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Activating The Role of External Auditing of Big Data and Its Reflection on Economic Decision-Making An Analytical Study of Auditors' Offices and Companies Operating in the Kurdistan Region – Iraq

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Abstract:
The study aimed to highlight the activation of the role of external auditing of big data and to ascertain the extent to which this is reflected in economic decision-making, In order to achieve the study's objectives, the analytical descriptive curriculum was relied upon and a questionnaire was designed and distributed after being evaluated and judged by a number of specialists to the study sample of all the Kurdistan Region auditors' companies and offices who were (93) individuals, and the valid questionnaires for statistical analysis (87) were the identification of the equivalent (93.5%), to measure auditors' awareness of the benefits of using big data, to describe the main challenges they face when using their offices and companies for these data and how to deal with them, as well as to identify the impact of such audited data in the support of economic decision-making The two researchers used the SPSS statistical program to analyze this data and the simple regression analysis test was used to test the study hypotheses.
The study found a number of findings, the most important of which are: the benefits of the audit process under big data are one of the most important outputs of that process, and the emergence of constraints and challenges in that process contributes to the difficulty of dealing with them, which exposes the specificity and credibility of the audit process to risks, procedures and mechanisms are one of the most important ingredients for activating the audit process in the big data environment and that the ultimate objective of big data auditing is to improve economic decision-making.
The study made several recommendations, the most important of which were the need to address the obstacles and challenges facing the auditing process of big data in a rational way and to move away from illicit methods. and the need to raise auditors' awareness about the importance of big data auditing, which has an impact on improving audit outputs and quality; Auditors must activate their role in supporting and upgrading economic decision-making.
Keywords: Big Data, External Auditing, Economic Decision-making.

Introduction

In an era when the world has become a small village, economic units face a Big Data Revolution, the use of the vast amount of data produced, stored and made available across multiple networks has become a major asset in the modern economy and an important core resource that is just as important as financial and human resources in an era of constant change and instability. So it has become a necessary thing for economic units that want to achieve a high degree of quality and rationality in economic decision-making, to reorganize and redesign its operations to take advantage of those revolutions and developments and seek to overcome competition and develop its operations by leveraging the big data revolution to gain many strategic advantages. Based on the above, this study takes on the task of highlighting the impact of external auditing of big data on economic decision-making in response to developments in the fourth industrial revolution techniques with which techniques and methods capable of making radical

changes in all areas of accounting and auditing are accompanied by no exception.

On this basis, and in order to meet the objective of the study, the first study was divided into four sections. The first section examined the methodology of the study, the second examined the theoretical framework, the third examined the field aspect and the fourth examined the main findings and recommendations of the study.

Section 1: Study methodology

- **Study hypotheses**: A set of hypotheses can be formulated as follows:

Main hypothesis: There is no statistically significant relationship at a P-value (0.05) between the external auditor's role in the process of auditing big data and make economic decisions.

The following sub-hypotheses are subsumed from the main hypothesis:

Sub-hypothesis 1: There is no statistically significant correlation at a P-value (0.05) between the use of big data analyses and the realization of a range of advantages and benefits to meet the requirements of the big data audit process.

Sub-hypothesis II: There is no statistically significant correlation at a P-value (0.05) between the use of big data analyses and the external auditor's confrontation of a number of constraints and challenges in order to meet the requirements of the big data audit process.

Sub-hypothesis III: There is no statistically significant correlation at a P-value (0.05) between the external auditor's use of a group of mechanisms and procedures and their role in big data auditing.

Second Section: The Theoretical Framework of the Study

To complete the first section, which included the general framework of the study, the two researchers in the current study will review the study's variables, namely the profession of external auditing, big data and decision-making process as follows:

First: What is external audit:

The existence of the audit profession is necessary to meet the needs of the community where it is expected that the audit will always be in evolution and modernity in order to meet the evolving needs, and so we note that the audit profession is changing at an unprecedented pace and this is due to a change in the business environment, especially the technological development. The emergence of big data and its analysis, which will be a valuable addition to the economic unit and audit profession, the external auditor in view of the enormous technical progress in the client's business environment, faces a major challenge when carrying out his responsibilities related to the use of big data in the audit (Abdulkader, 2020: 803), external audit is the type of audit carried out by a party outside the economic unit in order to thoroughly and constructively examine the internal control systems, accounts, records and documents of the economic unit subject to audit; He or she is a qualified and independent professional person with a view to express an impartial technical opinion supported by arguments about the quality and confidence of financial information presented by the Economic Unit by adhering to applicable accounting standards and principles (Fared, 2018: 17), the external auditor is an intermediary between the economic unit and the external parties and the objective of his work is to reassure the users of the final financial lists of the extent to which this information represents a true, honest, sound and legitimate picture of the financial situation and the outcome of the economic unit's work (Logani, 2020:3).

Second: The conceptual framework of big data:

1-**Nature and Definition of Big Data**: Big Data is considered to be today's revolution data, where at every moment huge amounts of structured and unregulated data flow very significantly from multiple sources, the world has never seen so much data, and it's the good knowledge of the concept of big data that helps to understand it. A good understanding of it helps to paint a clear picture of it, which enables deep access and analysis, thus, to make the best use of them, data are primary materials that become valuable when they add meaning to them in order to convert them into useful information. As technology has evolved, that data has increased in volume, significantly and continuously, and has become referred to as big data. (Hammad, 160:2021), and the definitions for this term have varied, defining it as high-volume, high-speed, high-diversity information assets requiring new forms of processing to enhance decision-making and deep understanding and to

improve the process (Peace and creativity, 2018:5), while International Organization for Standards defined it as a set of structured or unstructured data that cannot be handled efficiently using traditional technology to benefit from it (Fatiha and Rasheed, 2019:65).

2-**Big Data Characteristics:** Big Data has the following main characteristics:

 Size: Size refers to very large datasets so that conventional tools are insufficient, which is the number of terabyte data we release daily from content,

Diversity: The diversity of such data between structured, unstructured and semi-structured, means a variety of data and a large number of diverse data sources to be combined, reflecting different data formats, such as quantitative, text and mixed models, as well as images, video and other formats,

Speed: Measuring the speed at which new data are available, which is often at a very rapid rate (Gepp et al., 2018:107).

Value: Where the quality and relevance of data can change significantly over time, which is described as correct.

Credibility: means unreliability inherent in certain data sources (Josh & Marthandan, 2018:1).

Multifaceted: When using Big Data, they must be analyzed and shown in different forms commensurate with the nature of their use, in this context they take multiple forms such as: statistics, numbers, geometric forms, etc. (Shehata, 2018:17).

Value variable: means that Big Data is constantly changing like social media data Kshetri, 2016:302),

Big Data analytics are conducted using techniques that detect hidden and unknown patterns and associations and highlight the interesting relationships they contain through the examination, processing, detection and presentation of the result, and enable understanding of market trends, user preferences and other valuable information that could not be analyzed using traditional tools (Hariri et al., 3019:8).

3-Big data analysis phases: Big data analysis phases can be summarized in the following five steps (Sivarajah et al., 2017:11-12)

Data capture and storage: Data are obtained and stored from a variety of sources to generate value from them.

Data extraction and filtering: This is about extracting and cleaning data from a wide range of unstructured data, given the diversity and overlap of big data.

Data aggregation and integration: By compiling and integrating structured data from unstructured data, big data often collects diverse activities across the internet such as: tweets, blogging, etc., which carries a variety of meanings and feelings.

Data Analysis and Modelling: Once the storage of structured and integrated data is completed the phase of data analysis and modeling follows which is centered on resolving the complexity of data relationships.

Data interpretation: This step is somewhat similar to visualizing data and making data understandable to users, and the results of data analysis and modeling are presented to decision makers to interpret the results and extract knowledge.

4-**The advantages and disadvantages of using big data in auditing**: the use of big data achieves and provides many advantages with attendant flaws and challenges in the audit process, and can be addressed as follows:

4.1. **Benefits of Big Data Auditing**: Big Data resulted from accelerated information and communication technology development to achieve many advantages and benefits, including:

1-With big data analyses, the auditor can audit all of the client's data without any exceptions, since in the past the auditor was forced to adopt samples in the audit process, compiling only evidences relating to that sample, external audit shifted from samples to continuous scrutiny (Al-Amayadeh, 2022:47).

2-Using big data analysis, auditors get more and better insight into their client, and it becomes possible to better identify risks.

3-Increased professional suspicion among auditors in the big data environment, due to the large volume and diversity of such data.

4-The adoption of contemporary big data models helps auditors to obtain a more reasonable assurance as to whether each financial statement is free of material misrepresentations.

5-Any failure of audit can reach their pockets and affect their reputations. To meet this challenge,

these offices have begun to provide structured audit methods through which audit is developed to assist in decision-making (Vanbutsele, 2018:37).

6-Analysis of complete sets of big data leads to higher and more appropriate quality audit evidence, giving more confidence to the auditing profession.

7-The application of big data techniques in auditing enhances the competitiveness in the audit market, especially in the long term.

8-Big Data analysis helps auditors predict financial distress, and improve the assessment of the continuity required for the economic unit (Ali, 2020:643 - 644).

9-The application of big data techniques reduces paperwork which helps speed up accounting processes, minimizes cost, reduces environmental damage due to paper residues, speeds up registration and data delivery, and reduces audit time.

10-Addresses the problem of lack of resources, improves the efficiency of audits, increases the accuracy of audits and expands the scope of their operations.

11-Helps develop and improve accounting and auditing activities, financial procedures and policies, reduces audit costs, improves decision-making and works to minimize risk (Mohammed, 2020:89).

12-Scrutiny under big data not only depends on the sample but also includes analyzing groups that improve audit quality and efficiency (Abdulkader, 2020:799).

4.2. Flaws and challenges of Big Data Auditing:

Big Data faces many flaws and challenges that hinder its benefits and benefits. The most important of these are:

1-Some auditors do not accept the idea of auditing in the big data environment, and auditing financial lists considering it as a big data environment. The volume of transactions that auditors analyze is still small, and the use of media and social platforms for the current time at least has little place in the audit procedure.

2-In a big data analysis environment, testing is done on the entire audit community and not the sample, which will affect the increased cost of auditing (Ali, 2020:646 - 647).

3-An audit profession needs to be restructured in line with future market requirements and requires developing and training auditors and acquiring some skills to analyze and use big data. Most economic units have proven to be successful in providing auditors with some skills in handling traditional data. In contrast, these economic units may seek to raise the level of training and thus increase their costs. These economic units may need to employ some big data analysts and invest in programs that support the analysis. This increases auditors' fees, the economic units must overcome these costs (Mohammed, 2020:94).

4-The concept and nature of big data remains unclear when used for checking financial statements, especially given the multiple sources of access, magnitude and diversity of such data.

5-The overload of the information may hinder the analysis and processing of this amount of data, and may confuse and hinder the work of auditors when performing audit.

6-The auditors use the financial and organizational statements only when forming an opinion on the financial lists. They are not accustomed to collecting non-financial or unregulated data, so there is a risk that they may not be able to distinguish between significant and non-significant data to determine appropriate data (Salijeni,et .al,2019 :103).

7-Under paper-based audit evidence, data obtained from abroad were seen as highly reliable, and given the rise of big data, the reliability of big data obtained from outside the economic unit has become questionable and doubtful, as it has become difficult to ensure that they are not changed.

8-Access to data required from internal sources may be more difficult than external sources, because some economic units do not allow auditors to access their own data, especially since many economic units invest heavily in protecting technology to secure their data (Younis, 2019:17).

Third: Conceptual framework for economic decision-making

1-The concept of the decision-making process: There is no doubt that, given the current progress in the various fields of science, there has been a significant change in the role played by the decision-making process, which is one of the most

important processes within the economic unit, being the key to judge the efficiency and effectiveness of managers and it is described as the core of the administrative process, the focus of the administrative function's activity and the starting point for all other operations and activities.

The decision was defined as the most appropriate and not the ideal choice of alternatives available to the resolution to accomplish the existing goal or objectives or to solve the problem awaiting the most appropriate solution (Al-Nawi, 2022: 30), and the decision-making process relates to a problem that requires a specific solution, which is developed consciously, perceptively, after study and reflection with the possibility of its implementation at the lowest cost and maximum return and as it is a process of choosing a strategy or of conducting and this process is organized, rational, far from emotions and based on study and objective thinking to reach a satisfactory or an appropriate decision (Elham, 2018:166),

Decision-making requires knowledge, comprehension and special skills, which requires decision makers at all administrative levels of the economic unit to understand what the concept of decision-making is, through the development of decision makers' knowledge and skills to solve the problems they face. (Al-Alwan, 2019:164), and others defined decision-making as a technical process to identify and select the best alternatives available to the decision-maker by pursuing sequential steps or elements that could ultimately lead to a particular result or achievement of a particular objective. Therefore, decision makers should consider decision-making as an integrated process from its earliest stage of understanding the problem until the resolution's implementation is achieved, and follow up of its implementation and assessment (Sami and Yassin, 2021:21).

2. Big Data Decision Making Stages:

To summarize Big Data Decision Making in three phases and each of these phases can apply technology tools suited to each phase. The phases are (Bofruch and Botigreen, 2017:13):

•**Intelligence phase**: The purpose of this phase is to obtain data relevant to the decision problem from the data stored in BD in order to create opportunities and alternatives once these data are analyzed. This phase represents the ability to collect value from big data.

•**Design phase:** It is the stage of generating opportunities and alternatives, at this stage business intelligence technique are used to analyze the content of big data. Also at this stage, criteria are set to judge and evaluate each alternative by the decision maker. Decision support systems are also used to assist the decision maker in obtaining a signal of the most appropriate alternative that can be implemented to solve the problem.

•**Decision implementation phase:** The decision is taken in the implementation of the satisfactory alternative to solving the decision problem.

3 - **The importance of using big data analytics in support of decision-making**: The vast amount of data produced, stored and made available from multiple locations has become a major strength of any knowledge-based society. If properly managed, these big data can make an effective contribution to the development of the economic and social environment (Fathia and Rasheed, 2019:2).

Big data help people learn the requirements of their usage and non-usage to make the right decisions, Big data enable them to identify and strengthen the insignificant data through analyzing such data provided to them, as well as the evolution of their ability to make this data meaningful, also these data allow to decrease efforts and time at all stages of decision-making using the tools and devices available to them, starting from data collection to analysis, as well as providing the best information from analysis process to decision makers, this creates new types of experiences in these economic units whose results may be better than traditional decision-making methods, more effective and credible (Makanani and Shabila, 2019:6).

Many economic units rely on the policy of big and complex data analysis, which requires software specialized in data management and analytics, which cannot be processed using just one tool or working on traditional data processing applications, data and information collection is known to help accurately characterize and analyze the problem to achieve accurate results. Therefore, a financial and administrative system including big data analysis had to be adopted (Al-Bar, 2018: 6). Big data analyses are processes in which the external auditor examines, cleans, converts and models big

data, to detect and communicate useful information and patterns, to propose conclusions and support decision-making, and to use big data for advanced analysis in many areas (Cao et al, .2015: 425), where many economic units analyze big data for use in different situations (Rashwan, 2020:11) and (Farage, 2021:161):

- Big data analysis helps make rational and appropriate economic decisions.
- Big data analysis helps improve the services provided to beneficiaries and stakeholders.
- The collection, processing and storage of big data helps to obtain accurate information on the basis of which economic decisions are made.
- Big Data analysis helps improve important future vision that can be implemented.
- Massive big data is dealt with by eliminating unnecessary data and identifying and analyzing the most important data for the target groups, and presenting it in a scientific, reliable and simplified manner to the decision makers.

Big data is considered to be the 21st century's oil. As in the case of crude oil, it can only be used and utilized once it is refined. Also, data can be used only if it is purified, analyzed and the most important is extracted from it for economic decision-making. (Ayta, 2019:699), and big data analysis is considered to be an effective basis at all stages of decision-making from the identification of problems, the identification of alternatives, and hence appropriate decision-making among the available alternatives and the assessment of decision outcomes in achieving predetermined objectives, and that the value of big data does not stop at decision-making, but continues to know the consequences of the decision, and to work on assessing its efficiency and its service to the objectives and gains of the economic unit (Bhimani & Willcock, 2014:472), therefore economic units must provide adequate and organizational infrastructure for the processing and analysis of big data to benefit from, allocate adequate budgets and recruit specialists with the required expertise and skills to handle big data (Shetty, 2021:207).

The rapid acquisition and processing of big data by competitors helps in timely decision-making and adds capacity to the economic unit to help it attract new customers and better productivity gains than those that lag behind in doing so.

Big data has first-class effects on better decision-making processes, which in turn improves the performance of economic units in line with the impact of decision support systems on organizational processes. Therefore, the more accurate data with the least noise and better distribution should see more use by the decision makers in order to increase the quality of the decision, data should be collected and selected among decision makers, big data factors that are highly competitive and more technology information intensive need to be increased (Shariah, 2021:23).

Third Section: The Field Aspect of the Study

This study explains, analyzes and presents the results of the field side of the study based on the information collected through the questionnaire. The questionnaire used in the study dealt with two sets of questions. The first group dealt with the respondents' personal information. The second group included the information on the subject of the study. Table No. (1) shows the contents and dimensions of the questionnaire for the current study.

Table 1: Contents of the study's questionnaire

Paragraphs and variables	Dimensions	Paragraphs No.	Total
General information	**Sample Data**	3	-
Big Data	**Benefits & advantages**	14	38
	Constraints and challenges	12	
	Procedures and mechanisms	12	
Economic decision -making	-	11	11
Total of paragraphs			49

Source: Prepared by the two researchers

The members of the study community consisted of all the companies and offices of auditors operating in the Kurdistan Region/Iraq, with a view to achieving the study's objectives, (93)

questionnaires were distributed to all the members of the sample examined and the number of returned forms valid for analysis were (87) questionnaires which is equivalent to a ratio of (93.5%), and the analysis of the questionnaire data was done through the Social Science Statistical Package Program (SPSS), table No. (2) shows the number of forms distributed, returned and valid for analysis.

Table 2: Number and Percentage of Distributed, Recovered and Valid Forms for Analysis

Governorates in Kurdistan	Number of auditors	Number of distributed forms	Number of returned and valid forms for analysis	Percentage of analytical forms
Erbil	79	79	73	%92
Sulaimaniyah	11	11	11	%100
Duhok	3	3	3	%100
Total	93	93	87	%93.5

Source: Prepared by the two researchers

In order to complete the field aspect, the researchers used some statistical methods:

First: Test the veracity, consistency and presentation of information on the questionnaire themes and analysis:

1. **Reliability and Validity Test**: This tool is consistently intended to give the same results if applied several times to population and the study sample itself. The reliability has been verified using the (Cronbach-Alpha) method, and (Reliability coefficient) values are statistically acceptable when they are equal to or greater than (0.60) and specifically in humanitarian studies, the questionnaire has achieved the required reliability, and for this analysis the researcher has adopted the program (SPSS V. 26) for its implementation, the results of which are shown in Table No. (3) as follows:

Table No. 3: Cronbach-Alpha Determinant Factor

Variables and dimensions	Number of phrases	Reliability coefficient	Validity coefficient
Benefits and advantages dimension	14	0.809	0.90
Obstacles and challenges dimension	12	0.715	0.85
Dimension of procedures and mechanisms	12	0.711	0.84
Big Data variable	38	0.815	0.90
Economic decision-making variable	11	0.817	0.90
Total indicator of identification terms	49	0.840	0.917

Source: Prepared by the two researchers based on the results of the statistical analysis

The questionnaire validity was verified using (Cronbach's alpha). We note from the table above that there is a strong correlation between reliability and validity tool which takes the square root of the Reliability coefficient value. The validity coefficient is equal to (0.917), which is a high value that indicates that the questionnaire validity is (91.7%) and it is acceptable at a high level.

2. **Study Data Test**: The statistical study hypothesis test requires that the study data be examined in order to adopt one of the statistical methods either according to the parametric or non-parametric

tests. To verify this in the current study data, the following tests were carried out:

Normal Distribution: After the mentioned analysis, the results in Table No. (4) show that all calculated significance values were greater than 0.05. This confirms that Shapiro-Wilk test values were all below the standard value of natural distribution (1.960) and with confidence levels (95%) indicating the availability of normal distribution condition in the current study data.

Table No. 4: Normal Distribution Requirement

Variables and dimensions	Shapiro – Wilk values	Degrees of freedom (df)	Significance value
Benefits and advantages dimension	0.971	87	0.059
Obstacles and challenges dimension	0.986	87	0.490
Dimension of procedures and mechanisms	0.977	87	0.122
Big Data variable	0.989	87	0.657
Economic decision-making variable	0.965	87	0.120

Source: Prepared by the two researchers based on the results of the statistical analysis

Independency: After testing, the results are shown in Table No. (5) on the absence of a subjective correlation between the dimensions of procedures and mechanisms, advantages and benefits, and constraints and challenges. This in turn indicates that those dimensions exceed the condition of Independency, allowing for the application of parametric tests.

Table 5: Independency requirement

Independent Variable	Dimension	Tolerance	VIF
Big Data	Benefits and advantages Dimension	.861	1.162
	Obstacles and challenges dimension	.952	1.050
	Dimension of procedures and mechanisms	.855	1.170

Source: Prepared by the two researchers based on the results of the statistical analysis

Variance Homogeneity: Results for this test are noted in Table No. (6) the significant values calculated for the Levin test and the variables and dimensions of study were greater than P-value of (0.05), which indicates the assumption of Variance Homogeneity is achieved and hence the possibility of applying parametric tests to analyze hypotheses, and supports that calculated (F) values were all lower than their tabular value of (3.105) and with the degrees of freedom (84, 2).

Table No. 6: Variance Homogeneity requirement

Variables &Dimensions	Levene Test		(F) Test	
	Statistic	Sig.	Value	Sig.
Benefits & Advantages Dimensions	1.386	0.256	1.058	0.352
Obstacles and challenges dimension	1.083	0.343	0.523	0.595
Dimension of procedures and mechanisms	1.389	0.255	0.437	0.647
Big Data Variable	**0.291**	**0.748**	**0.753**	**0.474**
Variable economic decision-making	**0.218**	**0.805**	**0.098**	**0.907**

F-value tabular degree of freedom (84, 2) = 3.105 N = 87

Source: Prepared by the two researchers based on the results of the statistical analysis.

Based on the results of the study data test, we conclude that statistical analysis of the current

study hypotheses can be carried out according to the parametric tests, thus giving high accuracy and reliability to the statistical test parameters.

Second: Analysis of the general (personal) information of the study sample individuals:

1. **Distribution of sample study personnel by governorate:** Table No. (7) shows that Erbil governorate has the highest number and distribution of auditors' offices compared to those in Sulaymaniyah and Dohuk governorates, indicating that most companies operating in the region focus their audits on the offices in Erbil because of presence of experienced people in Erbil.

Table No. 7:
Sample personnel distribution by governorate

Categories	Number	Percentage %
Erbil Governorate	73	83.9
Sulaimaniya Governorate	11	12.7
Dohuk Govrnorate	3	3.4
Total	87	100.0

Source: Prepared by the two researchers based on the results of the statistical analysis

2- Distribution of study sample personnel according to academic achievement: Table No. (8) shows that the majority of staff in the auditors' offices of the investigated offices have specialized certificates (CPA), which in turn reflects the efficiency and effectiveness of big data audits.

Table No. 8: Sample Distribution by Academic Achievement

Categories	Number	Percentage %
High Diploma	11	12.7
CPA	70	80.4
Master	0	0.0
PhD	6	6.9
Other	0	0.0
Total	87	100.0

Source: Prepared by the two researchers based on the results of the statistical analysis

3- Distribution of sample personnel by years of audit experience: Table No. (9) shows that the sample individuals' experiences are distributed over the years of work in the audit field at close levels, ranged between one and 20 years and over, and therefore not limited to only one or two categories.

Table No. 9: Sample distribution by years of experience

Categories (years)	Number	Percentage %
less than 5	23	26.4
5- to less than 10	15	17.2
10- to less than 15	13	14.9
15- to less than 20	20	23.1
20 years and over	16	18.4
Total	87	100.0

Source: Prepared by the two researchers based on the results of the statistical analysis

Third: Description and diagnosis of questionnaire variables:

A number of descriptive measures of statistical analysis have been used, which included percentage, frequency, mean, standard deviation

and response ratio. The study's variables and dimensions have been described in accordance with the following paragraphs:

1-The Big Data Variable: The description of this variable was based on its three dimensions: advantages and benefits, constraints and challenges, procedures and mechanisms, the results of which are as follows:

Advantages and Benefits Dimension: The results of description of this dimension are demonstrated in Table No. (10), it shows the ratio of agreement of the views of the sample members with respect to the phrases (X1 - X14) which were used to measure it tended to be agreed (fully agreed and agreed) by (78.7%). We can therefore say that advantages and benefits are the outputs of the audit process under Big data, and there is a high agreement on the role of advantages and benefits in activating the Big data audit process in terms of its storage, processing and distribution.

Table No. (10): Description of Advantages and Benefits Dimension

Paragraphs	Totally agree		Agree		Somewhat agree		Do not agree		Do not totally agree		Mean	Standard deviation	Response ratio%
	N	%	N	%	N	%	N	%	N	%			
X1	37	42.5	40	46.0	9	10.3	1	1.1	0	0	4.30	0.701	0.86
X2	19	21.8	53	60.9	14	16.1	1	1.1	0	0	4.03	0.655	0.81
X3	24	27.6	41	47.1	22	25.3	0	0	0	0	4.02	0.731	0.80
X4	12	13.8	55	63.2	19	21.8	1	1.1	0	0	3.90	0.629	0.78
X5	17	19.5	48	55.2	21	24.1	1	1.1	0	0	3.93	0.695	0.79
X6	17	19.5	51	58.6	18	20.7	1	1.1	0	0	3.97	0.673	0.79
X7	16	18.4	43	49.4	25	28.7	3	3.4	0	0	3.83	0.766	0.77
X8	5	5.7	49	56.3	30	34.5	2	2.3	1	1.1	3.63	0.684	0.73
X9	13	14.9	52	59.8	19	21.8	2	2.3	1	1.1	3.85	0.740	0.77
X10	36	41.4	45	51.7	4	4.6	2	2.3	0	0	4.32	0.673	0.86
X11	36	41.4	45	51.7	6	6.9	0	0	0	0	4.34	0.607	0.87
X12	18	20.7	52	59.8	16	18.4	1	1.1	0	0	4.00	0.665	0.80
X13	14	16.1	50	57.5	22	25.3	1	1.1	0	0	3.89	0.672	0.78
X14	13	14.9	56	64.4	18	20.7	0	0	0	0	3.94	0.598	0.79
Average		22.8		55.9		19.9		1.3		0.2	4.00	0.678	0.80
Total indicator	78.7				19.9		1.4						

Source: Prepared by the two researchers based on the results of the statistical analysis

The dimension of obstacles and challenges: The results of the description of this dimension are illustrated in Table No. (11), it shows that the ratio of agreement of the views of the sample members with respect to the terms (X26-X15), which were used to measure it, they tended to agree (fully agreed and agreed) by (69.2%), so we can say that the constraints and challenges are the difficulties facing the audit process under big data, and there is a high agreement on the role of obstacles and challenges in activating or disrupting big data auditing in terms of storage, processing and distribution.

Table No.11: Description of the dimension of constraints and challenges - Big Data

Paragraphs	Totally agree		Agree		Somewhat agree		Do not agree		Do not totally agree		Mean	Standard deviation	Response ratio%
	N	%	N	%	N	%	N	%	N	%			
X15	21	24.1	52	59.8	13	14.9	1	1.1	0	0	4.07	0.661	0.81
X16	15	17.2	28	32.2	40	46.0	4	4.6	0	0	3.62	0.825	0.72
X17	10	11.5	59	67.8	15	17.2	3	3.4	0	0	3.87	0.643	0.77
X18	19	21.8	54	62.1	10	11.5	4	4.6	0	0	4.01	0.723	0.80
X19	20	23.0	54	62.1	11	12.6	2	2.3	0	0	4.06	0.671	0.81
X20	10	11.5	37	42.5	32	36.8	7	8.0	1	1.1	3.55	0.846	0.71
X21	11	12.6	36	41.4	32	36.8	7	8.0	1	1.1	3.56	0.859	0.71
X22	3	3.4	46	52.9	33	37.9	3	3.4	2	2.3	3.52	0.729	0.70
X23	6	6.9	46	52.9	31	35.6	4	4.6	0	0	3.62	0.686	0.72
X24	19	21.8	56	64.4	8	9.2	4	4.6	0	0	4.03	0.706	0.81
X25	4	4.6	52	59.8	29	33.3	2	2.3	0	0	3.67	0.604	0.73
X26	2	2.3	62	71.3	22	25.3	1	1.1	0	0	3.75	0.511	0.75
Average		13.4		55.8		26.4		4.0		0.4	3.78	0.705	0.76
Total indicator	69.2				26.4		4.4						

Source: Prepared by the two researchers based on the results of the statistical analysis

 Dimension of procedures and mechanisms: The results of the description of this dimension is shown in Table No. (21), it illustrates the ratio of agreement of the sample's views to the terms (X38 - X27) that were used for measurement which tended to be agreed (fully agreed and agreed) by (89.5%) and so we can say that procedures and mechanisms are the components for activating the audit process under Big data. There is a high agreement on the role of the procedures and mechanisms adopted in activating the audit process for big data in terms of storage, processing and distribution.

Table No. 12: Description of Procedures and Mechanisms Dimension - Big Data

Paragraphs	Totally agree		Agree		Somewhat agree		Do not agree		Do not totally agree		Mean	Standard deviation	Response ratio%
	N	%	N	%	N	%	N	%	N	%			
X27	45	51.7	42	48.3	0	0	0	0	0	0	4.52	0.503	0.90
X28	42	48.3	42	48.3	1	1.1	2	2.3	0	0	4.43	0.640	0.89
X29	36	41.4	49	56.3	2	2.3	0	0	0	0	4.39	0.536	0.88
X30	35	40.2	43	49.4	8	9.2	1	1.1	0	0	4.29	0.680	0.86

X31	**34**	**39.1**	**44**	**50.6**	**7**	**8.0**	**2**	**2.3**	**0**	**0**	**4.26**	**0.706**	**0.85**
X32	**26**	**29.9**	**52**	**59.8**	**8**	**9.2**	**1**	**1.1**	**0**	**0**	**4.18**	**0.638**	**0.84**
X33	**21**	**24.1**	**46**	**52.9**	**14**	**16.1**	**6**	**6.9**	**0**	**0**	**3.94**	**0.826**	**0.79**
X34	**25**	**28.7**	**52**	**59.8**	**8**	**9.2**	**2**	**2.3**	**0**	**0**	**4.15**	**0.674**	**0.83**
X35	**26**	**29.9**	**45**	**51.7**	**15**	**17.2**	**1**	**1.1**	**0**	**0**	**4.10**	**0.716**	**0.82**
X36	**25**	**28.7**	**46**	**52.9**	**15**	**17.2**	**1**	**1.1**	**0**	**0**	**4.09**	**0.709**	**0.82**
X37	**25**	**28.7**	**56**	**64.4**	**5**	**5.7**	**1**	**1.1**	**0**	**0**	**4.21**	**0.593**	**0.84**
X38	**27**	**31.0**	**50**	**57.5**	**9**	**10.3**	**1**	**1.1**	**0**	**0**	**4.18**	**0.656**	**0.84**
Average		**35.2**		**54.3**		**8.8**		**1.7**		**0.0**	**4.23**	**0.656**	**0.85**
Total indicator	**89.5**				**8.8**		**1.7**						

Source: Prepared by the two researchers based on the results of the statistical analysis

Economic Decision-Making Variable: The description of this variable relied on a set of phrases adopted to measure it as evidenced by the description results shown in Table No. (13), the ratio of agreement of the views of the members of the sample to the phrases (Y11-Y1) used to measure it tended to be inclined to agreement (totally agreed and agreed) by (90.8%), so we can say that economic decision-making is a rational process to choose one alternative from two or more potential alternatives and to achieve a goal or a set of goals within a given period of time in the light of both the internal and external environment and the resources available to the economic unit, and that dealing with big data helps to give too much data, give more ideas and more choices to decision makers within the economic unit.

Table No. 13: Description of economic decision-making variable

Paragraphs	Totally agree		Agree		Somewhat agree		Do not agree		Do not totally agree		Mean	Standard deviation	Response ratio%
	N	%	N	%	N	%	N	%	N	%			
Y1	**42**	**48.3**	**43**	**49.4**	**2**	**2.3**	**0**	**0**	**0**	**0**	**4.46**	**0.546**	**0.89**
Y2	**33**	**37.9**	**48**	**55.2**	**6**	**6.9**	**0**	**0**	**0**	**0**	**4.31**	**0.597**	**0.86**
Y3	**25**	**28.7**	**58**	**66.7**	**4**	**4.6**	**0**	**0**	**0**	**0**	**4.24**	**0.528**	**0.85**
Y4	**23**	**26.4**	**60**	**69.0**	**4**	**4.6**	**0**	**0**	**0**	**0**	**4.22**	**0.515**	**0.84**
Y5	**31**	**35.6**	**49**	**56.3**	**7**	**8.0**	**0**	**0**	**0**	**0**	**4.28**	**0.604**	**0.86**
Y6	**31**	**35.6**	**47**	**54.0**	**9**	**10.3**	**0**	**0**	**0**	**0**	**4.25**	**0.633**	**0.85**
Y7	**31**	**35.6**	**51**	**58.6**	**5**	**5.7**	**0**	**0**	**0**	**0**	**4.30**	**0.573**	**0.86**
Y8	**24**	**27.6**	**54**	**62.1**	**9**	**10.3**	**0**	**0**	**0**	**0**	**4.17**	**0.595**	**0.83**
Y9	**26**	**29.9**	**49**	**56.3**	**12**	**13.8**	**0**	**0**	**0**	**0**	**4.16**	**0.645**	**0.83**
Y10	**12**	**13.8**	**47**	**54.0**	**28**	**32.2**	**0**	**0**	**0**	**0**	**3.82**	**0.656**	**0.76**
Y11	**40**	**46.0**	**45**	**51.7**	**2**	**2.3**	**0**	**0**	**0**	**0**	**4.44**	**0.543**	**0.89**
Average		**33.2**		**57.6**		**9.2**		**0.0**		**0.0**	**4.24**	**0.585**	**0.85**
Total indicator	**90.8**				**9.2**		**0.0**						

Source: Prepared by the two researchers based on the results of the statistical analysis

IV: Test of study hypotheses:

1- Macro-level analysis: It is the analysis of the correlation between the big data variable and

its three dimensions. The results of the analysis are as follows:

- **Sub-hypothesis 1:** Table No. 14 indicates that there is a significant and positive correlation between the use of big data analyses and achievement of a range of benefits and advantages to meet the requirements of the big data audit process, which has reached (0.741) at a significance level (0.01) and based on this result, we are assured to reject the first sub-hypothesis represented by the null hypothesis and accept the alternative hypothesis that (a statistically significant correlation exists between the use of big data analyses and the achievement of a range of advantages and benefits to meet the requirements of the big data audit process and at a P-value (0.05).
- **Sub-hypothesis II:** Table No. 14 indicates that there is a significant and positive correlation between the use of big data analyses and auditors' confrontation with a range of constraints and challenges to meet the requirements of the big data audit process, which has reached (0.650) at a significance level (0.01), and based on this result, we are assured of the rejection of the second sub-hypothesis (null hypothesis) and the acceptance of the alternative hypothesis, which states that (a statistically significant correlation exists between the use of big data analyses and auditors' confrontation with a range of constraints and challenges to meet the requirements of the big data audit process and at a significance level of (0.05).
- **Sub-hypothesis III:** Table No. 14 indicates that there is a significant and positive correlation between the use of a set of mechanisms and procedures by auditors and the auditing of big data, which has reached (0.714) At a significant level (0.01), and based on this result, we are assured to reject the third sub-hypothesis and accept the alternative hypothesis which states that (a statistically significant correlation exists between auditors' use of a range of mechanisms and procedures and their role in big data auditing and at a significance level of (0.05).

2- Analysis at the micro level: It is the analysis of the correlation between the three dimensions of the big data variable among each other, the results of the analysis include the following:

- The correlation between the dimension of advantages and benefits and the dimension of constraints and challenges mentioned in table 14 indicates that the advantages and benefits are not accomplished by constraints and challenges. Constraints and challenges are not the reason why auditors obtain advantages and benefits from big data auditing.
- The correlation between the procedures and mechanisms dimension and the advantages and benefits dimension mentioned in table 14 indicates that whenever auditors adhere to the territory's mechanisms and procedures specialized in auditing , this increases the advantages and benefits derived from analysis and auditing of big data, and vice versa.
- The correlation between the dimension of procedures and mechanisms and the dimension of constraints and challenges mentioned in table 14 indicates that the higher the levels of compliance of auditors with the territory's audit and audit mechanisms and procedures, the lower the levels of constraints and challenges they face when analyzing and auditing big data, and vice versa.

Table No. 14: Correlation between the big data variable and its dimensions

Variables	Advantages & benefits	Constraints and challenges	Procedures and mechanisms	Big data
Advantages & benefits	**1**	**0.170**	**0.358 ****	****0.741**
Constraints and challenges	**0.170**	**1**	**- 0.289***	****0.650**
Procedures and mechanisms	**** 0.358**	***0.289 -**	**1**	****0.714**
Big data	****0.741**	****0.650**	**0.714****	**1**

* * P-value at the level (0.01), * P-value at the level (0.05)

Source: Prepared by the two researchers based on the results of the statistical analysis

3- **Analysis at variable level**: The correlation between the big data variable and the economic decision variable mentioned in Table No. (15) states that there is a statistically significant relationship between them which has reached (0.277) at a P-value (0.01), indicating that there is a significant correlation between big data analysis by auditors and economic decision-making in the examined audit offices, which can be concluded that the better the auditors' levels in big data analysis the better this contributes to economic decision-making, and vice versa.

Table No. 15: Correlation between the main study variables

Variables	Big data	Economic Decisions
Big data	**1**	****0.277**
Economic Decisions	****0.277**	**1**

* * P-value at the level (0.01)

Source: Prepared by the two researchers based on the results of the statistical analysis

4- **Impact Relationship Analysis**: To recognize the influential role of auditors in the big data audit process in economic decision-making, simple linear regression has been applied, the results of the analysis are mentioned in Table No. (16) the impact of the independent big data variable on the economic decision-making variable, which indicates that if audit offices are to fulfill economic decision-making requirements, they must adopt big data analysis procedures.

Table No.16: The direct role of big data in economic decision-making

Model	Economic Decision making					
	B_0	B_1	R^2	Calculated F	Table F *	Sig.
The role of auditors in the light of big data	2.654	0.277	0.077	7.084	3.953	0.009
***F-value tabular degree of freedom (85,1)**						

N=87, P ≤ 0.05

Source: Prepared by the two researchers based on the results of the statistical analysis

Based on the results of the auditors' role in the big data audit process in economic decision-making mentioned in the previous table, the main hypothesis (null hypothesis) is rejected which states that (there is no role for auditors in the big data audit process in economic decision-making and at a significance level of 0.05) and the alternative hypothesis is accepted which states that (there is a role for auditors in the big data audit process in economic decision-making and at a P-value of 0.05).

Section IV: Conclusions and recommendations

This section is a summary of the two researchers' efforts in their study and findings. In the light of these findings, a set of recommendations has been developed and will be presented as follows:

First: Conclusions: In the light of what were presented, the most important findings of the study can be identified:

1. The results of the study found that data met the requirements for statistical analysis according to the parametric tests because they followed a normal distribution, and the condition of independency was met, as well as there was a homogeneity in the variation between the study variables allowing researchers to apply the parametric tests for the purpose of testing the study assumptions.

2. The advantages and benefits of the audit process in the light of big data are one of the most important outputs of that process, both for auditors and beneficiaries, as was indicated in the sample's opinions.

3. The emergence of constraints and challenges in the audit process under big data contributes to the difficulty in dealing with them, thus exposing the specificity and credibility of the audit process to risks, and subsequently adversely affecting evidence in audit processes as was indicated in the sample opinions.
4. The big data analysis was found to be difficult to understand when presented to users, which represented the highest level of constraints and challenges faced by auditors and as was indicated in the sample's opinions.
5. The procedures and mechanisms are one of the most important components of activating the audit process in light of big data as the study sample indicated this is importance, considering them as the requirements that must be available in an auditor such as the skills, capabilities, and contents of the reports submitted by them.
6. There has been an agreement among members of the sample that economic decision-making is a rational process for selecting one alternative from two or more potential alternatives and for achieving one goal or a set of goals within a given period of time and in the light of both the internal and external environment and the resources available to the economic unit.
7. The results of the study found that the higher the levels of compliance of auditors with the territory's audit mechanisms and procedures, the lower the levels of constraints and challenges faced by auditors when analyzing and auditing big data, and vice versa.
8. It can be inferred that sample individuals consider that the ultimate goal of big data auditing is to improve economic decision-making.

Second: Recommendations: In the light of the study's findings, the two researchers recommend the following:

1-The need to raise the level of auditors' awareness of the importance of big data auditing, which has an impact on improving audit outputs and quality, as well as enhancing their long-term capabilities.
2-The need for auditors to pay attention to sources of access to big data by determining the credibility of these sources and classifying them according to their importance to decision-makers or to solve customer problems.
3-Reengineering the control processes related to the audit profession in the Iraqi environment regarding how big data techniques and mechanisms are utilized to enhance their ability to make complex and innovative decisions based on large amounts of organized and unorganized data.
4-Achieving excellence by the sample individuals in the auditors' offices in their performance of big data auditing is not only accomplished through their expertise and skills but it is a must to employ the latest software and technologies that facilitate their operations in this field.
5-The obstacles and challenges facing Big Data Audit need to be dealt with in a rational manner and avoid illegal methods that compromise data security, and violate privacy.
6-There should be clear criteria on which auditors can depend on for the big data audit process in order to facilitate their work in guiding disputes and differences in points of view with beneficiaries, especially in the light of the growing need for financial and non-financial information to rationalize economic decisions.
7-The auditors should coordinate with academic authorities in holding workshops and training courses for stakeholders from the big data audit process as one of the methods needed to equip them with the required skills and also to remove ambiguity and lack of understanding by report users toward big data auditing.
8-The territory's academic institutions related to audit and accounting specialty should adopt appropriate topics in their curricula and to provide their graduates with the necessary knowledge to deal with the big data audit process.

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