# The impact of using big data accounting analytics on achieving financial sustainability in banks:  A survey of the opinions of accountants and financial managers in commercial banks

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## Abstract
*This research aims to identify the role of big data analytics in enhancing or improving the dimensions of sustainable financial performance, within the theoretical framework of big data and sustainable financial performance, and to study and measure the relationship between these variables. To achieve these aims, a questionnaire was developed and distributed to nine commercial banks listed on the Iraq Stock Exchange. Eighty questionnaires were distributed and statistically analyzed to arrive at the results. Among the most important findings of the research are the following: Big data is a significant factor in the world of accounting because it enables accountants to analyze financial and non-financial data, contributing to enhanced quality of accounting information and improved sustainable financial performance for banks. Today, big data analytics is a strategic tool used by economic units, including commercial banks, to improve financial sustainability by enhancing the quality of decisions made and predicting future financial risks.*

## I.    Introduction

Due to the significant evolution of the business environment in recent years, sustainability in financial institutions, particularly commercial banks, has become a key performance indicator. It is no longer limited to financial aspects but extends to their contribution to achieving sustainability through environmental protection, social welfare, and economic development, alongside effective governance. Commercial banks are among the most important financial institutions contributing to improving a country's economic standing.

Technological advancements are rapidly transforming business sectors in general. The shift from manual accounting systems to advanced algorithms, digital accounting, and automated accounting systems is a direct result of these technological developments. These technological advancements are being rapidly adopted by major commercial institutions focused on improving business strategies and enhancing accounting transparency. Public institutions use automated and digital accounting systems to ensure the accuracy, accountability, and transparency of their accounting practices. By employing advanced accounting techniques, they can reduce the risk of fraud and manipulation within their accounting systems. This improved accountability and transparency provides them with greater opportunities to raise capital from private sector investors and investment institutions (Appelbaum, Kogan, Vasarhelyi, & Yan, 2017; Kaya & Akbulut, 2018; Ramling, & Rittenberg, 2015). The need to integrate sustainability information into financial statements is highlighted to enhance the overall picture of corporate performance. Traditional financial statements often lack transparency regarding environmental and social aspects, limiting stakeholders' understanding of companies' true performance. Researchers indicate that independent sustainability reporting is a crucial step towards achieving transparency and evaluating performance according to the Triple Bulke (TBL) concept, which integrates economic, social, and environmental dimensions. This integration contributes to financial sustainability by improving accounting disclosure, boosting investor confidence, and ensuring continued growth (Al Dulamy & Al Dulamy, 2023, p. 442).

Sustainable development today also requires changes in accounting to meet the needs of users of financial and accounting information. Although the concept of sustainable development has become an increasingly common topic in accounting and management literature, the field of sustainable development offers countless research possibilities that have not yet been sufficiently explored, requiring exploration across different disciplines at the academic level (ANDREI et al., 2023, p. 149). The 17 Sustainable Development Goals (SDGs) proposed by the United Nations aim to stimulate activities and actions in areas of strategic importance to humanity and the planet (United Nations, 2015; Bebbington and Unnerman, 2018). Transparency in sustainability reporting and the adoption of digital accounting technology can improve operational efficiency and investor confidence, ultimately

contributing to better financial performance for companies, as demonstrated by the positive relationship between sustainability reporting and financial performance (Muliawan et al., 2024, p. 150). Companies that adopt sustainability reporting are considered more transparent and accountable to their stakeholders. This transparency impacts a company's reputation, which in turn can directly or indirectly affect its financial performance (Junwan et al., 2022). Therefore, it is important to understand how sustainability reporting contributes to a company's financial performance.

Big data analytics in accounting and financials offer opportunities to enhance environmental, social, and governance (ESG) reporting through real-time monitoring, predictive insights, and increased transparency. However, realizing the full effectiveness of these reports requires sophisticated regulatory frameworks, enhanced cross-sectoral collaboration, and wider technology adoption, particularly in emerging economies (Ahmed, 2025). Prominent accounting organizations, such as the American Institute of Certified Public Accountants (AICPA), the Financial Accounting Standards Board (FASB), and the Chartered Financial Accountants Institute (CFA), have helped to validate sustainability professionals' claims about the need for sustainability accounting (Biswas and O'Grady, 2016). Research has also indicated that companies that perform well in environmental, social, and governance (ESG) have better long-term financial performance, partly due to superior risk management, higher stakeholder confidence, and greater resilience to environmental and social shocks (Lee et al., 2024; Patay et al., 2020). The characteristics of financial sustainability accounting disclosure were measured through indicators developed for this purpose, which follow the Global Reporting Initiative (GRI) (G4). The results revealed a statistically significant effect of sustainability accounting disclosure on financial performance. The study results also showed that reporting on economic and social dimensions had a positive effect on return on equity (ROE). (Al-Dhaimesh & Al Zobi, 2019). Managerial awareness in banks is the most positive factor influencing the application of risk analysis in companies, while regulatory costs are the only negative factor. Accordingly, the researchers suggest adopting strategies to promote the use of risk analysis among listed banks in Vietnam, thereby increasing bank transparency, enhancing investor confidence, and improving operational performance, which in turn supports the achievement of long-term sustainability goals (Thi Lan & Thanh, 2025).

The results showed that economic, environmental, and social aspects have a significant positive impact on companies' financial performance. Furthermore, the two control variables (top management support and innovation) have a significant positive impact on the relationship between sustainability accounting and companies' financial performance (Elkholy, 2020, p. 39). Evidence from various studies and reports, along with the importance of auditing, points to the need to develop and improve accounting practices to enhance corporate financial sustainability. Research shows that adopting technology, particularly audit data analytics, can improve audit quality and provide accurate insights to support sustainable financial decision-making. (Zoet et al., 2023), Sustainable finance models play a key role in aligning financial decisions with long-term social and environmental goals (Zeolu et al., 2020). Sustainable finance not only positively impacts company value but also promotes corporate governance practices, thereby increasing its value in the banking sector (Tafsir, 2021). Furthermore, financial authorities regulate the implementation of sustainable financial practices to ensure adherence to sustainability principles (Kusumahadi et al., 2021). According to Khasawneh (2022), traditional expertise in finance and accounting is insufficient for achieving sustainable success as a business partner, thus adding long-term value. Furthermore, Bargman et al. (2023) found a lack of expertise in digitalization that would enable graduates and employees to successfully manage relevant processes in the workplace.

However, Tang and Yang (2023) noted that thanks to the robust computing and storage resources provided by cloud service providers, industries can rapidly increase or decrease their computing capacity as needed, allowing them to manage costs efficiently and enhance their responsiveness. Sustainability performance indicates a company's commitment to improving its social, environmental, legal, ethical, and economic performance, reflecting a voluntary commitment to sustainable business practices and social responsibility. Companies rely on assessment tools and frameworks to monitor and report on sustainability issues to stakeholders; however, weak transparency and the difficulty of verifying claims can lead to environmental misinformation. This is where accounting analysis plays a crucial role in providing accurate and reliable data, enhancing transparency and contributing to the financial sustainability of companies and the achievement of sustainable economic performance (Aryista et al., 2024). The results revealed an important role for sustainable financial practices and green accounting in improving the environmental and financial performance of companies. However, there are several challenges to implementing these practices, including limited data, regulatory barriers, and a lack of stakeholder awareness. (Fitrianim242;2024). Sustainable finance has emerged as a critical focus for investors and financial institutions, driven by growing concerns about environmental degradation, social inequality, and corporate governance practices. Integrating environmental, social, and governance (ESG) factors into investment strategies is no longer a niche consideration but a mainstream practice impacting the global financial system (Miloni et al., 2017). With the proliferation of big data and advanced analytics, investors can now leverage ESG data to make more informed decisions (Rahman, 2024). The evolution of data analytics, particularly in the context of financial markets, has enabled the extraction of actionable insights from vast amounts of structured and unstructured data (Monk and Rook, 2021).

Therefore, in under of the foregoing, the following research problem can be identified: Iraqi economic sectors in general, and the banking sector in particular, suffer from challenges and problems that hinder their operations. These include the problem of failing to achieve financial sustainability due to a lack of experience and understanding in applying modern technologies, including the failure to implement big data tools in banking operations and their actual impact on achieving the required financial sustainability. This occurs at a time when the Iraqi market is attractive to many foreign shareholders and investors, which has affected the sustainability of funding sources for the financial (banking) sectors. Despite the tremendous development in big data analytics technologies, there is also a lack of integration between modern data analytics technologies, including big data, and traditional systems. This leads to limitations in financial and accounting information systems, along with a weak ability to predict the future and manage financial risks, which negatively impacts the efficiency and sustainability of the bank's financial performance. Hence, the main research problem arises in the following question: What is the impact of using big data analytics on achieving financial sustainability in commercial banks? In light of this problem, the research Aims can be defined as follows:

1 -To identify the concept, definition, importance, and dimensions of big data.

2 -To analyze and study the relationship between big data and the accounting profession in light of studies. Previous.

3 -Identifying the conceptual framework of financial sustainability and its relationship to big data accounting.

4 -Measuring the extent to which accounting analysis of big data contributes to enhancing the financial sustainability of commercial banks. In under of the research problem and its objectives, the importance of the research can be summarized in the following points:

1 -The research will contribute to bridging the knowledge gap in accounting and financial literature related to accounting big data analytics and financial sustainability in the Iraqi banking sector.

2 -This research contributes to linking two modern fields in the financial environment: big data analysis in accounting and financial sustainability in the banking sector. This strengthens the theoretical framework for integrating technology to support sustainable development.

3 -The research presents an applied model on how to implement accounting big data in commercial banks. This model can be used when preparing future research in sectors other than the financial sector, especially in measuring the impact of digital technologies on their financial performance.

4- It contributes to guiding financial sectors, including commercial banks, towards the necessity of adopting and developing digital infrastructure for banks by building the skills and knowledge of bank employees, including accountants, auditors, and analysts. (financial professionals) to ensure long-term financial sustainability

## II. Lecture review

**First ;Big data**

Recent years have witnessed a growing interest among accounting researchers in big data applications, given their vast potential for analyzing massive and complex volumes of accounting and financial data. Big data is considered one of the most prominent technological developments that has contributed to reshaping traditional concepts of financial data processing, becoming an effective tool for supporting decision-making, improving the accuracy of financial reports, and enhancing transparency (Younes, 2019:13). Big data analytics is a modern revolution in information technology, as it has an effective ability to store, analyze and manage a large amount of data, whether structured, semi-structured or unstructured, to become useful to stakeholders and contribute to decision-making (Abd Al-Fattah et al., 2023:134).

The International Organization for Standardization (ISO) defines big data as a set of data with unique characteristics such as size, velocity, variability, reliability, and validity that cannot be efficiently processed using traditional methods (ISO, 2019). It is also defined as the use of techniques to examine and process large amounts of data to uncover relationships that help in understanding activities and functions and making decisions based on predictions and expected outcomes (Iman & Setareh, 2019, p. 5). Alternatively, it is a set of advanced analytical methods, processes, and techniques used to understand and process large datasets and uncover valuable information to reach conclusions that support sound decision-making (Boubaia & Al-Wafi, 2021, p. 534). Biglari et al. (2023, p. 166) define it as a set of big data that takes multiple and heterogeneous forms and cannot be analyzed using traditional tools or software. Walhasi & Ahmouda (2025, p. 302) define it as a large dataset characterized by speed, diversity, and complexity, making it difficult to process using traditional methods and requiring more complex approaches. Modern technology machine. Big data analytics involves performing several operations to maximize the benefits derived from the data used, as outlined by Rejeesh & Sanjay (2021):

1. Data management: This includes acquiring, organizing, validating, and processing data in a timely manner to ensure the availability of high-quality data.

2. Data mining: This involves examining data to discover types and establish relationships between various events based on links, sequences, and correlations.

3. Predictive analytics: This aims to predict future outcomes and includes statistical algorithms and machine learning techniques.

4. Textual data analysis: This involves scanning text from websites, emails, books, and documents. Big data is divided into three types (Walhasi & Ahmouda, 2025: 302):

1- Structured data, which is organized and structured in tables or databases and is ready for immediate processing and analysis (Abdelalah & Abdelmajid, 2024: 42).

2- Unstructured data, which is unorganized and difficult to analyze due to its unclear structure. IBM estimates that 90% of data is unstructured (Risen, 2023: 7).

3- Semi-structured data, which is a combination of the first type (structured data) and the second type (unstructured data) (Mohammed, 2024: 53). The most widely used definition of big data consists of four characteristics identified by Cartner Information Technology (Daniel, 2018; Abdel Ghaffar, 2021:487):

1- Volume: This refers to the generation of large quantities of data, which increases dramatically, requiring significantly more storage space than traditional databases.

2- Velocity: This refers to the speed at which data is generated and flows from transactions that require rapid processing and real-time analysis.

3- Diversity: This refers to the diversity of data sources and formats, as well as the variety of extracted data, which helps analysts select the data relevant to their work.

4- Reliability: This refers to the degree of trustworthiness of the data and information used for decision-making.

5- Change, complexity, value, and decay. Change refers to the continuous change of data. Complexity refers to the multiplicity, diversity, and heterogeneity of data sources. Value is considered the essence of big data because it will generate insights and benefits or not. Decay refers to the decrease in the value of data over time (Kashetri, 2016) (lee, 2017) (kuurila, 2017).

**Big data and its relationship to accounting**

Big data is a profoundly influential factor in the evolution of the accounting profession, particularly in expanding the role of the management accountant. Its characteristics have enabled accountants to analyze accounting and financial data more effectively, thereby enhancing the quality of management decisions and improving company performance. With this transformation, the management accountant has become a strategic partner in achieving organizational goals, rather than simply a performer of traditional tasks, as data-driven analysis contributes to supporting financial sustainability and ensuring the optimal use of resources (Elhoushy, et al., 2023). Data analytics has had a significant impact on the accounting sector, enabling accountants to make sound decisions based on real-time data. However, there are some challenges and problems associated with implementing and adopting advanced analytics and business intelligence in accounting systems. Business managers must focus on these challenges and problems when implementing technology development plans in business organizations, especially accounting departments (Aziz, 2023, p. 649). In a field study to survey the opinions of a sample of (209) accounting professionals in the Egyptian business environment, through a questionnaire, to identify opportunities for using big data in accounting, to clarify the most important challenges facing the accounting profession when using big data, and to measure the impact of big data on the quality of accounting information in the Egyptian business environment, the results showed that most of the sample agreed that there is a substantial impact of using big data in accounting on the quality of accounting information in the Egyptian business environment (Hassan, 2024:567). In a study by Sardi et al. (2020), the results indicated a significant increase in the number of published research papers related to big data and performance, while there was a shortage in the fields of management and accounting. Hassan (2024: 580) found a scarcity of studies conducted on the Arab environment concerning big data and its importance in accounting in general. Continuing the discussion of the role and impact of big data on the accounting profession, a study by Rezaee & Wang (2018) analyzed the importance and value of big data and concluded that interest in this data remains constant and increasing, along with the necessity of using it to reduce current and future accounting discrepancies and evaluate the current financial performance of companies. Big data helps accountants manage their work and their relationships with clients by providing them with timely financial and non-financial information. There is also a significant and positive correlation between big data and the qualitative characteristics of accounting information (Saad & Mutter, 2022: 25). In a study by Pourabedin & Vance (2023: 15), big data provides an opportunity for more objective fair value assessments. Big data offers opportunities to improve the quality of accounting information by integrating new non-financial data into its operations. A study by Walhasi and Ahmouda (2025:299) found that big data recognizes the importance of improving the accounting and auditing profession, despite obstacles related to a shortage of qualified personnel. A study by Abdel-Aal et al. (2022:228) showed that adopting big data has a positive impact on accounting disclosure, company characteristics, and remeasurement. However, this adoption did not show a significant impact on changing accounting measurement methods and estimates in the United Kingdom. A study by Abdel-Ghaffar (2021:485) addressed a different approach by examining the impact of big data. It offered a future vision for using big data analysis and processing to improve the quality of electronic accounting disclosure of the informational content of integrated business reports, and

concluded that it does affect the quality of electronic accounting disclosure of informational content. A study by Riziq et al. (2023:5) found that big data analysis affects the use of accounting information systems on the quality of financial reports, which in turn helps improve financial performance through decision-making. Sound Decision-Making. The importance of big data in accounting is highlighted by (Abdul Ghaffar, 2021:485) (Geord, et al., 2018; Zhaohao, et al., 2018; Wang, et al., 2018; Marijn, et al., 2017; Acharjya and Kauser, 2016):

1- Providing more effective support for integrated business operations through the use of financial and non-financial information to disclose company performance.

2- Detecting material misstatements in financial statements, especially in the financial sector (banks).

3- Enabling banks to provide better services to users of financial reports in terms of both financial and non-financial data.

4- Enhancing the opportunities for sound decision-making in banks based on information derived from financial and accounting data.

5- Increasing the bank's ability to make predictions about future accounting information that support decision-making.

**Second; The concept and definition of financial sustainability**

The concept of financial sustainability is relatively recent, emerging after the concept of sustainable development, of which it is a part. However, it specifically concerns the economic unit and its economic and financial aspects, as well as its continuity and sustainability (Al-Jarhi, 2023: 1340). The concept of sustainability initially involves achieving solvency and liquidity. Solvency is the ability of an economic unit to meet its financial obligations, and it is achieved when the current discount rate for current and future expenditures is less than the discount rate for current and future revenues less debt repayments. This means having sufficient financial resources to meet financial obligations when they fall due (Bani Lam, 2018: 475). Financial sustainability is the study of how an economic unit operates and controls the external and internal variables that contribute to its continuity and the effective increase of its resources and wealth. The main function of financial sustainability in economic units is to identify and analyze the total cost and the possibility of diversifying their financial resources (Al-Jarhi, 2023: 1340). Financial sustainability describes the steady increase in an organization's revenues and the continued free use of its funds. It is a continuous process of production and sales. Financial stability is formed during production and economic activities and is a fundamental element of the organization's overall sustainability (Bulatovic, 2019: 4641-4642). Sustainability is the ability of an economic unit, both present and future, to meet its financial obligations and service its debts without rescheduling or accumulating arrears. It is the ability to bear debt without requiring significant future adjustments to fiscal policy to balance revenues and expenditures (Benni Lam, 2018: 475). Financial sustainability depends on a range of financial and managerial factors that influence institutional performance (Afriyie, 2015: 20). The importance of sustainability lies in enhancing the resilience of financial institutions and their ability to adapt to challenges by improving efficiency and transparency and strengthening control over internal processes. Financial sustainability also contributes to supporting economic and social development by reducing financial risks and enhancing trust among investors and stakeholders (Laktionova et al., 2020: 98). Financial sustainability helps banks adjust their operations so they can be used as an effective tool for strategic decision-making, increasing their ability to withstand fluctuations and mitigate future risks. Key dimensions of financial sustainability include risk management, improved organizational performance, and ensuring long-term economic viability (Caruana et al., 2019: 2).

**The Goal & Importance and dimensions of Financial Sustainability**

Financial sustainability aims to ensure the achievement of its objectives by guaranteeing sufficient income to enable investment in its current and future activities. To achieve this goal, the economic unit needs to maintain sustainable growth, particularly with regard to its financial position. Sustainable growth is the rate at which the economic unit can grow while maintaining its financial policies and profitability without change (Hussein & Sabiha, 2020). Based on the study by Saeed & Taleb (2022:25), the importance of financial sustainability in banks can be determined, as it is considered one of the fundamental pillars for the success and stability of institutions in the 21st century. It has become an essential part of their strategies to ensure a balance between economic, social, and environmental dimensions, thus contributing to strengthening their position and continuity in the contemporary business environment (Abu Samra, 2017). It also contributes to improving institutional efficiency and transparency by promoting financial discipline and good governance, which leads to increased investor and depositor confidence in the performance of financial institutions (Folwell, 2017; Chikaliba, 2015). Its importance is further highlighted in supporting economic and social development by enhancing the ability of institutions to direct their resources towards achieving sustainable growth, reducing poverty rates, and improving the self-sustaining development of banks by reducing non-performing loan ratios and increasing financial stability (Al et al., 2019; Tsionas & Tan, 2020). In addition, financial sustainability is a strategic tool for making sound financial decisions, as it enables institutions to manage their resources efficiently and direct them towards activities that achieve sustainable returns and reduce future risks (Mei & Shuleka, 2020). Finally, financial

sustainability contributes to achieving overall economic prosperity by increasing revenues and improving the efficiency of banks' financial performance, which enhances their competitiveness and continuity in the markets (Pulato, 2019; Nosratabadi, 2020). The dimensions of financial sustainability can be defined (Al-Jakhlab & Al-Jamasi, 2023:63):

1. Strategic Financial Planning: This focuses on ensuring the adequacy of current and future financial resources for institutional growth, with a focus on achieving strategic objectives rather than merely managing day-to-day operations.

2. Financial Resource Management: This includes accurate budgeting, transparency in financial management, and building robust control systems to ensure efficient resource allocation and long-term financial sustainability (Molony & Petwrsson, 2017).

3. Sustainable Financial Integration: This aims to maintain long-term and short-term capital to ensure the company's continuity, while enabling current and future generations to benefit from financial resources sustainably.

4. Liquidity: This means having the necessary cash to meet financial obligations on time, legally and smoothly, and with minimal losses, to ensure the stability of day-to-day operations (Cheptot, Iravo & Wandera, 2017).

5. Sustainable Income Generation: This includes diversifying internal and external income sources to provide the necessary funding for core operations, reducing potential economic risks, and keeping administrative costs at reasonable levels.

6. Capital Technology supporting operations: This refers to the proportion of capital allocated to support modern, long-term operations, through the adoption of digital financial services and available technologies such as electronic cards and long-term loans, thereby enhancing financial sustainability (Cheptot, et al, 2017).

**Third ;The impact of using big data accounting analytics on achieving financial sustainability in banks**

Big data aims to transform financial sustainability indicators into tools that improve company performance, but it is constrained by these obstacles that hinder the full potential of the data revolution in terms of preparing more reliable and transparent financial data reports (Qi & Cao, 2025). The impact of financial sustainability reporting and digital accounting systems on corporate financial performance has become a significant topic in various academic studies and business practices. Sustainability reporting is believed to increase consumer loyalty, attract environmentally conscious investors, and create long-term value (Potry, 2021). Digital innovation in accounting leads to efficient accounting management characterized by authenticity, reliability, credibility, and transparency. Big data, data analytics, cloud computing, artificial intelligence, and blockchain technology are promising areas for future research directions in sustainable accounting practices. (Alsulami, 2025, p. 38). A quantitative approach was applied in this study to a sample of 81 individuals in senior financial, operational, and executive positions at major Saudi manufacturing companies. The results of the multiple regression analysis revealed that organizations that effectively integrate big data analytics into their risk management practices improve their sustainability performance. Furthermore, the study expands on future big data trends, confirming its role as a key contributor to long-term corporate sustainability. (Abdelhalim & Hassan, 2025). Big data financial analytics contributes to enhancing the quality of financial sustainability reporting by improving data collection and integration, real-time data analysis, stakeholder engagement, detailed reporting, and supporting predictive and foresight analytics, predictive modeling, and advanced strategic planning solutions (Hussien, et al., 2025).

The relationship between big data analytics and the credibility of sustainability reports is explained through the lens of the knowledge-based perspective (KBV), which views knowledge as a strategic resource that enhances corporate performance. In this context, big data analytics is a means of transforming accounting and environmental data into actionable knowledge for decision-making. This knowledge analysis contributes to enhancing the reliability of reports and supporting financial sustainability by providing accurate insights that aid in the optimal use of resources and the achievement of long-term goals (Hussien et al., 2025). The knowledge-based perspective theory demonstrates that big data analytics transforms data into knowledge that contributes to improving organizational performance. Through this analysis, the reliability and credibility of financial sustainability reports can be enhanced. Knowledge derived from accounting and financial data enables more efficient decision-making. Thus, data analytics becomes an essential tool for achieving financial sustainability and promoting the optimal use of resources (Juthi et al., 2024). The study by Abdel Hamid and Ismail (2022) aimed to analyze the differences in the perceptions of bankers and academics regarding the impact of transitioning to digital banking services and disclosing expected credit losses on enhancing banks' financial sustainability. It also assessed the relationship between these variables and their direct impact on sustainable financial performance. The results showed a difference in viewpoints between the two groups, along with a significant impact of digital transformation and financial disclosure on achieving financial sustainability. The study also demonstrated a strong positive correlation between digital transformation and transparent financial disclosure in supporting the stability and sustainability of banks.

In under of this, researchers concluded that big data analytics has a significant and positive impact on improving financial sustainability by enhancing the quality of financial decisions, increasing the accuracy of future forecasts, strengthening risk management, and improving the overall performance of banks. Achieving this sustainability requires investment in banks' digital infrastructure, developing the knowledge and skills of bank accountants, and fostering integration between traditional systems and data analytics systems. The impact of big data analytics on financial sustainability can be summarized in the following points:

1- Improving the quality of strategic financial and accounting decisions, which helps big data analysts make sound and effective decisions, thus enhancing banks' financial performance.

2- Increasing the accuracy of accounting and financial forecasts, which provides data analytics users with a deeper future perspective, thus serving the future performance of banks.

3- Big data analytics tools contribute to more effective risk management by proactively identifying and predicting risks, thus improving risk management.

4- Big data analytics supports innovation in production processes by providing accurate information and impactful financial analyses.

5. Big data accounting leads to more neutral and accurate financial reports that accurately reflect the actual situation, thus increasing their credibility among users.

6. The use of big data accounting techniques improves the quality of accounting information and sound decision-making, which in turn enhances financial sustainability by increasing the company's financial returns. In under of this, the following recommendations are necessary to enhance financial sustainability in commercial banks through the use of big data analytics:

1. Developing and modernizing the banks' infrastructure to enable the rapid and efficient processing of accounting data by optimizing the use of the banks' digital infrastructure.

2. Developing the knowledge and skills of accountants and auditors by training accountants, auditors, and financial managers in banks to acquire the skills to effectively use big data analytics tools, thereby enhancing the financial sustainability of banks.

3. The need to enhance security and privacy in banks by implementing robust security policies to protect accounting and financial data from hacking and cyberattacks. This will strengthen the value and reputation of banks.

4. A comprehensive upgrade of accounting and financial systems is necessary, achieved by integrating traditional accounting systems with electronic big data analytics systems.

5. The importance of promoting a culture of big data analytics by encouraging bank employees to use big data analytics tools through training, workshops, and seminars to foster wider adoption of these tools within the banking sector.

## III. Discussion of Statistical Analysis Results and Hypothesis Testing

This section highlights the results of the statistical analyses obtained by the researchers using a questionnaire developed according to the research variables. (90) questionnaires were distributed to employees (accountants, auditors, department managers, and financial analysts) in (9) commercial banks listed on the Iraq Stock Exchange, as well as auditors in government units located in Samawah. (80) questionnaires were returned, representing approximately 92%.

**Research Hypotheses**

The main research hypothesis is that there is a correlation between big data analytics and sustainable financial performance. This hypothesis branches into five sub-hypotheses:

1 -Big data analytics has a statistically significant effect on improving the (financial dimension) of efficiency and sustainable financial stability.

2 -Big data analytics has a statistically significant effect on the dimension of governance and sustainable financial management. 3. There is a statistically significant effect of big data analysis on the strategic dimension (growth and future sustainability).

4 .There is a statistically significant effect of big data analysis on the fourth dimension (social and environmental) (responsible and sustainable finance).

5. There is a statistically significant effect of big data analysis on the dimension of sustainable financial risk management.

**First: Description of the Study Sample**

The research sample consists of a group of 80 employees working in commercial banks. The research was conducted on the individuals in the sample. To understand the research sample, it is necessary to identify the characteristics of its members. These characteristics include:

 a) Years of employment.

Table (1) Characteristics of the research sample according to years of service

| Years of employment | Percentage | Repetition |
|---|---|---|
| Under 5 years | 31% | 25 |
| 6 to 10 years | 38% | 30 |
| 11 to 20 years | 19% | 15 |
| Over 20 years | 12% | 10 |
| Total | 100% | 80 |

The table shows the distribution of the research sample according to years of service in their field. The total number of respondents was (80). It appears that the largest percentage of the sample consisted of those with intermediate experience, ranging from (6 to 10) years of service, totaling (30) individuals (38%). This indicates that the majority of participants possess sufficient practical experience to provide realistic and accurate opinions on the research topic. The second largest group was those with less than 5 years of experience, numbering (25) individuals (31%). This group represents relatively new employees who can reflect modern and updated perspectives in light of recent developments in the financial or accounting field. The group with experience ranging from (11 to 20) years comprised (15) individuals (19%). This group represents a segment of long-term experienced professionals who can offer more mature evaluations based on accumulated professional experience. Finally, those with more than 20 years of experience constituted (12%), totaling (10) individuals. Although small in number, the sample represents high-level expertise that adds depth to the analysis and understanding of long-term institutional practices. The results indicate that the majority of the sample (69%) possess professional experience ranging from 6 to 20 years, reflecting a good balance between practical experience and a realistic perspective on the research issues. Furthermore, the distribution of the sample across different years of service enhances the comprehensiveness of the data and enables the analysis of viewpoints across diverse experience levels, thus lending credibility and intellectual diversity to the study's findings.

**B- Academic Qualification**

Table (2) Characteristics of the research sample according to academic qualification

| Academic Qualification | Percentage | Repetition |
|---|---|---|
| Diploma | 25% | 20 |
| Bachelor's | 55% | 45 |
| Master's or equivalent | 15% | 12 |
| PhD | 5% | 3 |
| Total | 100% | 80 |

The table shows the distribution of the research sample members according to their educational qualifications. The total sample size was (80) individuals. It is evident that the largest percentage of the sample members hold a bachelor's degree, numbering (45) individuals (55%). This indicates that most of the sample members possess intermediate to advanced academic qualifications, enabling them to understand the research topic and deal effectively with its scientific and accounting concepts. Those holding a diploma came in second place with (20) individuals (25%), a significant percentage representing a group with field and practical experience in the financial or administrative field, thus strengthening the applied dimension of the research findings. Meanwhile, the number of those holding a master's degree or its equivalent (advanced diploma) reached (12) individuals (15%), indicating the presence of a segment of highly qualified individuals capable of providing deeper analytical insights that contribute to enriching the research content. Finally, only 5% of the sample (3 individuals) held a PhD, a small percentage, but it adds a specialized scientific dimension of high academic experience. Generally, the majority of the sample (75%) possessed at least a bachelor's degree, which enhances the credibility of the results and the sample's ability to grasp and analyze the research questions accurately. Furthermore, the diversity of educational levels, ranging from diplomas to postgraduate studies, contributes to a balanced sample and a variety of perspectives, lending the results greater comprehensiveness and realism.

**c- Scientific Specialization**

Table (3) Characteristics of the research sample according to scientific specialization

| Scientific Specialization | Percentage | Repetition |
|---|---|---|
| Accounting | 44% | 35 |
| Management | 14% | 11 |
| Economics | 5% | 4 |
| Finance and Banking | 25% | 20 |
| Other Specializations | 12% | 10 |
| Total | 100% | 80 |

The table shows the distribution of the research sample by academic specialization, with a total sample size of (61) individuals. The data reveals that accounting represents the highest percentage among the respondents at (44%), or (35) individuals. This indicates that the majority of the sample possesses direct knowledge in the field

of accounting, which enhances the accuracy and relevance of their answers to the research topic related to the financial and accounting field. Finance and banking come in second place at (25%), or (20) individuals, reflecting a clear interest among professionals and students in this field in the research topic, especially if the research addresses issues related to financial sustainability or financial analysis. Management comprises (14%) of the sample, or (11) individuals, adding a managerial perspective that supports understanding the applied and organizational aspects of the study. Economics constitutes only (5%) of the sample, or (4) individuals, a limited percentage that contributes to providing a comprehensive analytical view of the economic indicators related to the research. Finally, other disciplines represent 12% (10 individuals), indicating a diversity of knowledge within the sample, which may contribute to a broader range of perspectives on the study topic. Overall, the table shows that the sample is predominantly accounting and financial (69%), which strengthens the data's validity and consistency with the research objectives, particularly if the focus is on financial or accounting issues. Furthermore, the presence of other disciplines to varying degrees provides the study with a degree of diversity in academic backgrounds, enriching the analysis and mitigating any bias towards a single discipline.

**Second: Cronbach's Alpha Test to Determine the Reliability of the Questionnaire Items**

Cronbach's alpha was used to measure the reliability of the questionnaire items, as shown in Table (4). Therefore, the reliability coefficients range between (0.660-0.750), indicating that the reliability coefficients are consistent for the dimensions of the questionnaire items. The overall value of all items (0.716) indicates that the questionnaire is highly reliable, and that all five axes are interconnected and work to measure the overall concept of the research in a consistent manner.

**Table (4) shows the reliability coefficients for the questionnaire items**.

| Axis | Title Axis | Number of Items | Cronbach's Alpha Reliability Coefficient |
|---|---|---|---|
| First | **The impact of big data analytics on improving (the financial dimension) efficiency and sustainable financial stability.** | 10 | 0.730 |
| Second | **The impact of big data analytics on the governance and sustainable financial management dimension.** | 11 | 0.740 |
| Third | **The impact of big data analytics on the strategic dimension (growth and future sustainability).** | 10 | 0.701 |
| Fourth | **The impact of big data analytics on the fourth social and environmental dimension (responsible and sustainable finance).** | 12 | 0.660 |
| Fifth | **The impact of big data analytics on the sustainable financial risk management dimension.** | 12 | 0.750 |
| Total | All paragraph | 55 | 0.716 |

The reliability test results indicate that the measurement tool used in the research has a high degree of internal consistency and reliability, confirming its suitability for accurately and objectively measuring the impact of using big data accounting analytics on achieving financial sustainability in commercial banks.

**B- Internal Consistency of the Questionnaire Items**

The internal consistency of the questionnaire items for the study sample (55 items) was calculated, as well as the correlation coefficient between all of these items.

1- Measuring the internal consistency of the items in the first axis (The impact of big data analytics on improving (the financial dimension) efficiency and sustainable financial stability)

**Table (5) Correlation coefficients between each item of first axis and the total score of its items**

| No. | Paragraph | Correlation coefficient | Significance level |
|---|---|---|---|
| **1** | **The bank relies on big data analytics to improve cash flow management.** | 0.580 | .000 |
| **2** | **Big data technologies contribute to detecting financial waste risks and reducing operating costs.** | 0.422 | .001 |
| **3** | **The bank uses big data analytics systems to accurately forecast future revenues and expenses.** | 0.659 | .000 |
| **4** | **Accounting big data analytics contributes to increasing the efficiency of surplus financial investment in commercial banks.** | 0.551 | .000 |
| **5** | **Financial big data helps enhance banks' ability to maintain stable capital adequacy ratios.** | 0.475 | .000 |
| **6** | **Big data analytics contributes to improving the accuracy of financing and investment decisions within the bank.** | 0.380 | .002 |
| **7** | **Big data technologies help identify the most profitable revenue streams and optimize the allocation of financial resources.** | 0.500 | .000 |

| 8 | Big data analytics systems enable banks to detect financial imbalances before they worsen. | 0.490 | .000 |
|---|---|---|---|
| 9 | The use of big data contributes to improving the efficiency of working capital management in the bank. | 0.520 | .000 |
| 10 | Big data enables senior management to make financial decisions based on immediate and accurate indicators. | 0.540 | .000 |
| | | 0.512 | .000 |

The table (5) above shows the correlation coefficients between each item in the first axis and the total score for each item. The correlation coefficients ranged from 0.380 to 0.659 at a significance level of 0.05 .Since all correlation coefficients are positive and statistically significant, this indicates the validity and reliability of the items in measuring the financial dimension variable under study. The highest correlation coefficient (0.659) was achieved for item (3): "The bank uses big data analytics systems to accurately predict future revenues and expenses".This indicates that the predictive power of big data is one of the most important determinants of financial stability in commercial banks.The lowest correlation coefficient (0.380) was recorded for item (6): "Big data analytics contributes to improving the accuracy of financing and investment decisions within the bank".This correlation is statistically acceptable and significant at the 0.05 level, meaning that all items are positively correlated with the total score for the axis. The average overall correlation coefficient for the first axis was approximately 0.512, indicating good internal consistency among the items and their uniformity in measuring the concept of efficiency and financial stability. All significance levels (Sig. = 0.000 – 0.002) were less than 0.05, confirming the statistical significance of all items and the absence of any invalid items in the measurement. The results show that the items of the first axis accurately and effectively measure the financial dimension related to big data analytics, reflecting the sample's awareness of the importance of employing big data analytics in improving liquidity management efficiency, reducing costs, and enhancing the solvency and sustainable financial stability of commercial banks.

2- Measuring the internal consistency of the items of the second axis (there is a statistically significant effect of big data accounting analysis on the dimension of governance and sustainable financial management).

**Table (6) Correlation coefficients between each item of the second axis and the total score of its items**

| No. | Paragraph | Correlation coefficient | Significance level |
|---|---|---|---|
| 1 | Big data analytics provides transparency in financial reporting and disclosure. | 0.540 | .000 |
| 2 | The bank uses big data to monitor indicators of corruption or financial mismanagement. | 0.450 | .000 |
| 3 | Big data analytics tools help support senior management decisions with evidence-based analysis. | 0.535 | .000 |
| 4 | Financial big data is used to monitor compliance with international regulatory and accounting standards. | 0.640 | .000 |
| 5 | Big data contributes to strengthening internal control systems and rapidly detecting financial errors. | 0.680 | .000 |
| 6 | Big data analytics enhances the quality and accuracy of financial information provided to stakeholders. | 0.410 | .001 |
| 7 | Big data helps track complex financial transactions and identify unusual patterns. | 0.525 | .000 |
| 8 | Using big data analytics improves the efficiency of internal and external financial audits. | 0.425 | .000 |
| 9 | Big data analytics systems enable objective comparisons of a bank's financial performance with its competitors. | 0.450 | .000 |
| 10 | Big data helps reduce reliance on personal estimates when preparing financial reports. | 0.400 | .000 |
| 11 | Big data analytics helps build an early warning system to detect potential financial risks. | 0.490 | .000 |
| | | 0.504 | |

The table (6) shows the correlation coefficients between the items of the second axis and its overall score. Correlation coefficients ranged from 0.400 to 0.680 at a significance level of 0.05. These values indicate that all items are statistically significant and positive, confirming the highest correlation coefficient (0.680) achieved for item (5) Big data contributes to strengthening internal control systems and quickly detecting financial errors .This reflects a deep understanding among respondents of the importance of employing big data analysis in enhancing internal control and supporting financial transparency. The lowest correlation coefficient (0.400) achieved for item (10): "Big data contributes to reducing reliance on personal estimates when preparing financial reports".This is a statistically acceptable and significant value at the (0.05) level, indicating a general consensus on the role of big data analytics in improving the objectivity of financial reports. The mean correlation coefficient for the axis = (0.504), demonstrating good internal consistency and homogeneity among the items in measuring the dimension

related to governance and financial management. All statistical significance values (Sig. = 0.000 – 0.001) are less than 0.05, confirming the validity of the items and their suitability for measuring the variable under study. The correlation coefficient results indicate that the items of this axis are positively and statistically significant, enhancing the reliability of the measurement tool in assessing the impact of big data analytics on improving governance, increasing the efficiency of internal controls, and promoting transparency and financial disclosure in commercial banks. The internal consistency and reliability of the items in measuring the concept of governance and sustainable financial management are also confirmed.

3- Measuring the internal consistency of the items of the third axis (there is a statistically significant effect of big data accounting analysis on the strategic dimension (growth and future sustainability).

**Table (7) Correlation coefficients between each item of the second axis and the total score of its items**

| No. | Paragraph | Correlation coefficient | Significance level |
|-----|-----------|------------------------|--------------------|
| 1 | Banks rely on big data analytics to formulate long-term strategic plans. | 0.545 | .000 |
| 2 | Big data enables banks to identify growth and investment opportunities that are more financially sustainable. | 0.395 | .001 |
| 3 | Big data helps in assessing future financial risks and making proactive financial decisions. | 0.595 | .000 |
| 4 | Big data helps in assessing future financial risks and making proactive financial decisions. | 0.270 | .033 |
| 5 | Big data analytics is used to study customer behavior and improve the design of financial services. | 0.495 | .000 |
| 6 | Big data contributes to enhancing a bank's resilience and ability to adapt to economic changes. | 0.515 | .000 |
| 7 | Big data analytics supports innovation and the development of new financial products that meet future market needs. | 0.450 | .000 |
| 8 | Big data enables management to measure the impact of strategic decisions on the bank's financial sustainability. | 0.615 | .000 |
| 9 | Big data analytics supports the ability to predict macroeconomic trends that will affect the bank's future performance. | 0.505 | .000 |
| 10 | **Big data contributes to strengthening evidence-based strategic decision-making rather than intuition or past experience.** | 0.545 | .000 |
| | | 0.493 | |

The table (7) shows the correlation coefficients between the items of the third axis and its overall score. Correlation coefficients ranged from 0.270 to 0.615 at a significance level of 0.05 .These values indicate positive and statistically significant correlations for all items, meaning that the items in this axis exhibit an acceptable degree of internal consistency and effectively contribute to measuring the strategic dimension variable. The highest correlation coefficient (0.615) was achieved for item 8:Big financial data enables management to measure the impact of strategic decisions on the bank's financial sustainability." This reflects a high level of awareness among respondents regarding the importance of big data in evaluating strategic decisions and analyzing their long-term effects. The lowest correlation coefficient (0.270) was achieved for item4: Big financial data analytics is used to study customer behavior and improve the design of financial services." Although the value is low, it is still significant at the 0.05 level, indicating a moderate correlation that reflects the importance of behavioral analysis, but to a lesser extent compared to fundamental financial factors .The overall average correlation coefficient for the axis is (0.493), which demonstrates good consistency among the items and indicates that they all measure the concept of the strategic dimension in a coherent manner. All statistical significance values (Sig.) are less than (0.05), confirming the validity and statistical reliability of the items within this axis. The results show that the items of the third axis exhibit an acceptable degree of internal consistency and accurately express the role of big data analytics in supporting sustainable growth, improving long-term strategic plans, and enhancing the competitiveness of commercial banks.

4-Measuring the internal consistency of the items in the fourth axis (There is a statistically significant effect of big data accounting analysis on the fourth social and environmental dimension (responsible and sustainable finance)).

**Table( 8) Correlation coefficients between each item in the fourth axis and the total score for its items**

| No. | Paragraph | Correlation coefficient | Significance level |
|-----|-----------|------------------------|--------------------|
| 1 | The bank relies on big data to assess the social and environmental impact of its future financing projects. | .475 | .000 |
| 2 | Big financial data helps identify economic sectors that contribute to sustainable development. | .405 | .001 |

| | | | |
|---|---|---|---|
| 3 | Big data is used to measure the bank's efficiency in financing environmentally friendly projects. | .350 | .004 |
| 4 | Big data contributes to monitoring the bank's commitment to its social responsibilities. | .495 | .000 |
| 5 | Big data technologies help in preparing highly transparent social and environmental sustainability reports. | .385 | .002 |
| 6 | Big data analytics contributes to directing investments towards projects that balance profitability with positive social impact. | .345 | .005 |
| 7 | Big data helps identify potential environmental risks of projects before granting financing. | .275 | .024 |
| 8 | Big data enables banks to develop financing policies that consider environmental and social factors. | .600 | .000 |
| 9 | Big data analytics is used to assess the alignment of a bank's activities with the Sustainable Development Goals. | .370 | .003 |
| 10 | Big data helps enhance a bank's transparency towards the public regarding its financing practices. | .229 | .069 |
| 11 | Big data technologies contribute to measuring the impact of the bank's initiatives in reducing carbon emissions and protecting the environment. | .465 | .000 |
| 12 | Big data supports the decision-making process regarding financing small and medium-sized enterprises (SMEs) with a positive social impact. | .495 | .000 |
| | | 0.407 | |

The table illustrates the relationship between the use of big data and the social and environmental dimension in banks. The results show that most items are statistically significant, with correlation coefficients ranging from 0.229 to 0.600, and an overall mean correlation coefficient of 0.407, reflecting a moderate positive relationship between the two variables. The strongest correlation was observed in item eight (0.600, significant at the 0.000 level), indicating that big data enables banks to develop financing policies that consider environmental and social factors. Items four and twelve also recorded high correlation coefficients (0.495), reflecting the role of big data in monitoring compliance with social responsibility and directing financing for small and medium-sized enterprises (SMEs) with a positive social dimension. In contrast, a weak and non-significant relationship was observed in item ten (0.229, significance level 0.069), suggesting that enhancing bank transparency towards society through big data may require practical improvements to maximize its impact. Overall, these results support the research hypothesis that big data contributes significantly to enhancing banks' social and environmental responsibility and achieving sustainable development.

5-Measuring the internal consistency of the items in the fifth axis (there is a statistically significant effect of big data accounting analysis after sustainable financial risk management).

Table (9)
Correlation coefficients between each item in the fifth axis and the total score for its items

| No. | Paragraph | Correlation coefficient | Significance level |
|---|---|---|---|
| 1 | Big data analytics helps in the early detection of potential credit risks. | 0.685 | .000 |
| 2 | Data analytics is used to estimate the likelihood of customers experiencing financial distress. | 0.502 | .000 |
| 3 | Big data contributes to improving a bank's risk management policies. | 0.540 | .000 |
| 4 | Big data financial analysis tools are used to assess the impact of potential economic crises. | 0.601 | .000 |
| 5 | Relying on big data helps in making safer and more sustainable investment decisions. | 0.490 | .000 |
| 6 | Big data analytics helps in monitoring abnormal financial trends that may indicate potential risks. | 0.515 | .000 |
| 7 | Big data helps in developing predictive models to identify customers with high-risk financial behavior. | 0.410 | .001 |
| 8 | Big data enables banks to improve the accuracy of risk classification and allocate appropriate financial reserves. | 0.205 | .099 |
| 9 | Big data analytics is used to estimate the potential losses during periods of economic volatility. | 0.404 | .001 |
| 10 | Big data analytics techniques help enhance the effectiveness of early warning systems for financial risks. | 0.525 | .000 |
| 11 | Big data contributes to improving credit pricing decisions to better reflect actual risk levels. | 0.340 | .005 |
| 12 | Big data enables continuous monitoring of investment portfolios to minimize the bank's exposure to unforeseen risks. | 0.535 | .000 |
| | | 0.479 | |

The table illustrates the relationship between big data use and financial risk management in banks. The results show that most items are statistically significant, with correlation coefficients ranging from 0.205 to 0.685, and an overall mean correlation coefficient of 0.479, reflecting a moderate to strong relationship between big data use and financial risk management. The highest correlation coefficient was observed in item 1 (0.685, significant at

the 0.000 level), indicating that big data analysis significantly aids in the early detection of potential credit risks. Items 4 and 12 also recorded high correlation coefficients (0.601 and 0.535, respectively), reflecting the role of big data in assessing the impact of potential economic crises and monitoring investment portfolios to mitigate risks. In contrast, a weak and non-significant relationship was observed in item 8 (0.205, significance level 0.099), which may suggest that improving the accuracy of risk classification and the allocation of financial reserves requires further development or the integration of additional tools. Overall, these results underscore the importance of big data in supporting financial risk management policies and achieving safer and more sustainable investment decisions.

**Fourth: Hypothesis Testing**

1 -There are a statistically significant correlation and effect between big data analysis and improving (financial dimension) efficiency and sustainable financial stability. To test the relationship between big data analysis and improving (financial dimension) efficiency and sustainable financial stability, a one-sample t-test was used. The calculated t-value was 26.538, which is greater than the critical t-value of 1.671. The significance level is 0.000, which is less than 0.05. Therefore, the hypothesis that there are a statistically significant correlation and effect between big data analysis and improving (financial dimension) efficiency and sustainable financial stability is accepted.

2 -There is a statistically significant correlation and effect relationship between big data analysis and the dimension of governance and sustainable financial management. To test the relationship between big data analysis and the dimension of governance and sustainable financial management, a one-sample t-test was used. The calculated t-value was 25.395, which is greater than the critical t-value of 1.671. The significance level is 0.000, which is less than 0.05. Therefore, the hypothesis that there is a statistically significant correlation and effect relationship between big data analysis and the dimension of governance and sustainable financial management is accepted.

3 -There is a statistically significant correlation and effect relationship between big data analysis and the strategic dimension (growth and future sustainability).To test the relationship between big data analysis and the strategic dimension (growth and future sustainability), a one-sample t-test was used. The calculated t-value was 24.445, which is greater than the critical t-value of 1.671. The significance level is 0.000, which is less than 0.05. From 0.05, therefore, the hypothesis that there is a statistically significant correlation and effect relationship between big data analysis and the strategic dimension (growth and future sustainability) is accepted.

4 -There is a statistically significant correlation and effect relationship between big data analysis and the fourth social and environmental dimension (responsible and sustainable finance).To test the relationship between big data analysis and the fourth social and environmental dimension (responsible and sustainable finance), a one-sample t-test was used. The calculated t-value was 21.321, which is greater than the critical t-value of 1.671. The significance level is 0.000, which is less than 0.05. Therefore, the hypothesis that there is a statistically significant correlation and effect relationship between big data analysis and the fourth social and environmental dimension (responsible and sustainable finance) is accepted.

5 -There is a statistically significant correlation and effect relationship between big data analysis and the sustainable financial risk management dimension. To test the relationship between big data analysis and the financial risk management dimension (Sustainable). The One Sample T-test was used, and the calculated t-value was 15.619, which is greater than the critical t-value of 1.671. The significance level is 0.000, which is less than 0.05. Therefore, the hypothesis that there is a statistically significant correlation and effect between the analysis of big data accounting data and sustainable financial risk management is accepted.

Table (10) shows the test table for proving the five hypotheses regarding the existence of a correlation and effect.

Table (10)
Shows the One-Sample Test table

| | Test Value = 3 | | | | | |
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
|---|---|---|---|---|---|---|
| Axis1 | 26.538 | 80 | .000 | 1.33830 | 1.2374 | 1.4392 |
| Axis2 | 25.395 | 80 | .000 | 1.27491 | 1.1745 | 1.3753 |
| Axis3 | 24.445 | 80 | .000 | 1.17884 | 1.0824 | 1.2753 |
| Axis4 | 21.321 | 80 | .000 | .96812 | .8773 | 1.0590 |
| Axis5 | 15.619 | 80 | .000 | .91032 | .7937 | 1.0269 |

The results of the t-test reflect that big data analytics has a positive and tangible impact on improving the dimensions of banks' financial sustainability, whether in terms of strategic financial planning, resource management, or enhancing transparency and financial control. This supports the research hypothesis that the use of big data analytics contributes to enhancing the sustainability of institutions' financial performance.

## IV.    CONCULSON

Big data is a significant factor in the world of accounting because it enables accountants to analyze financial and non-financial data, contributing to enhanced quality of accounting information and improved sustainable financial performance for banks. Today, big data analytics is a strategic tool used by economic units, including commercial banks, to improve financial sustainability by enhancing the quality of decisions made and predicting future financial risks. Previous studies and theoretical findings have shown that linking financial analysis of big data with the dimensions of financial sustainability represents a global trend to raise the efficiency of the financial and accounting system in banks by enhancing transparency and reducing or eliminating opportunities for fraud and financial manipulation. Through the applied aspect of research in commercial banks, a clear positive and complementary relationship was found between the application of big data analytics techniques in accounting and the dimensions of financial sustainable development (financial governance, social and environmental strategy, and financial risk management). The sample showed an awareness among employees of the importance of modern technologies in accounting, which confirms the trend of commercial banks towards digital transformation to improve their financial performance and reputation. Theoretical evidence has confirmed that the successful application of big data in accounting depends on the availability of a digital infrastructure and qualified human resources capable of managing the analysis efficiently. Therefore, to improve their financial performance, commercial banks need to develop digital infrastructure and enhance the security of financial data. Hacking and training its employees on modern analytical tools, while spreading the culture of big data analysis through workshops and seminars, and adopting integrated sustainability reports in its banking operations in the competitive banking environment.

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