Test**

Tests the normal distribution of the study data in order to determine the suitable statistical tests to analyze the desired data.

5.6 Testing Hypotheses and Analyzing Results

5.6.1 Descriptive Analysis of the Study Variables

The following table (3) represents descriptive statistical analysis to recognize the most important statements in addition to the least important one.

Table 3: the descriptive statistical analysis of the study variables

Factor	Statement	Mean	Standard Deviation
X	Big Data Characteristics.	3.68	.44
Y_1	Inputs of the audit process.	4.19	.48
Y_2	Audit procedures & audit evidence accumulation.	3.89	.48
Y_3	Outputs of the audit process.	3.73	.43
Y	Audit Quality.	3.93	.41

According to the table (3), we can consider the first dependent variable (inputs of the audit process) is the highest agreement one, with a mean (4.19) and standard deviation (.48), followed by the second dependent variable (audit procedures & audit evidence accumulation) with a mean (3.89) and standard deviation (48). Then, the third dependent variable (outputs of the audit process) can be considered as the least agreement with a mean (3.73) and standard deviation (.43).

5.6.2 Testing the First Hypothesis

The first hypothesis says that "There is no significant statistical relationship between Big Data and audit quality". The Spearman Correlation was used to study the relationship between Big Data (X) and the audit quality (Y). The following table (4) shows the results of this relationship:

Table (4) Correlation Matrix Coefficients among the Study Variables (X & Y)

	Statistics	Inputs of the audit process Y1	Audit procedures & Audit evidence accumulation Y2	Outputs of the audit process Y3	Audit Quality (Y)
Big Data represents the data with high volume (X1)	Spearman Correlation	.235**	.191**	.190**	.233**
	Sig.(2-tailed)	0.001	0.007	0.007	0.001
Big Data refers to the variety content of data (X2)	Spearman Correlation	.398**	.377**	.348**	.424**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data contains financial data only (X3)	Spearman Correlation	-0.033	0.107	.199**	0.098
	Sig.(2-tailed)	0.642	0.133	0.005	0.167
Big Data velocity relates to the frequency of data generation (X4)	Spearman Correlation	.400**	.393**	.377**	.441**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Data Visualization is on feature of Big Data (X5)	Spearman Correlation	.434**	.443**	.318**	.454**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data represents data that can be represented in a visualized charts (X6)	Spearman Correlation	.322**	.468**	.326**	.420**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data includes structured and non-structured data (X7)	Spearman Correlation	.456**	.467**	.399**	.499**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data reflects well organized data in a tabular form only (X8)	Spearman Correlation	-0.023	0.129	.256**	0.131
	Sig.(2-tailed)	0.750	0.069	0.000	0.064
Data variability is one feature of Big Data (X9)	Spearman Correlation	.213**	.375**	.224**	.307**
	Sig.(2-tailed)	0.002	0.000	0.001	0.000
Big Data reflects multiplicity of data sources (X10)	Spearman Correlation	.456**	.516**	.411**	.523**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
One feature of Big Data is its veracity (X11)	Spearman Correlation	.328**	.444**	.351**	.425**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data denotes to validity of data. (X12)	Spearman Correlation	.387**	.522**	.393**	.491**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data concentrates on extracting valuable information to gain valuable benefits. (X13)	Spearman Correlation	.332**	.437**	.314**	.410**
	Sig.(2-tailed)	0.000	0.000	0.000	0.000
Big Data Characteristics (X)	Spearman Correlation	.573**	.731**	.623**	.726**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000

- The results included in table (4) indicates that the correlation coefficient with the two stars (**) can express the strong relationship at 1% significance level, then there is a strong positive correlation between the basic variables Big Data (X) & audit quality (Y), as the correlation coefficient is (.726**), and at a significance level of (1%).
- As a result of the previous explanation, we can reject the first hypothesis: **H1**: *"There is no significant statistical relationship between Big Data and audit quality"* and accept the alternative hypothesis that there is a significant relationship between Big Data and audit quality.

5.6.3 Testing the second Hypothesis

The second hypothesis says that "There is no significant statistical effect of Big Data on the audit quality". Regression analysis was used to identify the effect of Big Data on audit quality. The following table (5) illustrates the results of regression analysis:

Table (5) the results of regression test related to the most important variables affectingY: Audit Quality

Symbol	Variables	Unstandardized coefficients		Standardized Coefficients	T	P-value	TOL	VIF
		B	Std. Error					
X1	Big Data represents the data with high volume.	0.013	0.023	0.030	0.580	0.563	0.806	1.240
X2	Big Data refers to the variety content of data.	0.046	0.030	0.096	1.564	0.119	0.587	1.705
X3	Big Data contains financial data only.	0.021	0.024	0.050	0.900	0.369	0.729	1.372
X4	Big Data velocity relates to the frequency of data generation.	0.053	0.031	0.096	1.716	0.088	0.708	1.412
X5	Data Visualization is on feature of Big Data.	0.069	0.027	0.142	2.579	0.011	0.732	1.366
X6	Big Data represents data that can be represented in a visualized charts.	0.114	0.038	0.167	3.028	0.003	0.727	1.376
X7	Big Data includes structured and non-structured data.	0.143	0.035	0.236	4.067	0.000	0.654	1.529
X8	Big Data reflects well organized data in a tabular form only.	0.045	0.020	0.124	2.278	0.024	0.741	1.349
X9	Data variability	-0.001	0.025	-0.002	-0.029	0.977	0.784	1.276

Symbol	Variables	Unstandardized coefficients		Standardized Coefficients	T	P-value	TOL	VIF
		B	Std. Error					
	is one feature of Big Data.							
X10	Big Data reflects multiplicity of data sources.	0.067	0.036	0.122	1.849	0.066	0.506	1.976
X11	One feature of Big Data is its veracity.	0.043	0.025	0.115	1.711	0.089	0.493	2.029
X12	Big Data denotes to validity of data.	0.068	0.028	0.177	2.431	0.016	0.419	2.388
X13	Big Data concentrates on extracting valuable information to gain valuable benefits.	0.027	0.025	0.065	1.065	0.288	0.589	1.698
Constant		1.191						
Correlation coefficient (R)		.768						
Determination Coefficient (R2)		0.589						
Adjusted determination coefficient (Adj.R2)		0.560						
F-test		20.516						
P-value		.001						

- The results included in table (5) indicates that the most important variables affecting the dependent variable (Y), as (F-test) is (20.516) and (P-value) is (.001), which can show that the model is valid for predicting the value of (Y) and the results have a statistical significance as the significance level is (.001) less than (5%), which helps us in making the decision.
- Moreover, the variance inflation factor (VIF) for each variable is less than (10) and tolerance (T) is greater than (0.1) for each variable, meaning that there is no multi-collinearity among the explanatory variables so the researcher can rely on the results of this model.
- There is a high correlation (.768) between the independent variables in the previous table and the dependent variable (Y: Audit Quality), and the determination coefficient (R^2) reveals that the explanatory variables are contributing to explain 58.9% of the variation in (Y) dependent variable.
- We can use the following equation to illustrate the main result obviously:

$$\mathbf{Y=1.191}+0.013X_1+0.046X_2+0.021X_3+0.053X_4+\mathbf{0.069X_5}+\mathbf{0.152X_6}+\mathbf{0.143X_7}+\mathbf{0.045X_8}+(-0.001)X_9+0.067X_{10}+0.043X_{11}+\mathbf{0.068X_{12}}+0.027X_{13}+e$$

- Therefore, we can refuse the second hypothesis: "There is no significant statistical effect of Big Data on the audit quality". And accept the alternative hypothesis that there is significant statistical effect of Big Data on the audit quality.

6. Conclusion and Recommendations

6.1 Conclusion

The study aimed at examining the effect of Big Data on audit quality. The most important findings of the study are the following:

- Big Data is a recent unfolding phenomenon that offers promising opportunities for improving the audit process through improving the professional skepticism, professional judgments and relationships between auditors and their clients, and thereby improving the audit quality.
- There is a significant relationship between Big Data and audit quality.
- There is significant statistical effect of Big Data on the audit quality.

6.2 Recommendations

The following recommendations that can be presented as following;

- Auditors need to become more comfortable and experienced to use adequate data, identify both data they need and analytics to perform and thereby driving suitable conclusion that support decision-making process.
- Then, auditors dealing with big data and data analytics, need to be adequately trained, have additional education & experience in information technology, statistics, and modeling.
- Audit Firms should assure that internal processes of data generation and control systems are performed conveniently in order to reduce dependence on irrelevant data.
- Setting special auditing standard related to applying the Big Data in the Egyptian environment to determine the mechanisms and motivations of applying it effectively.

6.3 Future Researches

- The relationship between Big Data & the solvency.
- The financial inclusion in an era of Big Data.
- The effect of Big Data on joint audit.
- The effect of Block chain on audit quality.
- Audit quality and Data Mining.

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