The competition Fourthten For scientific research Organized by Arab Organization of Financial and Accounting Auditing Institutions (the ARABOSAI)

Research on the topic:

Modern scientific methods and innovation in supervisory work

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Two female judges

Algerian Court of Accounts

Research Summary:

Modern scientific methods are considered one of the most important research topics of our time, so that digital transformation has radically changed the way business is done by taking advantage of the technological progress and development we are experiencing. This is due to the great scientific and cognitive revolution and the rapid technological progress.

All these developments have made institutions always strive for continuous change and improvement and to make the innovations required to adapt to new situations, as technological innovation is considered one of the most important approaches that help institutions manage the change they are experiencing and adapt to various developments.

On this basis, this study aims to identify these modern scientific methods such as artificial intelligence, cloud computing, big data analysis and cyber security, and the extent to which these modern scientific methods contribute to the financial operations of state accounting in providing quality accounting information to achieve effective oversight by the Auditing Council, and the role of these modern scientific methods in the extent of development of the oversight work, while highlighting the extent to which the Algerian Auditing Council has adopted these modern scientific methods through the technologies and tools used in the oversight of information systems and the analysis of big data in the audit environment.

To achieve this goal, the analytical inductive approach was followed due to its suitability to the nature of the study, in addition to the applied study through evaluating the information system (SI) for a public hospital institution (case study) and big data analysis through use the chart In a way astral (Star Schema) in framework for the preliminary report of the Control Law Budget (Case study).

The study reached many results through the applied study; big data is a major resource for the important information industry used in the auditing process by the Court of Accounts. It is also dealt with by eliminating unnecessary data, analyzing the necessary data, and using it in the auditing process. Use electronic data in the information system of the Court of Accounts in document shortage case and supporting documents, or lack of reliability, and despite the challenges and difficulties that may face information systems and big data analysis, it has been revealed, but it seeks to provide reliable and credible information to be used in the auditing process to achieve effective oversight of the methods of the Accounting Council to reach its desired goals represented in preserving public money.

Keywords: Court of Accounts, Modern Scientific Methods, Artificial Intelligence, Technological Innovation, Big Data, Information Systems.

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The introduction:

The world is witnessing, under globalization, a deep and rapid development at the economic, social, political and technological levels. As a result of the depth and speed of this development in the field of information technology, the world has entered the era of the information society, informatics and digitization. We find most of the developed countries of the world competing with each other to develop their strategies and plans for the development of information technology, this is what accompanied the emergence and spread of computers, which have become an absolute necessity needed by all institutions, whether in the public or private sector, due to their strong advantage in processing and storing a huge amount of information in an organized, accurate and fast manner, in addition to the development of communication devices and satellites, has made it possible for the auditor or reviewer to access information and invest it in his oversight work. The importance of information and its technologies had a major impact on the emergence of some terms "artificial intelligence, big data analysis, cloud computing and cyber security" and other terms such as information and information technology with the emergence of the systems approach, the term "information system" has become used as a contemporary method of modern administrative methods that help rationalize the administrative process to meet challenges in an era characterized by continuous change. Therefore, the concept of information systems has become an essential and vital role in administrative and information thought.

The field of regulatory work is also witnessing tremendous development thanks to these modern scientific methods, regulatory authorities in various sectors seek to adopt modern and innovative scientific methods to enhance the efficiency of their work and achieve their goals in a better way, as these methods and innovations provide tremendous opportunities to improve regulatory work, enhance compliance with laws and regulations, and protect people from risks.

The Algerian Court of Accounts, as the country's highest financial oversight body, has kept pace with these developments by monitoring information systems and analyzing big data as modern scientific methods in order to achieve effective oversight to achieve its desired goals of preserving public money.

Research problem:

What are the modern scientific methods that can help innovate in supervisory work in light of the rapid technological developments?

This question branches into sub-questions:

- What are modern scientific methods?
- What are the basic concepts of innovation in regulatory work?
- What is the extension impact of modern scientific methods on innovation in regulatory work?
- How does the Algerian Court of Accounts adopt these methods for innovation in supervisory work?

Research objectives:

This research aims to identify the concept of innovation in regulatory work and discover modern scientific methods that can be applied in regulatory work;

The impact of applying modern scientific methods on the efficiency and effectiveness of supervisory work;

Discussing the difficulties and challenges facing the application of modern scientific methods in supervisory work.

Importance of research:

The importance of the research lies in trying to identify modern scientific methods in light of technological developments. The rapidly evolving and innovative role of regulatory work at the institutional level, preventing violations and transgressions, and enhancing transparency.

Research methodology:

For information in various aspects of the study topic, this study relied on the inductive analytical method with its tools of description and analysis, where description is used to present the theoretical concepts of both innovation in regulatory work and modern scientific methods.

Study division:

In order to achieve the objective of the study, and in light of the above, the research was divided into two chapters, a theoretical chapter and an applied chapter, where each chapter includes the following:

Chapter One: The general and theoretical framework of modern scientific methods and innovation in supervisory work.

Chapter Two: The practical framework for modern scientific methods and innovation in the supervisory work of the Algerian Court of Auditors.

Finally, **the conclusion:** In which the most important results, recommendations and hypotheses were included.

Chapter One: The General Framework for Modern Scientific Methods and Innovation in Supervisory Work

First: The nature of modern scientific methods

Digital transformation has radically changed the way business is done by taking advantage of the technological progress and development we are experiencing. The public sector can be considered one of the most prominent sectors that invest in digital transformation in order to serve users in a faster and better way. Public sector institutions have realized the importance of exploiting modern technologies and keeping pace with technological developments to achieve the best levels of control. Oversight work in the public sector is one of the most important stages of transformation when it comes to the process of digitization or digital transformation. Therefore, it can be said that digital transformation plays an important role in improving the efficiency and effectiveness of oversight work in the public sector. All institutions are keen to employ modern technologies in order to build an effective society through the enormous capabilities provided by digital transformation, which leads to major changes in the work environment.

Modern scientific methods for innovation in supervisory work have become numerous. In this chapter, we will discuss these new methods and learn what innovation in supervisory work is, as well as these methods affect the supervisory work.

I-Artificial intelligence:

In light of global developments in information technology, the term artificial intelligence has been frequently discussed in recent times, as it is considered a modern field that attracts the attention of all societies and is constantly evolving, and it is expected to play a crucial role in the future of humanity.

The use of artificial intelligence systems and modern information technology is essential for the future of data processing in auditing to accomplish Audit work efficiently and effectively.

Artificial intelligence has greatly enhanced productivity and financial performance across all sectors, but at the same time it has brought with it many risks, and the auditing profession is no different from these fields, and it may even be considered among the most affected with artificial intelligence, auditors serve various companies in all sectors that are witnessing major changes, which is reflected in auditing work.

1The concept of artificial intelligence:

Artificial intelligence is known as a modern science built in a harmonious and interconnected manner between mathematical rules, devices and programs that are assembled in computers, which in turn lead to many operations and tasks that humans can accomplish, but differ from them in terms of speed and accuracy in finding solutions to complex problems that are difficult to solve. On a broader scale, artificial intelligence has many benefits[1]:

*Production efficiency: Artificial intelligence can perform various tasks, which leads to production efficiency.

*Accuracy: Artificial intelligence can process large amounts of data, identifying patterns that humans cannot detect, which may help in making more accurate predictions and better decisions.

*Innovation: Artificial intelligence can contribute to the development of new products and services that were not possible before.

[1] - Article prepared by the ASA Working Group on the INTOSAI Subcommittee on Internal Audit Standards.

*Cost-effectiveness: AI helps reduce costs by reducing levels of human intervention.

2-Advantages of artificial intelligence for auditors:

Auditors can access the information and evidence required in the audit process in a timely manner and providing this information in a timely manner increases the accuracy of the information, and can help auditors achieve reliability and transparency.

Auditors can further develop the accounting and auditing profession in order to raise the competitiveness in the field of accounting and auditing to keep pace with the speed of other sectors, and to reduce fraud and financial and administrative corruption.

The auditing and accounting profession is one of the professions most affected by the use of artificial intelligence, as auditors need to keep up with the accounting systems of the entities subject to control. Therefore, the auditing profession cannot rely on traditional methodologies, and auditors must respond to technological developments and enhance their technical, technological and cognitive skills and capabilities on an ongoing and appropriate basis.

3- Benefits of using artificial intelligence in the field of auditing:

Auditors can find the benefits of using AI technologies in several contexts, including:

***Benefits from using expert systems in auditing:**

Expert systems are computer systems that can simulate the decision-making ability of a human expert in an audit.

These systems can achieve many advantages such as improving the efficiency of the audit process, reducing costs, reducing the workload of the audit and providing the results of the audit process in a timely manner.

Expert systems can increase auditors' performance in learning how to benefit from and work with expert systems so that auditors become trained and qualified, which increases their effectiveness. Expert systems can also serve as a documentary reference for auditors'.[2]

***Contract auditing:** the use of artificial intelligence in contract audit procedures is the most common, as a larger number of contracts can be analyzed continuously in real time. The auditor can automatically extract data from contracts using programming tools and identify relevant items for accounting treatment such as the contract start date.

The contract amount, renewal and termination options, etc. are all analyzed using artificial intelligence so that auditors can more effectively assess the risks in the contract.

***Electronic auditing and cost advantage:** The use of electronic auditing or digitization of auditing operations contributes to reducing the cost of auditing services and increasing profitability. The use of auditing software in data review for example it can help to expedite the completion of audit services. To achieve this, the auditor must be trained to use electronic auditing programs.[3]

***AI's ability to detect fraud:** According to auditing standards, fraud detection is not directly the responsibility of the auditor, as fraud detection and prevention are primarily the responsibility of management.

However, auditors are responsible for discovering weaknesses during the control process that may create opportunities for fraud. They are responsible for

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[2]Article prepared by the ASA Working Group on the INTOSAI Subcommittee on Internal Audit Standards. (op. cit.).

[3]Article prepared by the teamASA concerned with the INTOSAI Subcommittee on Internal Audit Standards. (op. cit.).

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discovering material errors in the financial statements, whether they result from error or fraud.

Artificial intelligence and machine learning can be used to detect fraud, as these technologies help enhance the effectiveness of data analysis models and identify patterns that constitute fraudulent transactions to identify suspicious transactions that may represent fraudulent transactions, noting that the continued effectiveness of these models requires them to be updated continuously to keep pace with the change and development of fraud methods. It is worth noting the importance of the data to be analyzed being directly linked to the detection of suspicious and questionable transactions or unusual cases, including those that may indicate fraud, therefore, data sources must include the processes that that an employee can affect in a transaction, such as employee expense reports and cash transactions, and the data must be accurate and up-to-date and the data sources must be known and reliable.[4]

***Enhancing audit quality:** The use of artificial intelligence techniques may help reduce the audit risks that revolve around expressing an incorrect opinion or, in other words, failing to detect material errors in the financial statements due to only examining a specific sample.

Here the importance of artificial intelligence techniques emerges due to their high ability to examine and thus enable the auditor to identify unusual transactions that are difficult to detect when examining through a sample.

Efficiency considerations are also seen as one of the most important benefits of using artificial intelligence in auditing, as it qualifies the auditor to reach the highest levels of control while saving time and effort. Instead of spending long hours reviewing accounts, the machine does this in record time, which helps the

[4]-Implications of Artificial Intelligence on the Field of Auditing Prepared by Maha Samhadan Introductory Booklet Series Issue 15 Arab Monetary Fund 2021

auditor save time and make the desired results of the audit strong and well-supported.[5]

4- Tools and techniques auditing with help Computer:

Artificial intelligence technology is used in the field of Computer-Assisted Audit Tools and Techniques (CAATs). These are tools that use computers to collect and analyze audit data. In traditional auditing, conclusions are based on a sample of data, while in auditing using CAATs tools, the auditor can examine and analyze huge amounts of data and audit it completely, and identify specific risks to audit.

These tools are characterized by being independent of the original databases, so they are audited in "read-only" format and are not modified. Various types of readable electronic data are imported, and specific routine audit work is carried out, and all inspection work is documented for the auditor as a historical record that the auditor can refer to in the future[6].

Specialized audit tools can also perform data search equations, identify duplication and identify missing sequences, extract samples (e.g., extract risk samples), and stratify data, create a pivot table, a cross-tabulation, and statistical analysis. In addition, there are other uses such as creating electronic work papers, detecting fraud or forgery, analytical tests, data analysis reporting, and continuous follow-up.

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[5]-Implications of artificial intelligence on the field of auditing (previous reference).

[6]Article entitled Artificial Intelligence Techniques in Auditing and Accounting Operations, Issam Al-Mutairi, Audit Journal of the Kuwait Audit Bureau, Issue 63-2021.

Among the most prominent tools and techniques of computer-assisted auditing are the following:

Audit command language (ACL):

ACL is a tool released by Galvanize, and it enables auditors to analyze large volumes of data from various file types and identify anomalies that may indicate fraud, weak controls, or other areas".[7]

Interactive Data Extraction and Analysis (IDEA):

IDEA is a tool designed by auditing experts and released by Case Ware. It is a user-friendly tool that performs comprehensive and powerful data analysis. IDEA works through a modern interface and advanced analytical functions to accelerate data analysis, provide a more user-friendly experience, and enable deeper insights in a timely and cost-effective manner for decision-making".[8]

Team Mate Analytics:

TeamMate Analytics is a tool released by Wolters Kluwer, and it leads to the development of the audit process through rapid auditing, continuous risk monitoring, adding value to the audit report, and anticipation of what will be in the future. The auditor arrives at a clear vision through in-depth data analysis, which is considered a sensitive part of audit operations.[9]

-**Info Zoom:**

It is a tool released by Human IT, and it is used for data analysis and visualization. This tool is used by more than 100,000 licensed users and more than 1,000 clients worldwide, and it has been used in the medical field through

[7] Galvanize Company Website: https://www.wegalvanize.com
[8] Caseware website: https://idea.caseware.com
[9] Wolters Kluwer website: https://www.wolterskluwer.com/en

providing a visualization of blood analysis results and finding correlations between them.

Most of these tools import various types of data and provide similar functions such as historical analysis (i.e., reducing data according to its history), searching for common data in a specific field, sampling (random or using specific units), detecting recurring data, detecting gaps in sequential data, adding a field with an arithmetic operation, calculating equations, and sorting data (ascending or descending).[10] And the preparation of statistics, stratification, calculation of totals, and merging of tables. Comparing them, we find that there are differences in their cost and ease of use, and all of them require an information technology specialist for installation on the computer. What distinguishes the TeamMate tool is that it is considered an additional toolbar that is installed on the Excel program and is not a stand-alone tool like the rest of the mentioned tools. Most auditors prefer to use it because they are accustomed to using the Excel program, and because it is considered less costly[11].

5- Challenges of using artificial intelligence in auditing work:

As artificial intelligence (AI) continues to evolve with technological advancements, auditors will inevitably encounter challenges in its application to audit work. Some key obstacles include:

- **Designing AI Software for Auditing:** Developing AI software specifically for auditing purposes presents significant challenges. The complex and varied work environments of auditors, involving the collection and use of diverse data and evidence, make integrating these disparate data forms into a single AI model difficult. Furthermore, audit

[10] InfoZoom Company Website: https://www.infozoom.com
[11] InfoZoom Company Website: https://www.infozoom.com (op. cit.).

software must carefully balance AI integration with the continued essential role of the auditor.

- **Auditor Qualifications and AI Interpretability:** It is crucial to ensure that audit staff possess the necessary qualifications to effectively utilize AI in relevant methodologies and can keep pace with technological developments in the field. Auditors must also be able to understand and articulate the rationale behind audit findings. Achieving transparency and interpretability of AI-generated results is critical for trust and accountability, but it can be a complex undertaking.
- **Cybersecurity and Data Integrity:** Ensuring robust cybersecurity for the high-quality data and information used by both regulated entities and supreme financial oversight bodies is paramount. AI models rely heavily on accurate data for reliable decision-making. Maintaining data integrity is a major challenge, as inaccuracies in input data will inevitably lead to flawed and unreliable results. This includes not only preventing malicious attacks but also ensuring data quality throughout the collection, storage, and processing phases.[12]

II. Cloud Computing:

Information and communication technology (ICT) offers numerous solutions that facilitate institutions' digital transformation, enabling them to seamlessly integrate into the knowledge economy. These technological tools digitize various internal functions, such as accounting and human resources, as well as external commercial and administrative transactions with clients. Cloud computing has emerged and evolved as a modern technological solution alongside the development of internet technologies and their services for modern

[12] Article prepared by the ASA Working Group on the INTOSAI Subcommittee on Internal Audit Standards. (op. cit.).

institutions. These technologies hold a strategic position within institutions, offering a new perspective on organizational structure and information systems. They allow institutions to focus resources on core activities rather than support functions, prioritizing operational functions and activities.

1- The concept of cloud computing:

The term cloud computing is a relatively new term that has found its place within the modern business environment that is based primarily on information and communication technology solutions, and digital solutions through the Internet in particular.

The term cloud computing has been defined by many entities and institutions specialized in the field of digitization, as defined by the American National Institute of Standards and Technology in Publication No. 800-145 (page 02 - 2011). "A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources 1 such as networks, servers, storage, applications, and services that can be rapidly provisioned and launched with minimal administrative effort or interaction with a service provider. 2 It also refers to the delivery of computing services over the internet. Companies that provide these cloud computing services are called cloud service providers, and typically charge for cloud computing services on a usage basis, similar to the way water and electricity bills are billed. Some define it as resources and technologies available on demand via the internet that can provide a number of integrated services without being restricted by local resources, with the aim of facilitating the customer's use of unlimited resources anywhere and at any time. These resources include space for data storage, backups, and software. The cloud here means the internet, which represents the vast space that provides

ease, flexibility, and lack of complexity in exploiting the resources and solutions of modern information and communications technologies.[13]

As HURWITZ sees it, the cloud is a collection of devices, networks, storage locations, applications and services available over the internet either as separate components or as a complete platform based on the user's request. Some studies have indicated that cloud computing is a suitable enabling model for on-demand network access to a shared set of configured computing resources such as networks, servers, storage units and applications. So that it can be provided and launched very quickly and with minimal effort from the service provider.[14]

2- Types and components of cloud computing:

A-Types of cloud computing:

Cloud computing types can be divided into:

***In terms of cloud computing models:** It can be summarized as follows:

- Infrastructure as a Service (IAAS);
- Working platforms as a service (PAAS);
- Software as a Service (SAAS);
-Data as a Service (DAAS).

***In terms of cloud building models:**

The National Institute of Standards and Technology has determined (NIST) four models of cloud computing:

- Public cloud computing public cloud:

It is an infrastructure based on providing cloud computing resources via the Internet to a group of clients, whether they are individuals, companies or institutions.

- Private cloud computing private cloud:

[13]-Article of the Algerian portal for scientific journalsASJP Mr. Muftahi Muhammad, Volume 9, Issue 01, April 2023.

[14] Mubarak Raash, Using Cloud Computing Applications in the Educational Process, Al-Mohtraf Journal of Sports Sciences and Humanities, p. 21.

This model is used to provide customized services to specific clients, where you are hired by a single client and are at his complete disposal and control.

- Community cloud computing community cloud:

This model provides infrastructure for the specific use of a specific community with common interests and policies.[15]

- Hybrid Cloud computing hybrid cloud:

This model brings together the beneficiaries of the combination of public, private and community cloud features at the same time, so this model is called hybrid cloud computing because it combines the features of the previous clouds in one service.[16]

B- Components of Cloud Computing:

Cloud computing consists of several key elements, including:

- **Applications**: These are the software programs that users run within the cloud environment. The service provider is responsible for developing, updating, and maintaining these applications.
- **Clients (Users):** Clients are the individuals or entities who access and utilize cloud computing services. They typically use personal devices, such as computers, smartphones, or tablets, to connect to the cloud.
- **Services:** This refers to the range of functionalities and resources provided by the cloud platform. It encompasses the conversion of traditional computing products into on-demand, accessible services[17].

3- Cloud Computing Objectives:

Cloud computing aims to achieve the following objectives:

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[15] Mohamed Shawky Shaltout, Cloud Computing between Understanding and Application, E-Learning Magazine, Issue 11, 2015.

[16]Majed Awadha Faleh Al Shamrani, The Impact of Cloud Computing on the External Review Process, Arab Journal of Literature and Studies, Issue 8, 2019.

[17]Majed Awadha Faleh Al Shamrani, The Impact of Cloud Computing on the External Review Process, Arab Journal of Literature and Studies, Issue 8, 2019.

- **Transforming the computer into a mere access point:** This objective aims to transform the user's computer into a simple means of accessing the server that houses the data storage space. This enables the user to run and manage their data centrally without relying fully on local device resources.
- **Providing high-quality storage space:** Cloud computing strives to provide high-quality storage spaces for information, characterized by reliability, security, and accessibility from anywhere.
- **Eliminating the need for local backups:** Cloud computing eliminates the need for users to create and maintain backup copies of information stored on their personal devices or external storage media. It ensures easy access to information and retrieval at any time and from any location with an internet connection.
- **Providing software for free:** Cloud computing allows access to most operational and application software for free or at a low cost, saving users the costs of purchasing and maintaining software.
- **Facilitating information sharing:** Cloud computing simplifies the process of sharing information between users, allowing them to easily exchange and transmit it over the internet, regardless of the size of the information and the format of its files.
- **Saving time and effort and improving performance:** Cloud computing contributes to saving time and effort within the work environment, ensures high availability of services, business continuity, improves performance, and reduces costs in general[18].

Note:

[18] Article of the Algerian Portal for Scientific Journals ASJP, Mufti Muhammad, Volume 9, Issue 01, April 2023.

It is worth noting that the principle of cloud computing dates back to an earlier period, where it was used in email services such as Gmail, by storing messages and files on the servers of service providers. However, current technology has significantly developed this feature and made it available to customers in the form of a paid service over the internet.

4- The impact of the cloud computing environment on the implementation of the audit mission:

Based on the division of the stages of implementing the audit mission adopted by all Algerian and international auditing standards and based mainly on the risk approach, it is possible to clarify the assistance tools in the cloud computing environment that can be used in each stage of the audit mission, and this is what shows the following table:

Cloud computing tools	Internal audit stages
•402 ISA •3402ISAE •30-800 NIST •0.7SIG •Smart Thinking About Cloud Computing Risks Deloitte	Risk identification and assessment phase
•402ISA •3402ISAE •53-800NIST •144-800NIST •0.7SIG •US Federal Risk Management and Authorization Program •Cloud Computing Audit Software for ISACA.	Risk Response and Reliability Collection Phase

The auditor has the option to refer or not to refer to the tools used in the audit process when preparing the report.	Report preparation stage

Source: Prepared by researcher Muhammad Muftahi, Al-Bisharat Economic Magazine-Faculty of Economics and Business Sciences – Bechar.

Based on the requirements of international auditing standards, the requirements of Algerian auditing standards and the challenges of electronic auditing references within the framework of external auditing, a set of procedures can be proposed that can be followed within the framework of the audit mission in an institution that relies on cloud computing services related to the preparation of accounting data, where the auditor obtains information about the institution being audited, for one of the functions related to the preparation of the financial statements of the cloud computing service provider, where the external auditor must obtain permission from the institution being audited to contact the cloud computing service provider to communicate with him, so that the latter communicates with him to provide him with the audit report including a description of his information system and his internal control system of type 1 according to (ISA 402) to send it to the external auditor of the institution benefiting from cloud computing services, so that the external auditor of the beneficiary institution can prepare his report and deliver it to the relevant parties.[19]

Cloud computing is a modern information and communication technology solution that serves the auditor to improve performance in a short time.

III. Big Data:

Big data is considered an important stage in the development of information and communication systems and technology that contributes to development in all

[19] Article of the Algerian Portal for Scientific Journals ASJP Mufti Muhammad Volume 9 Issue 01 April 2023. Previous reference

fields. It is a huge amount of complex data whose size exceeds the capacity of traditional software and computer mechanisms to store and process it.

1- The concept of big data:

Some definitions of global organizations that describe big data:

- ISO defines: Big data is a collection of data that has unique characteristics such as volume, velocity, variety, variability, and data accuracy...etc.; it cannot be process them efficiently using current and conventional technology to make the most of them.[20]

-It is known by the International Telecommunication Union (ITU) refers to the term big data refers to a data set that is characterized by being extremely large in size, speed, or variety, compared to the types of data sets that are commonly used.[21]

-As experts define big data from the perspective of service providers, "it is the tools and processes that organizations need to handle large amounts of data for analysis. Both parties agreed that it is massive data that cannot be processed using traditional methods.

Because of the time, effort and high cost that big data requires to analyze and process, technicians were forced to rely on artificial intelligence systems that have the ability to learn, infer and react to situations that were not programmed into the machine using complex algorithms to work on them, in addition to using cloud computing technologies to complete their work.

2- Characteristics of big data:

[20]ISO 2018 on the linkwww.inoledge.com(iso).
[21]Al-Baz, Adnan Mustafa, Big Data and its Application Areas, Faculty of Accounting and Information Technology, King Abdulaziz University, 2018, p. 77.

A set of characteristics and determinants have been developed to classify data as big data and are commonly known as (VS) it started with three characteristics and reached ten characteristics, which are:

- Volume: the main factor in describing the data is that it is huge, exceeding one terabyte in size.

- Diversity (variety): It is the extracted data, which helps users, whether researchers or analysts, to choose the appropriate data for their research field, and it includes structured and unstructured data.

- Speed (velocity): it means the speed of producing and extracting data to cover the demand for it, as speed is considered an important element in making decisions based on this data**.**

- Reliability/Accuracy (veracity): This means that the data must be correct, reliable, accurate and up-to-date.

-Value: meaning the ability to convert all types of data into valuable data. In order to benefit from big data, we need specialists who have the experience and skills sufficient to deal with this data and analyze it appropriately.

-Visual representation (Visualization): the ability to display and show data in a better way so that the person reading it can understand it quickly.

-Change/variance variability: the number of differences in data resulting from changes in either the structure of the data or in its meaning or form.

-Security vulnerability: maintaining data security and privacy.

- Credibility / Quality (Validity): data sources must be accurate and data must be reliable for the intended use.

-Volatility: data validity period and length of storage[22].

3- Types and sources of big data:

A-Types of big data: classification of data is divided into three types:

-**Structured data**: it is the data organized in tables or databases, where it can be searched and information can be extracted from it, such as ORACLE – MySQL.

-Unstructured data: It represents the largest proportion of data, which is the data obtained daily from text, images, videos, messages, clicks on websites, e-mails and files **(**WORD-PDF).

-**Semi-structured data:** It is a type of structured data, but the data is not in the form of tables or databases, a mixture of the two types, and is closer to organized data, but it lacks the organizational structure such as tables and databases.

The diversity of data helps beneficiaries to choose the appropriate data for their field and includes structured, unstructured and semi-structured data such as images, audio recordings, video tapes and map data, which require a long time and great effort to prepare them in a form suitable for processing and analysis.[23]

B- Big data sources: there are many big data sources, including:

- **Sources arising from the management of a program:** whether it is a governmental or non-governmental program, such as electronic medical records, hospital visits, insurance records, banking records, and food banks.

[22]Mahmoud Abdel Salam, Big Data Technology, Introductory Booklet Series, Issue 16, Arab Monetary Fund Magazine.
[23]Abu Bakr Sultan, Big Data, Its Characteristics, Opportunities and Power, Faisal Scientific Journal, Issue 2, 2018, p. 89.

- **Commercial or transactional sources:** these arise between two entities, such as credit card transactions and transactions conducted over the Internet, including mobile devices.

-Sensor network sources: e.g. satellite imaging, road sensors, climate sensors**.**[24]

-Behavioral data sources: for example, the number of times a product, service or other type of information is searched on the Internet, and the number of times a page is viewed on the Internet.

- Sources of data related to opinions: for example, comments on social media.

- Tracking device sources: for example tracking data from mobile phones and GPS**.**[25]

4- Using big data in the audit process:

The process of analyzing big data occupies an important position, due to its valuable implications for the auditing profession, especially since the technology of collecting and analyzing data works to bring about important changes in the auditing process, such as those related to the process of collecting and evaluating evidence, as well as many important tests in all stages of the audit.[26]

Four potential advantages of incorporating big data into the audit process were identified:

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[24] Mazen Samir, Big Data, Journal of Electronic Sciences, College of Science, University of Baghdad, Issue 9, 2014, p. 14.

[25] Mazen Samir, Big Data, p. 14 (previous reference).

[26] Juan zhang xiongsheng yang and deniz appelbaum 2015 “toward effective BIG DATA analysis in continuous auditing yol 29 N°02 p 469.

- Provides high predictive capacity to make forecasts about audited financial statements.

-Provides great opportunities to identify potential fraudulent activities.

-Increases the chances of detecting fraud and misleading information.

Although big data improves the auditing process, it also suffers from shortcomings that hinder its applications in continuous auditing, such as the characteristics of big data such as volume, speed, variety and reliability, which create problems in the application of continuous auditing through various gaps such as data consistency and transparency, data identification, data aggregation and data confidentiality.[27]

The use of big data analysis in auditing is one of the methods that can be used to implement a number of audit procedures such as risk assessment and conducting analytical tests to collect audit evidence to improve understanding of the subject operations and the risks associated with them, which are considered important in all stages of the audit process, starting from the planning stage to the completion stage of the audit process.

The audit activity helps companies maintain effective controls by evaluating the effectiveness and efficiency of these controls and by promoting continuous improvement. The auditor must focus heavily on how data is consumed and the actions companies take based on the results obtained from big data analysis. With the exponential growth in data and the availability of new, inexpensive technology to generate insight and business value, this is the right time for the audit profession to provide greater value through increased use of analytics. However, it cannot achieve progress on their own, organizations must consider developing a strategy for the future state of the analytics program and develop a

[27]Al-Masrawi Hamada, The Role of Internal Auditor in the Era of Big Data, Part One, an article published in the International Journal of Islamic Economics, Issue 78, p. 11.

long-term map for how big data will be increasingly used. The stages of external auditing using big data analysis have been identified as follows:

-The engagement stage: getting to know the customer.

- Planning phase: The risk assessment process for auditors.

- Management confirmation verification stage.

-Planning and completing the audit process: Use advanced data analysis tools as analytical procedures.

-Continuous audit phase: enhancing knowledge about customers.[28]

5- Risks in the Big Data Audit Environment:

The role of the internal auditor must evolve and adapt to modern technological developments and dealing with big data in order to provide senior management, the board of directors, the audit committee and the external auditor sometimes with quick and accurate reports and consultations in order to make the right decisions at the right time. Therefore, internal auditors must raise their efficiency, effectiveness and training levels in order to play their role in the era of big data. This is done by evaluating, assisting and following up on the internal audit of internal control, governance and risk management in the era of big data as follows:

-Risk assessment: to analytics can assist in ongoing risk assessment either through ad hoc testing or as part of ongoing risk monitoring processes.

-Planning: Can analytics help conduct a more targeted audit by helping auditors focus on areas of greatest risk?

-Fieldwork: Analytics can be used to provide a higher degree of assurance, or to perform testing more efficiently**.**

-Reporting: to we can provide more actionable results through analytics, by helping to measure risks, or identify root causes.

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[28] Deniz Appelbaum Alex Kogan Miklos-Yasarhely analytical procedures in external auditing journal of accounting literature 2018 N° 40 p 83.

IV. Information System :

The importance of information systems in the field of management and administration emerges as an important means of use in terms of providing information and using it for decision-making.

1- The concept of information systems:

Information systems are defined as an integrated set of components that collect, store and process data to provide information and digital knowledge. Organizations rely on information systems to implement and manage their operations.

Robert Reix defines information systems as a set of organized resources consisting of tools, software, individuals, data, and procedures that allow for the collection, processing, storage, and transmission of information in the form of data, text, images, and audio within an organization.

The UK Academy of Information Systems defines it as the means by which organizations and individuals use information technology to collect, process, store, use and disseminate information.

Harrison and Angelina concurred, positing that an information system functions as an instrument for both individuals and organizations, leveraging technology (encompassing hardware, software, communication networks, and data resources) to facilitate the acquisition, processing, storage, utilization, and dissemination of information.[29].

2- Components of information systems:

- **Inputs:** A set of terms and units that make up the system and on which it depends primarily. The system inputs are numerous and varied in light of

[29]Dr. Ruqayya Mansour, Strategic Planning for Information Systems, Osama Publishing and Distribution House, Amman - Jordan, p. 102.

the goals that the system seeks to achieve. They may be data or special materials or capital or human resources.

- **Operations (processing):** The precise working mechanisms that govern the regular internal interactions of the system elements, which are all the programmed relationships and transformational activities that process inputs and transform them into outputs so that their completion is linked to the achievement of specific organizational goals.
- **Outputs:** The outputs of the system may be in the form of physical products, services, information, etc., and the outputs are considered the result of the processes. In other words, the outputs of the system are strongly linked to the motivation for the existence of the system.
- **Feedback:** It is the feedback or the impact of the external environment on the system, which renews the extent of the system's suitability, validity and efficiency in achieving the required goals and meeting the needs of the beneficiary by passing the observations of any shortcomings or defects in the application of the system to be repaired and the defects avoided in the future.

3- Information systems classifications:

Information systems are used to provide the necessary information for management to perform various administrative functions such as planning, organizing, directing and controlling. This classification includes the following:

***Process processing systems (TPS):** Which specializes in dealing with several areas in the organization such as: following up and processing requests, following up on wages and following up on compensations, all of which serve the level of operations and commercial transactions in the organization. These systems are an important source of information for other systems, in addition to

being useful in operational control processes and in making structural decisions, so these systems are considered suitable for serving management managers.

***Office automation systems (office automation) (OAS):** They are automated systems that aim to improve the efficiency of the work of secretaries, workers and managers in the facility by modifying the structures of office activities. For:[30]

***Management Information Systems (MIS):** Also called management reporting systems, these systems are based on supporting those decisions whose information needs are known in advance and can be accurately determined by analyzing the situation of the decision that must be taken.

These systems are specialized in supporting planning, control and decision-making functions, and they depend on data from operations operating systems, and are usually its outputs are inward-looking, so it does not leave it does not provide information about the external environment of the organization, but rather is concerned with information about the current performance of the organization.

***Senior management support systems (EIS):** These are used at the senior management level, as these systems are specialized in supporting decisions that require a high degree of personal control, due to the lack of a clear way to deal with them. Senior management support systems are designed in a way that enables managers to easily access information about the internal and external environment of the organization, analyze it in different ways and display it in a graphic form.

***Decision support systems (DSS):** Decision support systems aim to support unstructured and semi-structured decisions that are characterized by rapid

[30] Al-Sabbagh, Imad, Information Systems, Its Nature and Components, Dar Al-Thaqafa for Publishing and Distribution, Amman, 2000, p. 15.

change and difficulty in determining their information needs in advance. Decision support systems are designed to support a specific administrative task or problem so that their use is limited to it.

An important function of a decision support system is to take into account historical data.

***Expert systems:** It is one of the branches of artificial intelligence, and it is technical systems that aim to attract the implicit knowledge of a human expert in one field. These systems attract knowledge from skilled knowledge workers in the form of a series of rules and procedures for a software system that other people in the organization can use. Expert systems also help managers in decision-making as decision support systems.[31].

4 - Scope of information systems audits:

Information systems auditing is a systematic process of determining the extent to which an information system is able to provide accurate information to users, at the appropriate time and cost, through to controlling risks related to information systems and adopting an effective security policy for this purpose. Information systems auditing work includes the IT infrastructure, with the aim of ensuring business continuity.

Information systems auditing is a consulting function that helps management in planning, organizing and controlling. The auditor is interested in studying and examining computerized information systems to ensure their effectiveness and develop them using the control methods and techniques he uses and discovering weak points to work on improving them.

[31] Al-Sabbagh, Imad, previous reference, p. 30.

The importance of auditing information systems can be summarized in the following points:

Trust: That is, to give ongoing confidence about the nature of the processing of operations, and thus the data and information are correct, accurate, complete and safe.

Unless Procedures: That is, the processing procedures are correct and effective during system operation.

Accuracy: That is, the system produces information that is characterized by accuracy.

Efficiency and effectiveness: The cost of the efficiency and effectiveness of the system will be evaluated, providing satisfactory service and meeting the needs of the beneficiaries.[32]

The audit function in information systems includes examining all components of the system, which are the employees, no Hardware, software, database, and these components integrate together to achieve the goal. From Auditing is as follows:

-Censorship To workers: it deals with especially:

-Separation of functions;

-unless insisting on granting the employee his annual leave;

-Check for passwords and specialized monitoring software. No Allow For anyone Easy access to information.

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[32] - Guide to the information systems, Guide to the practice of CHAI, French Edition, Version 1.0, June 2014 p. 19.

-**Control over Devices:** It includes what next:

- ✓ -Choosing a safe location for equipped;
- ✓ -Determine the list of employees allowed to use the computer;
- ✓ Keep Backup files and registry no Important in a safe place;
- ✓ -Equipment insurance.

-Software Control: this is from:

-To check the program accreditation procedures;

-Perform a surprise program review during operation and do not to rely on output evaluation only;

- Ensure that the program outputs are in line with the designed goal which it was designed;

-Database control: The auditor should audit the database as it contains data. Unless the political and confidentiality of the institution, therefore, must be protected from misuse. Unless especially since the cost of redesigning another database is very expensive.[33]

V. Cyber Security:

In light of the international trend towards e-government And Cyber security has become one of the major challenges, especially with electronic security threats. However, despite the positives that the Internet has brought, it has also brought with it many risks and threats that have been translated into electronic crimes, not to mention the threats that may affect the security and stability of institutions and countries.

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[33] Aqaba Al-Rida, (Auditing in the Light of Accounting Information Systems), a paper within the global activities of the Syrian Association of Certified Public Accountants, Syria, 2008, p. 5.

1- The concept of cyber security:

Cybersecurity can be defined, based on its objectives, as the activity that ensures the protection of human and financial resources related to communications and information technologies, and ensures the reduction of losses and damages in the event of risks and threats, where the information contained therein is protected from any motive of damage, unauthorized use, modification or exploitation.

It is also known as a set of tools, policies, security concepts and guidelines for information risks, their handling, procedures, training, best practices and ensuring technologies that can be used to protect the electronic environment and organize user assets.[34].

It is also known as the protection of networks, information technology systems, operational technology systems, their components, hardware and software, the services they provide, and the data they contain from any breach, disruption, modification, entry, use, or illegal exploitation to ensure the continuity and safety of the system's operation.[35].

Therefore, cyber security is a set of programs, technical mechanisms and human capabilities that are activated to confront any attack on electronic information in all types of electronic crime.

2-Types of cyber security:

[34]Cybersecurity in Algeria: Policies and Institutions, Dr. Bara Samir, Algerian Journal of Human Security, Issue 4, 2017.

[35]Understanding the IT and Cybersecurity Environment, General Auditing Bureau Training Meeting, Kingdom of Saudi Arabia 2023.

-Network Security:

Most attacks occur via electronic networks, so security systems have been put in place to act as a safety valve for the network. These systems ensure immediate solutions and complete control over data elements and access to the network, in order to prevent any attacks that attempt to steal or damage the data stored on its servers.

- Cloud Security:

Since the prevailing trends now for most organizations around the world are to use artificial intelligence technology and storage clouds, it has become necessary to secure the digital cloud because it contains a huge amount of data for these organizations, and a group of companies specialized in this field provide services to solve this crisis, such as: Google Cloud and Microsoft Azure.

- Application Security:

Web applications, like anything else, are directly connected to the Internet, so it makes sense that they are vulnerable to cybersecurity attacks. This type of cybersecurity helps companies and organizations discover sensitive data that needs to be protected from potential attacks, through antivirus software, firewalls, and information encryption processes.

- Internet of Things Security:

While the proliferation of Internet of Things (IoT) devices, encompassing smart devices, artificial intelligence tools, and sensitive sensors interconnected within a unified global network, offers numerous productivity enhancements, it concomitantly exposes organizations to a spectrum of cyber threats. IoT security plays a crucial role in mitigating these risks by employing a multi-faceted approach. This includes the detection and classification of connected devices

based on their operational roles and the authorization levels granted for accessing databases. Furthermore, upon the detection of any anomalous activity, the security system assumes control over network operations, diligently monitoring any potential exploitation of these devices during runtime and implementing appropriate countermeasures.

- End User Security:

Endpoint security is a set of technical practices used to protect end-user devices from cyber-attacks that originate from malicious and unwanted programs, such as desktop and laptop computers, and mobile phones, which employees use to access company networks and access various resources, so organizations seek to protect these devices in order to prevent any external attempt to access networks and databases stored on company servers.

- Infrastructure security:

Enterprise infrastructure security is defined as a security measure based on protecting the system's critical infrastructure and reducing vulnerabilities in these systems from corruption, sabotage and terrorism, such as network communications, data center, server or IT center. An emergency plan is put in place in the event that the company's systems are targeted by cybercriminals. Critical infrastructure includes the following:

*Power supply and transmission systems

*Water supply

*Cooling system

*Heating and air circulation

- Disaster recovery from cyber-attacks or natural causes:

Disaster recovery, or business continuity in the context of cyberattack recovery, is the process of resuming business after a database has been compromised, depending on the size, scope, and business of the company, different plans is put in place to help employees communicate and continue to perform their jobs in the event of an attack.

-Information and data security:

Information security is the process of designing and deploying tools to protect your business's critical information from destruction, disruption or alteration. It is the critical factor in ensuring cybersecurity. It is specifically designed to maintain the confidentiality, integrity and availability of business data, and ensure that only authorized applications and systems have access to certain information. It also plays a pivotal role in monitoring and investigating potential malicious behavior, attempting to contain threats and respond promptly to incidents while preserving evidence for potential prosecution.

- Financial security:

Some people think that cybersecurity and data security are not related to the accounting cycle, but due to the threats of hacking on the company's financial data which can include errors and unintentional data breach, the financial security system was created and provides innovative solutions in case the databases are attacked by cyber criminals, and protects the data from financial threats and violations that threaten livelihoods, business growth, customer relationships, and more.

3 -Cybersecurity Features:

Cybersecurity has a set of characteristics that distinguish it from other fields, the most important of which are:

- Trust and mistrust:

The cybersecurity system's firewall has something like an electronic filter for the type and nature of programs and technologies allowed to be activated, allowing the passage of programs that are already trusted by the user as well as the online store and have been verified to be safe to use, and preventing malicious programs from intruding or exploiting vulnerabilities.

The philosophy of information security can be translated at this point as cyber security deals with all programs as untrustworthy programs, until they are allowed by the user and their security is confirmed through their credibility in online stores, allowing the passage of what has been confirmed to be safe, and preventing unknown sources from hacking the system.

- Protection from internal threats:

One of the most important features of cybersecurity is protecting the device from internal threats that may occur due to the user’s lack of culture or ignorance of the field of information security, in which he may allow unknown programs to be activated or use tools that affect his personal security or the sensitivity of sharing his information, or one of the tools he uses contains a malicious virus that his system should not have. Then cybersecurity quickly alerts the individual or institution to the danger he faces and prevents this action from occurring as soon as possible.

- Protection from external threats:

Protection from external threats is the most important feature of cybersecurity, where a firewall is built that is capable of filtering out external risks resulting from dealing with the digital world, starting with the risks of dangerous emails, malicious links, viruses, or addressing weaknesses in the system or loopholes that a third party may exploit to control and dominate.

- Comprehensive vision:

Cybersecurity tools give users—both individuals and companies—a comprehensive view of their systems' strengths and weaknesses, so they can identify technological vulnerabilities and work to resolve them as quickly as possible, while also providing suggestions on how best to prevent them from happening again.

- Continuous monitoring:

Cybersecurity is based on the continuous monitoring feature, as its firewall does not work once or at specific hours, but the system works all the time with the aim of detecting any defect as soon as it exists and working to quickly fix it and prevent it from causing any harm and maintaining the security of the information and the security of the user for the longest possible period.

- Compliance with policies and laws:

The primary goal of cybersecurity is to maintain the confidentiality and privacy of data and information, in addition to combating all types of harmful viruses. In order to achieve this goal effectively, the powers granted to professionals must not be exploited in order to penetrate the foundation upon which it was originally created.

Therefore, compliance with laws and legislative policies related to information security is one of the most important characteristics of

cybersecurity, as external sources are not allowed to view the sensitive information and data that is shared, or misuse it in any possible way. These laws vary according to the type and nature of the field in which cybersecurity is applied.

- Diversity:

A cybersecurity system should have integrated solutions for dealing with cyber threats, so that the system is not activated to protect against one type of threat and allow another, but rather it should analyze, detect, deal with and prevent all possible types of attacks that pose a threat to the integrity and security of information.[36].

4- Cybersecurity and Control:

Cybersecurity crimes may affect the auditor's assessment of control risks or inherent risks. When an organization is exposed to cybersecurity crimes, this may be an indication of a weakness in the internal control structure applied and present in the organization. Therefore, if the organization is exposed to cybersecurity crimes, this may require the auditor or auditor to conduct more planning in the audit or control process and thus exert more effort as well as tests to ensure that the internal control structure of financial reports has not been compromised, as the company's books and records may be changed, which may lead to tampering with the financial statements. Even if cybersecurity crimes do not directly affect the organization's books and records, the auditor or auditor is still required to exert more effort. This problem has been emphasized by

[36]Understanding the IT and Cybersecurity Environment, Training Meeting, General Auditing Bureau, Kingdom of Saudi Arabia 2023 (previous reference).

regulators such as PCAOP [37].It warned auditors of the need to consider how cyber incidents affect the internal control structure of financial reporting.

Regarding the impact of cybersecurity crimes on the risk of non-detection, there is a negative relationship between the risk of material and significant misstatement (inherent and control risks) and the risk of non-detection. In other words, if the auditor estimates the inherent and control risks at a high level, the auditor should estimate the detection risk at a low level in order to reduce the audit risk to an acceptable level and avoid the failure of the audit process. Therefore, when the auditor estimates the inherent and control risks at a high level as a result of the institution being exposed to a cyber-attack, the auditor will work to reduce the risk of non-detection by conducting more detailed tests to reach an acceptable level of audit risk.[38].

Second: The basic concepts of innovation in supervisory work and the impact of applying modern scientific methods on its efficiency and effectiveness:

The topic of innovation has attracted the attention and study of many writers and researchers, as it is considered one of the highest achievements of human resources in terms of rank and status. What is noticeable at the present time is that the progress witnessed by institutions was only achieved through innovation, creative thinking, and interest in technological innovation in particular.

[37] https://pcaobus.org/news-events/speeches/speech-detail/cybersecurity-a-holistic-approach_707

[38] The impact of cybersecurity crimes on audit risks, Dr. Dunya Muhammad Qasim Salem, Scientific Journal of Business and Environmental Studies, Volume Fourteen, Issue Three, July 2023.

Thus, access to creativity and technological innovation makes institutions distinguished as creative and innovative institutions, because the latter becomes their own tool.

I. The concept of technological innovation:

Technological innovation is considered the main source of technological change facing institutions in our current era, and institutions usually resort to it in order to improve their quality, reduce their costs and increase their productivity, due to the role it plays in achieving outstanding performance. In general, technological innovation means "improving existing products or launching new products, creating new production processes or improving existing processes."[39].

And in opinion of (**kartus & kukrus**) Technological innovation includes new products and processes or changes to existing products and processes.(ju & fu)Technological innovation is the technology of design, manufacturing and business activities related to the first commercial application of new products and processes.

From a Turkish perspective, technological innovation is the process that achieves coordination and cooperation between the activities of the institution with the aim of adopting new ideas and methods and translating them in the field of work into a new product, developing a product, using a new production process, or developing an existing production process to meet customer requirements.

II. The importance of technological innovation:

[39]-Saleh Mahdi Mohsen Al-Amiri, Taher Mohsen Mansour Al-Ghalbi, Administration and Business, Wael Publishing and Distribution House, p. 175, 2007.

Technological innovation has become an inevitable necessity for the institution, especially with the current intensification of competition in the markets. The competitive factor has become based on the ability to innovate and use creative talents fully in accordance with the prevailing rules in the environment in which it operates. Today, these talents and creative capabilities have become one of the most important standards adopted to measure the institution's performance on the one hand and competitiveness on the other hand, as it is not possible ignoring the importance of technological innovation in particular in achieving progress for various societies and institutions, as it plays a major role in distinguishing the institution's performance and enhancing its competitive capabilities through the following:[40]

-Increase the institution's ability to compete.

- Maintaining the survival and continuity of the institution.

Innovation begets innovation, and soon it becomes innovation followed by other innovations to meet the same needs.

Innovation works to achieve sustainable development.

Technological innovations contribute to the advancement of the country's economic infrastructure and the advancement and prosperity of society.

-Continuous skill building and capacity development in order to ensure the promotion of research and development.

[40]Dr. Muhammad Qureshi, Technological Innovation in Organizations,Journal of Law and Humanities, Economic Issue 34 (1).

- It allows the company's product to be distinguished from competitors' products through sufficient flexibility in performing the work that achieves the highest levels of customer satisfaction.[41].

III. Technological innovation and regulatory work:

Digital transformation has radically changed the way businesses operate, by taking advantage of the technological progress and development we are experiencing. The public sector can be considered one of the most prominent sectors that invest in digital transformation in order to serve users in a faster and better way. Public sector institutions have realized the importance of exploiting modern technologies and keeping pace with technological developments to achieve the best levels of performance control.

Comprehensive financial review in the public sector is one of the most important stages of digital transformation, so it can be said that digital transformation plays an important role in improving the efficiency and effectiveness of financial and performance review in the public sector.

As organizations digitize their businesses, this is leading to major changes in the work environment. Therefore, auditors and reviewers must be well trained on these changes to be fully prepared to deal with the increasing volume of data and to have the ability and skills necessary to identify risks to prepare accurate reports.

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[41]Zaidi Abdel Salam, "The Reality of Technological Innovation in the Algerian Industrial Institution," International Conference on: The Algerian Economic Institution and Innovation, Department of Management Sciences, Faculty of Economics and Management Sciences, University of May 8, 1945, Guelma, Algeria, November 16-17, 2008, p. 72.

With the great technological progress that the world is experiencing, the permanent use of digitization in the field of accounting and auditing has become necessary and important, in order to ensure reaching the highest levels of efficiency in analysis and auditing.

With this technological development, the confidence of auditors and auditors in preparing financial reports increases, which enables them to improve the communication process, make the best use of time, and delve into the analysis process. It will also be beneficial for institutions subject to the audit process, as it provides them with new perspectives and a clearer perspective on operations and related risks. Using smart digital platforms, auditors can overcome daily challenges such as: fraud and risks, data complexity and authentication, documentation, and reports.[42]Through the use of these smart technologies, auditors and reviewers will be able to improve the quality of work and reach more practical and appropriate insights and conclusions. They will be able to easily detect risks and fraud attempts, enabling them to prepare better financial reports.

Auditors and auditors are currently keeping up with innovative technological developments such as artificial intelligence, big data and other modern scientific methods for the purpose of using them in audit IT systems to achieve better results. These technologies can help auditors produce more accurate information to reach a more comprehensive view of the financial position of the entity being audited. Auditing and auditing bodies must promote and enable a culture of innovation in order to achieve the required transformation.

The performance of technological innovation depends on the level of performance of the innovative individuals and the categories working in it. Since

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[42] The 17th Symposium, General Auditing Bureau, Kingdom of Saudi Arabia, The Future of Government Oversight Work in Light of Digital Transformation and Artificial Intelligence.

the institution represents a partial unit of the overall and integrated system, the effectiveness and efficiency of technological innovation performance ensures and guarantees the success of the institution's performance in particular and the state in general.[43].

IV. The impact of applying modern scientific methods on the efficiency and effectiveness of supervisory work:

Currently, the use of information technology by institutions in general has become inevitable, in order to keep pace with the developments taking place and because of the many benefits of this technology. Also, the use of this new technology by institutions will have an impact on the auditing process, because auditing in the information technology environment means using modern technologies in the auditing process, in order to improve the efficiency and effectiveness of the auditing process and obtain reliable and accurate information for decision-making.

The use of modern scientific methods in audit work is a double-edged sword. It may be positive and help the auditor in completing his audit work, or it may be negative and result in several risks that may be an obstacle to audit work. On the positive side, the use of modern scientific methods can lead to reducing the time spent by auditors or auditors in performing their supervisory duties for many matters[44].

These methods are characterized by the ability to inspect dangerous places with less effort, and they are also characterized by their detachment from emotion in law enforcement. They support the regulatory field by using them in

[43] The Seventeenth Symposium of the General Auditing Bureau, Kingdom of Saudi Arabia (previous reference).
[44] Safaa Ali Abdullah Al-Arabiyat, The Extent of Using Information Technology in the Auditing Process, Arab Journal of Scientific Publishing, Issue 40 - 2022.

reviewing and analyzing data, identifying risks, prioritizing risk management, determining operational capacity, and detecting corruption and misconduct. In addition, these methods allow for the audit of large volumes of data with full coverage instead of sampling, auditing it with less time and effort, accessing data from different sources, and the possibility of comparing it and applying equations to it. Moreover, these methods will enhance professionalism in regulatory work performance by modeling the thinking process and guiding the auditor's thinking. By using it, value will be added to the regulatory work and improve the quality of the audit by following up on automated tasks, reviewing advanced analyzes, and evaluating the results and implications of discovering observations. In line with this change, work roles will be redistributed, and accordingly, there will be a demand for new skills, which will result in enhancing the skills and satisfaction of the auditor. [45]

However, there are negatives that accompany these modern scientific methods that can manipulate or penetrate their inputs and thus obtain misleading outputs. From this standpoint, it has become necessary for internal control systems to keep pace with these modern technologies and the changes they have caused to the accounting system. These negatives result in risks in the auditing profession due to their impact on studying and evaluating the internal control system in various institutions. Therefore, many institutions tend to work on assessing the risks associated with information technology by identifying risk factors, as these risks may affect the continuity of institutions due to the lack of credibility of information data. This is when these financial statements contain fundamental errors, as the auditor expresses an inappropriate opinion in his report issued on the information contained in the financial statements, especially since the quality of the audit process is related to the degree to which the auditor or auditor

[45]Article entitled “Artificial Intelligence Techniques in Auditing and Accounting Operations”, Issam Al-Mutairi, Auditing Journal of the State Audit Bureau of Kuwait, Issue 63, July 2021 (previous reference).

discovers errors and fraud. The higher the quality of the audit, the lower the risk of auditing and avoiding fraud and enhancing transparency and accountability.[46]

Regardless of the degree of use of modern scientific methods, some risks of using these methods can be identified:

1- **Human risks:**

*Computer operation error

*Programming errors and analysis of systems and programs.

*Unauthorized use of hardware, software and systems.

*Risks of fraud, manipulation and misuse.

*Information security risks.

2 - Material risks resulting from the lack of appropriate environmental conditions:

*Power failure and fluctuation.

*Electronic devices malfunction for various reasons.

*Violation of users' privacy through hacking and computer intrusions.

*Incorrect maintenance of hardware and software.

*Risks of lack of advanced evidence with electronic media and communication networks[47].

[46]Mahmoud Yahya Zaqout, The Effectiveness of Using Information Technology in the Auditing Process and Its Impact on Improving the Quality of Auditing in the Gaza Strip, Al-Manara Consulting Websitewww.manaraa.com .

[47]Mahmoud Yahya Zaqout, The Effectiveness of Using Information Technology in the Auditing Process and Its Impact on Improving the Quality of Auditing in the Gaza Strip, Al-Manara Consulting Websitewww.manaraa.com (Previous reference).

Chapter Two: The application framework through the Algerian Court Of Account's adoption of modern scientific methods for innovation in audit work:

I. About the Supreme Financial Control Authority (Algerian Court Of Accounts):

The Court of Accounts is considered one of the most important oversight bodies that the state focuses on in oversight. The financial authority is responsible for implementing the state's general budget, which is subject to independent supervision.

1-Competencies and tasks of the Accounting Council

The Court of Accounts is considered one of the oversight bodies that is considered one of the most important bodies on which the state focuses in

financial control over the implementation of the state's public budget, which is a subsequent independent control.

Order No. 95-20, as amended and supplemented by Order No. 10-02 of August 26, 2010, relating to the Audit Council, grants the latter comprehensive jurisdiction in the control of public funds. Its duties are, in particular, as follows:

- Auditing the conditions of the bodies, resources, material means and public funds that fall within its jurisdiction;
- The aim is to encourage effective and rigorous use, promote the obligation to submit accounts and develop transparency in the management of public finances;
- The Court of Auditors exercises its judicial powers through decisions in the event of the liquidation of the accounts of public accountants, the presentation of accounts and discipline in the field of budget and financial management;
- He may also be consulted on preliminary draft laws relating to budget control and on preliminary draft texts relating to public funds.

2-The nature and objectives of the oversight exercised by the Audit Board

2-1 The nature of the control exercised by the Audit Board

Articles 6, 7 and 8 states: from the above mentioned matter on the nature of the control exercised by the Audit Board, and it is as follows:

- The subsequent control exercised by the Court of Auditors includes the legality of the accounts of operations relating to public state property and regional groups, their conformity and the keeping of a general inventory thereof;

- The control exercised by the Audit Board includes the form, regularity and accuracy of the accounts and reaches, by legal means, the completion of the disbursement order or its presentation on the one hand and the public accountant on the other hand for those operations.

2-2 The objectives of the control exercised by the Audit Board

According to the text of Articles 10 to 15 of the Decree relating to the Audit Council, the objectives of oversight exercised by the Council are limited to the following:

- If there is a failure or non-compliance with the provisions or principles of the legally required financial budget;
- The Audit Bureau shall prepare an annual report summarising the results of its audit and submit it to the President of the Republic.
- In parallel, the report is prepared annually for the National People's Assembly, and its publication, in whole or in part, depends on the initiative of the President of the National People's Assembly.
- The Audit Council has an advisory role on draft laws relating to the budget system;
- The reports prepared by the Audit Court shall be attached to the draft finance and budget submitted to the National People's Assembly;
- The Audit Council handles any file related to the public finances of the state or regional groups submitted to it by the government;
- The Audit Council examines any file relating to the public finances of the State or regional groups submitted to it by the government, in accordance with Article 5 of the law relating to the Audit Council and its operation;
- The Audit Board aims to conduct a subsequent audit of the previous year based on the accounts, records and documents that are systematically kept by the spending officers, managers and public accountants.

2-3-The oversight procedures carried out by the Council and the results arising therefrom.

Order 95-20, as amended and supplemented, relating to the Court of Auditors, as well as Presidential Decree 95-377 defining the internal regulations, provide for control procedures, which mainly concern control procedures and the results resulting therefrom.

A-Oversight procedures carried out by the Court:

The control procedures of the Court of Accounts consist of settling the accounts of public accountants and the quality control procedures for the management of public bodies and interests mentioned in Articles 7 to 10 of the above-mentioned order.

In addition to these two procedures, and on the occasion of carrying out a quality control of the management of bodies, the facts that can be referred to the disciplinary chamber in the field of budget and financial management that are recorded by the competent chamber following the commission of an error by a public official that may fall within the scope of application of Article 88 of the aforementioned order, are recorded in a detailed report addressed to the general supervisor for the purpose of providing written conclusions and from there applying the procedure followed after sending it to the disciplinary chamber in the field of budget and financial management. The same procedure is followed when it concerns an external notification.

-Results of the investigations of the Court of Accounts

The administrative and judicial powers exercised by the Court of Accounts lead to two types of results:

First: Administrative results

The administrative consequences of the court investigations are:

1- Evaluation note: after monitoring the quality of management, the Court of Accounts sets its final assessments and issues all recommendations and proposals with the aim of improving the effectiveness and efficiency of the management of the relevant departments and bodies and sends them to their officials, as well as to the ministers and the relevant administrative authorities.

2-Message from the Chamber President: the officials of the departments and bodies subject to audit shall be informed of the Court of Accounts observations relating to situations, facts or violations that harm the public treasury and the property of the public bodies and institutions subject to its audit.

3- Urgent procedure: if it is necessary to inform the competent authorities, the supervisory authorities or any qualified authority of the facts, situations or violations referred to in Articles 24 and 25 of the internal regulations, the President of the Court of Accounts shall notify all of them by means of an urgent procedure.

4-Initial note: the President of the Court of Accounts shall submit to the supervisory authorities of the supervisory services or bodies a preliminary memorandum on the deficiencies recorded in the field of application of the texts applicable to public funds.

5- Annual Report: the Court of Accounts shall prepare a report summarising all the inspections and observations which it deems necessary to send to the President of the Republic.

The annual report shows the main observations, observations and evaluations resulting from the work of the Court of Auditors' investigations, accompanied by the recommendations that it deems necessary to submit, as well as the

responses of the officials, legal representatives and relevant supervisory authorities. This report is published in whole or in part in the Official Gazette of the People's Democratic Republic of Algeria, based on a decision issued by the President of the Republic.

The Court of Accounts shall send a copy of this report to the Legislative Body.

6- Evaluation report on the preliminary draft of the Budget Control Law: the Court of Accounts prepares a draft evaluation report on the preliminary draft budget law prepared by the government and then sends it to the legislative body, accompanied by the related draft law.

Second: Judicial results

The judicial results arising from the Court's investigations are:

- **In the field of providing accounts of public accountants and disbursing officers:**

  The Court of Accounts issues fines against accountants and disbursing officers concerned in the event of delay in depositing accounts and against public accountants for not sending supporting documents.

- **In the field review Public Accountants Accounts:** the Court of Accounts issues a final decision when no violation is recorded against the accountant. It issues a temporary decision that includes orders and/or reservations in other cases, followed by a final settlement or entitlement decision.
- **In the field of quality control management:** If the chambers of the Court of Accounts, while exercising quality control over the management of bodies falling within their jurisdiction, notice facts that can be partially described, a detailed report shall be prepared in which the facts in question are recorded.

- **In the field of discipline control in the field of budget and financial management:** The Audit Council issues fines against officials, employees of facilities, institutions or bodies who have committed an error or violation that harms the public treasury or public property.
- **In the field of appealing the Council's decisions:** The composition of all chambers together broadcasts the Court of Auditors in the appeals submitted by the General Supervisory Authority, the supervisory authorities or the concerned litigants who oppose the decisions issued by the chambers of the Council.
- **Ways to appeal the Council's decisions:** The decisions of the Court of Accounts may be subject to review, appeal or cassation.

The request for review may be submitted by the concerned litigant or the competent authority or guardian to whom he is subject at the time of the occurrence of the operations subject to the decision - or by the public inspector, and the chamber or branch that issued the decision may review it automatically in the cases of: errors, omissions, forgery or double use, or when new elements appear that justify this (**Article 102 of Ordinance 95-20 as amended and supplemented**).

The request for review shall be directed to the Chairman of the Court of Accounts within a maximum period of one year from the date of notification of the decision subject to the appeal. The review may also be conducted after the aforementioned period if the decision was issued on the basis of supporting documents that turned out to be incorrect (Article 110 of Order 95-20, as amended and supplemented).

3-Requirements for the adoption of the International Accounting Standards Board for Financial and Accounting Oversight Bodies in Information System and Data Auditing Field Huge using information technology.

The International Standards of Supreme Audit Institutions (ISSAIs) are the authoritative international standards for public sector financial auditing, and their purpose is to:

- Ensure the quality of ongoing control processes;
- Enhance the credibility of financial control reports for users;
- Enhancing the transparency of the regulatory process;
- Determine the responsibility of financial controllers in relation to other interested parties;
- Identify the different types of control processes and the set of related concepts that provide a common language for public sector financial control.

The full set of International Standards for Supreme Audit Institutions (ISSAIs) is based on a core set of concepts and principles that define public sector financial auditing and the various types of duties and obligations supported by the international standards. The IT audit process has become (IT) is one of the main topics of audits conducted by Supreme Audit Institutions (SAIs) around the world, by following the INTOSAI working group on IT Audits and the INTOSAI development Initiative General Principles of Auditing as set out under the International Standards of Supreme Audit Institutions (ISSAI). The guide has also been taken from internationally recognized IT frameworks, including the Information Systems Audit and Control Association (ISACA) COBIT framework, the International Organization for Standardization

(ISO) standards, and IT guidelines and manuals from some SAIs, in an attempt to provide IT auditors with a complete set of guidance on IT audits.

The mandate granted to the Supreme Audit Institution to conduct an audit of information technology systems is included in the international standards for supreme audit institutions for information security management systems. ISO 27001 is adopted by the International Standards for Supreme Audit Institutions, as the international standard ISO 27001 is an effective work engine for every organization seeking to achieve secure and highly private asset management, in addition to protecting them. The standard helps to understand the work mechanism and improve it continuously to keep pace with current and future challenges. In this proactive way, it aims to:

- Identify risks and put in place appropriate controls to manage or eliminate them.
- Flexibility in setting controls at work.
- Gain the trust of stakeholders and customers.
- Compliance with controls gives the company the confidence of customers that it is the best supplier.
- Raising the level of ability to meet tender requirements and thus obtain new job opportunities.

The Algerian Court of Accounts, the Court of accounts, seeks to apply international standards for financial and accounting control bodies (ISSAI), by following the strategy developed by INTOSAI supported by guidelines to support supreme audit institutions based on the following:

- How to apply the international standards of supreme audit institutions practically in financial performance or compliance audit operations;
- How to apply the international standards of supreme audit institutions in practice in other duties and obligations;

- How to understand a specific topic and apply relevant international standards.

II. The application framework of the Court of Accounts in controlling information systems (practical case):

In implementation of its strategic plans, in order to achieve its goals and keep pace with the state's strategy in digitizing management public, did the Court of Accounts is expediting the development of the information system audit, in order to keep pace with this strategy adopted by the state, given the importance of auditing information systems recently, especially with the various projects aimed at modernizing management. Public, this in framework twinning with the European Union and partnership with the Court of Auditors Dutch, in this context, a specialized team was established at the Council level, tasked with developing the audit of information systems. In addition to reference coordinators at the level of each chamber, this team is tasked with developing guidelines related to auditing information systems and organizing training courses in the field of auditing information systems, as well as providing the necessary advice and technical assistance to control structures in the field of auditing information systems..

Many have shown that the use of information technology in the auditing process leads to reducing the time spent and thus reducing costs and improving the quality of the auditing process. From this standpoint, it has become necessary for the supreme financial oversight bodies in the Arab countries to keep pace with these developments by developing future plans to activate the concept of auditing in the computer environment and gradually transitioning to modern auditing methods.

1-Concept**IT Control:**

It is the process of evaluating and collecting evidence that confirms that the information technology systems used by organizations and institutions achieve the following objectives:

- ❑ Producing up-to-date, accurate, comprehensive and reliable information outputs.
- ❑ Ensure the confidentiality, integrity, availability and reliability of data.
- ❑ Ensure compliance with applicable laws and regulations.
- ❑ Ensure effective achievement of objectives and good use of resources.

2-**Bodies responsible for issuing standards in the field of information system control:**

- ❖ Information Systems Auditing and Control Society, which represents the standards for information systems auditing and the COBIT framework. Cobit framework.
- ❖ ISO 27001:2005 (Information technology - Assurance tools - Information security management systems - Requirements).
- ❖ ISO 2005:2000 (Information Technology - Service Management - Specifications).
- ❖ IT Infrastructure Library ITIL version 3,
- ❖ Institute of Internal Auditors.
- ❖ In addition to international organizations: ARABOSAI, INTOSAI, AUROSAI, CAROSAI, AFROSAI

3-**Financial data control using applications Informatics CAATs:**

-Mechanisms those auditors rely on, depending on the computer as this is it and to collect and analyze control data to improve and activate the control process.

-That use CAATs does not change the objectives of audit, but changes are required only at the level of audit methodologies.

-It becomes necessary to resort to the use of electronic data in the event of a shortage of supporting documents or evidence, or a lack of reliability, as the auditor must rely on CAATs to collect and analyze financial data.

-Data on any system can be examined for many years, from the inception of the entity subject to audit until the date of the audit process. This is for easy access to data without having to transfer a huge amount of documents and ease of linking between different files and systems, and get fast results Discover data gaps. And detect data interference, and detecting illogical data, and export financial data to excel file for analysis and clear reading.

He is employment CAATs on the IT system of the audited entity, either directly or by connecting the auditor's computer to the audited entity's network. Or download the database on the reference information system technology, and use CAATs for financial data analysis and processing.

4-Auditor work stages:

4-1-Planning stage:

Planning the work assignment by studying the client's (facility's) environment by reviewing all procedures, information, systems and instructions related to the information technology system so that the nature and timing of the assignment are determined and development and use of information applications (CAATs) appropriate to facilitate the review process such as: SQL; EXEL; IDEA

4-2-Mission implementation phase:

Evaluating the internal control system of the information technology system, if any, after designing a special questionnaire for this purpose, in order to identify the strengths and weaknesses in the internal control environment and control

procedures related to information technology systems, in order to determine the size of the work procedures (tests) on the computerized systems.

4-3-Reporting stage (results):

After completing the tests on computerized systems, information systems auditors can provide an independent opinion on the accuracy and completeness of IT performance measures, in addition to providing recommendations on the effectiveness of planned work in achieving objectives and addressing deviations, as well as on IT performance and risks.

4-4-Monitoring and follow-up phase:

At this stage, the client (facility) is referred to ensure that the (facility) has responded to the recommendations and made the necessary modifications as planned and recommended.

5- Information system evaluation SI For a public hospital institution (case study):

Within the framework of implementing the annual audit program for the year 2018, the Algerian Court of Accounts conducted a performance audit of the Djilali Rahmouni Public Hospital.

The control process focused on evaluating the conditions for managing human, financial and material resources, as well as the level of responsibility for the institution’s tasks. In this context, the institution’s information system was evaluated.

***The organization's information system:**

The information system established at the hospital level consists of eighty-six (86) computers, two (02) servers, fourteen (14) power banks, seventy-six (76) printers, in addition to twenty-five photocopiers, a scanner, a modulator (MODEM) plus a brass age armoire de and a group of applications.

Regarding applications, the information system of the public hospital institution contains eight (8) computer applications, detailed in the table below:

The interest	The job	Appointment	The number
Pharmacy interest	Drug management	**EPIPHARME**	1
Sub-Directorate of Health Services	Entering data of patients being treated in the hospital	**PATIENT**	2
Sub-Directorate of Health Services	Shift management	**GARDE**	3
Sub-Directorate of Health Services	Health Activities Account	**DHIS**	4
Epidemiology Service	Diseases and mandatory declarations	**SISDZ**	5
Sub-Directorate of Finance and Means	Payroll management	**WPAYE**	6
Human Resources Sub-Directorate	Employee file management	**SIRH**	7
Media OfficeY	Triple Hospital Accounting	**TRICOH**	8

* **Preparing an electronic data processing risk matrix:**

It was represented the most important risks related to the electronic operation of data at the enterprise level, which were identified by the control team, are:

❑ **expected risks due to technical errors and save data and information:**

- ✓ Risk of hacking.
- ✓ Virus risk.
- ✓ Risk of unauthorized entry.
- ✓ The risk of using pirated copies of software.
- ✓ Risk of unauthorized modification of data or information.

- ✓ Risk of accuracy, consistency and integrity of data and information.
- ✓ Risk of hardware or software failure.

❑ **Risks due to human and environmental errors:**

- ✓ Risk of lack of skills and competencies.
- ✓ Risk of human error.
- ✓ Risk of server and storage theft.
- ✓ Risk of data loss due to natural disasters Floods, fires, earthquakes.
- ✓ Risk of power outage
- ✓ Risk of interruption of technical support and maintenance from service providers to the computer center.

After identifying the most significant possible risks, the Audit Committee of the Audit Bureau constructed the risk matrix as follows:

too low 1	low 2	middle 3	Dangerous 4	Very Dangerous 5	The effect of the error when it occurs← probability of danger↓
5	10	15	20	25	Very high 5
4	8	12	16	20	High 4
3	6	9	12	15	middle 3
2	4	6	8	10	low 2
1	2	3	4	5	too low 1

Risk rating from 1 to 25 By multiplying (a) by (b)	**Potential impact From 1 to 5 (for)**	**The probability of error is 1 to 5. (A)**	**Description of the hazard**	**Identify the risk**
16	4	4	**These are programs that, if they**	**Virus risk**

			penetrate servers, may cause destruction or loss of data, information, or other things. **Damage caused by viruses**	
16	4	4	**This risk is represented by the failure of the organization's main devices, or the programs and systems that are concerned with running the most important operations or services provided by the organization.**	**Hardware and software faults**
16	4	4	**This risk is the lack of competencies and skills in electronic information and data processing technology.**	**loss Skills and competencies**
16	4	4	**Lack of integration and consistency between the various programs and applications integrated into the organization's information system, which may result in conflicting or incomplete data.**	**Lack of consistency and integration between different programs and applications**
16	4	4	**The lack of availability of programs to record all data, information and supporting documents, which may result in incorrect or incomplete information and failure to detect errors, violations and manipulations.**	**Data inaccuracy**
12	4	3	**Using unlicensed copies of software or systems that serve the work, which may cause the work to stop at**	**Using pirated software**

			some point during the work, or the inability to perform work on those programs, due to their stopping because they are not licensed.	
12	4	3	**F Data and information may be lost if servers are stolen from data centers.**	**Risk of server and storage theft**
12	4	3	**This risk is the occurrence of unintentional human errors during data entry and operation, which affects the performance of devices, systems and applications.**	**Human errors**
10	5	2	**Force entry and breaking of barriers and firewalls of servers and devices that serve programs and systems**	**Hacking technology risks (Hacking)**
8	4	2	**This risk is represented by the loss of data and information due to floods, fires or earthquakes that cause the destruction of the information center and the servers located in it that contain data and information specific to the various interests of the hospital institution.**	**Risk of information loss due to floods, fires or earthquakes**
4	4	1	**Unauthorized access to systems, programs or databases, by obtaining the username or password in an illegal manner, in order to modify the data.**	**Risk of unauthorized access and modification of data**
4	4	1	**This risk is represented by a power outage in the data center and then the failure of the various devices**	**risk of power outage**

			that manage and process data for the various interests of the hospital institution.	
4	2	2	**This risk is the sudden cessation of technical support and maintenance for the operating devices, software and applications.**	**Risk of interruption of technical support and maintenance from the supplier**

The audit and review of the information system of the public hospital institution revealed many shortcomings and irregularities, including those related to the state of the equipment and computer networks on the one hand, and those related to the integration and coordination between the various applications used on the other hand, in addition to recording a shortage in the qualifications of the human resources responsible for operating the information system.

Regarding the risk of hardware and software failures (It is a high risk according to the risk matrix):

- ✓ -Existence of out-of-service applications:

The audit revealed that two (2) of the most important applications at the hospital level are out of service, namely:

*application TRICOH relating to the three-tier hospital accounting (general accounting, analytical accounting and budget accounting) placed at the disposal of the Office of Information Technology, stipulated by Executive Decree No. 14-10 issued on 10 Jumada I 1435 corresponding to 12 March 2014, as some of the equipment allocated to it is not working and some is used in other interests;

*application DHIS relating to the health activities account placed at the disposal of the sub-directorate of health services.

- ✓ Equipment failures and lack of maintenance:

There is a large amount of faulty IT equipment. It is randomly stacked at the level of the Finance and Resources Sub-Directorate without any repair or maintenance.

- ✓ Server(Server) related to the patient application:

The application used by the admissions office has not been working for more than two years. The hospital administration has not taken any action to fix it, as a result the data of inpatients to the hospital entered in this application is stored on the hard disk of a computer with limited storage capacity and is at risk of failure at any time, which increases the risk of losing some information.

Regarding the risk of inconsistency and lack of integration between the various programs and applications integrated into the information system (It is a high risk according to the risk matrix):

The computer applications used at the hospital level are separate from each other and have not been designed within the context of integrated hospital information management. For example, the sub-directorate of health services operates three computer applications without any connection between them. This is the application called "Patient", which takes care of all the patient's data from the date of admission to the date of discharge as well as the bills, the other application "DHIS" is designed to calculate health activities and a third application is dedicated to managing the shift.

Regarding the risk of the programs not allowing the recording of all data, information and supporting documents (It is a high risk according to the risk matrix):

The applications used at the level of the organization's information system do not allow the recording and display of all accounting data and information and supporting documents.

On the other hand, we find that manual auditing of the various records, contracts, payment transfers and invoices held at the level of the public hospital institution reveals many violations that these applications do not show. For example, but not limited to, we find:

- ✓ Double payment of some bills;
- ✓ illegal deduction of expenses;
- ✓ Not applying a delay penalty to economic operators who are late in supplying the institution's purchases or who are late in delivering completion and maintenance works.

Regarding the risk of lack of skills and skills (which is High risk according to matrix Risks:

- ✓ Insufficient human resources allocated to operate the organization's information system;
- ✓ Lack of technical skills and competencies of those working on various applications related to the information system;
- ✓ Lack of training and education continuing in Information technology field for cadres and users.

Information systems have a major and significant role within institutions, as management information systems work to solve problems within institutions. Providing accurate information to decision makers in companies, by processing, storing and analyzing data to help implement the company's strategy.

III. The application framework of the Accounting Council in control based on big data analysis (practical case):

The Algerian Court of Auditors exercises its advisory functions on preliminary drafts of budget settlement laws in accordance with the Constitution and other legal provisions such as the provisions of the law relating to financial laws and the laws regulating the financial law.

The draft report prepared by the Court of Auditors relates to the draft law on the budget settlement for fiscal year N-3 in accordance with the law on financial laws, as amended and supplemented. This document records the most important findings and recommendations resulting from the investigations carried out by the national and regional chambers.

This report aims to evaluate the results of the implementation of the finance Law based on the preliminary draft of the Budget Settlement Law and the attached documents, which are submitted to the Council. The report also contains important observations arising from the work of the national and regional chambers on budget management and contained in sectoral memoranda and reports related to municipal development plans. This report records the most important observations, observations and comments on the implementation of the Finance Law.

*1*Analysis criteria:

A comprehensive assessment of budget management is prepared in light of the following criteria:

Budget regularity: The focus is on respecting the budget principles stipulated in the law on financial laws, namely the principles of annuality, allocation, comprehensiveness and unity.

Accounting regularity (compliance audit): The rapporteurs will ensure the existence and effectiveness of control mechanisms stipulated in applicable laws

and regulations, and the material validity, regularity and compliance of the transactions recorded in the accounts and financial statements.

Budgetary regularity control includes ensuring that appropriations are available, that budget and accounting entries are accurate, that the laws and regulations of the physical system are respected, and that the annual commitment is not fragmented and has no repercussions on subsequent years.

Performance approach: The rapporteurs judge the effectiveness of management. They must update the diagnosis of the performance approach, following it with the enumeration and evaluation of the indicators defined by the ministries that have started implementing the results-oriented management approach.

Principles of good budget management: Beyond the budget principles stipulated in the law on financial laws, the preliminary draft report on the budget settlement law will assess the quality of budget implementation through globally accepted criteria of credibility and sustainability.

The sector memorandum rapporteurs will analyze the budget credibility assessment, as the credibility of the estimates is assessed in relation to the information and elements available at the time of their preparation. And measure it on achievements (big differences).

Regarding with sustainability short- and medium-term finance, defined as the state's ability to respect the budget path set out in the Budget Act for the year (short-term) and to meet its commitments in the medium term. Financial sustainability can be assessed in a holistic manner, but also, in the context of sectoral memoranda, at the level of each sector. As such, rapporteurs will, in particular, undertake an in-depth study of the outstanding debts in order to identify the residuals of past payments, borne by the budget of year (n) and the sources of resilience of future expenditures.

In this regard, the Audit Board shall prepare a report that includes the following topics:

● Results of implementing the Finance Law.

● General budget revenues.

● Budget expenditures.

●Treasury special accounts.

●Treasury operations.

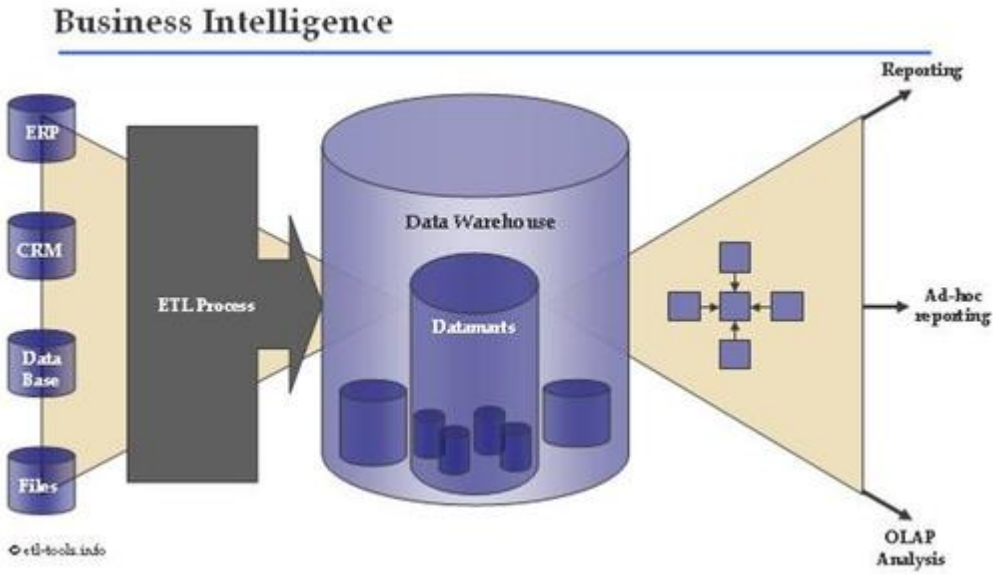
2-Program Treatment *Direct Analytics (OLAP):*

Direct Analytical Processing Program (OLAP) is an essential tool for auditors when evaluating the results of the implementation of the Finance Law and understanding how all the operations included in the budget are implemented. Evaluating the results of the budget requires auditors to audit the financial operations in various ministerial sectors, bodies, facilities and public institutions, in addition to sectoral development programs according to the states and municipal development plans according to the municipalities.

To achieve these objectives more effectively and efficiently, the auditors of the Accounting Board rely on the use of direct analytical processing software. OLAP, or online analytical processing, is a type of technology used in the field of data analysis and databases. OLAP software for auditors in the accounting board can view and analyze data interactively and in a multi-dimensional manner, allowing them to explore and extract information from data sets in multiple ways to understand relationships, patterns, and trends.

This system is based on storing data in a multidimensional form, where data is organized into cubes. OLAP (Online Analysis Cubes), allowing auditors to browse data from different perspectives such as time, ministerial sectors, appropriations by nature and any other dimensions that are relevant to the data.

The program is characterized by OLAP with graphical user interfaces make it easy for auditors to identify the information they need and perform analysis. Auditors can quickly and easily clean, filter, and aggregate data to understand patterns and make better decisions.



3- Use the diagram In a way astral (Star Schema) in Framework for the preliminary report of the Budget Control Law (Case study):

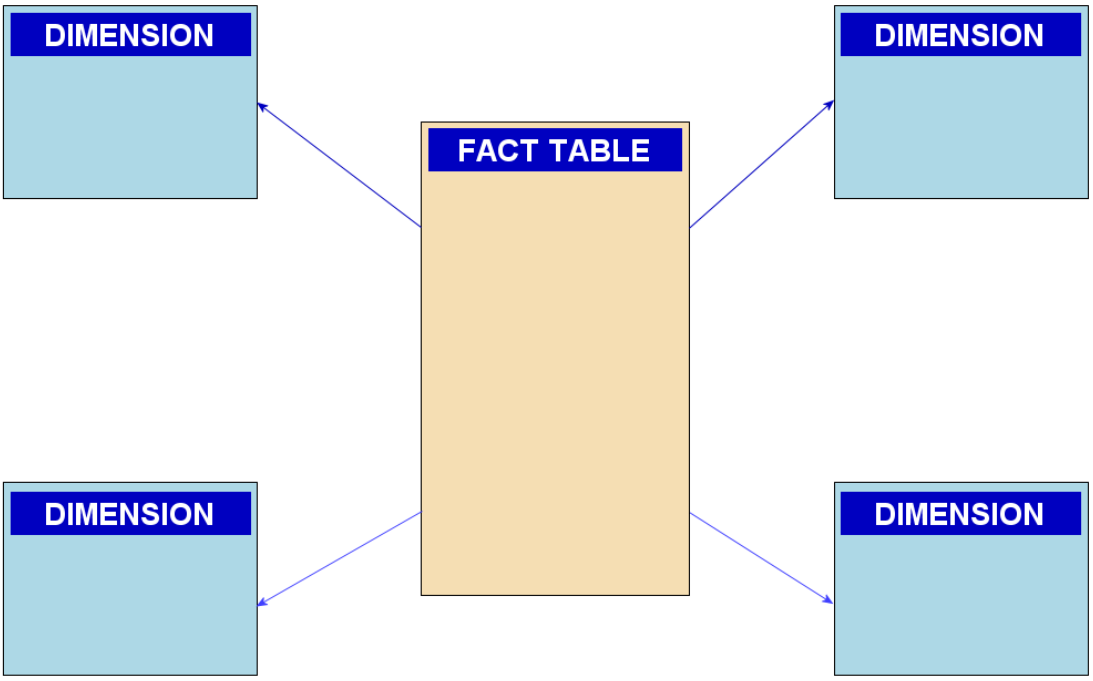
Star chart Star Schema is a database organization pattern that is widely used in data management and analysis. It is used to store data in multidimensional structures consisting of fact tables and dimension tables.

The main idea of a star schema is to organize the data so that there is a main table known as the fact table (Fact Table) which contains the main information and measures that are calculated and analyzed, while dimension tables contain descriptive and categorical information that helps in browsing and interpreting the data.

This pattern is mainly used in big data management systems, reporting databases, and intelligent business processes. The star schema is effective because it reduces the need for complex join operations. It facilitates querying databases for fast and accurate analysis.

In short, a star schema is a data storage methodology used to improve data performance, analyze data, and facilitate its use in business contexts and

decision-making processes. The diagram below illustrates what this model looks like:

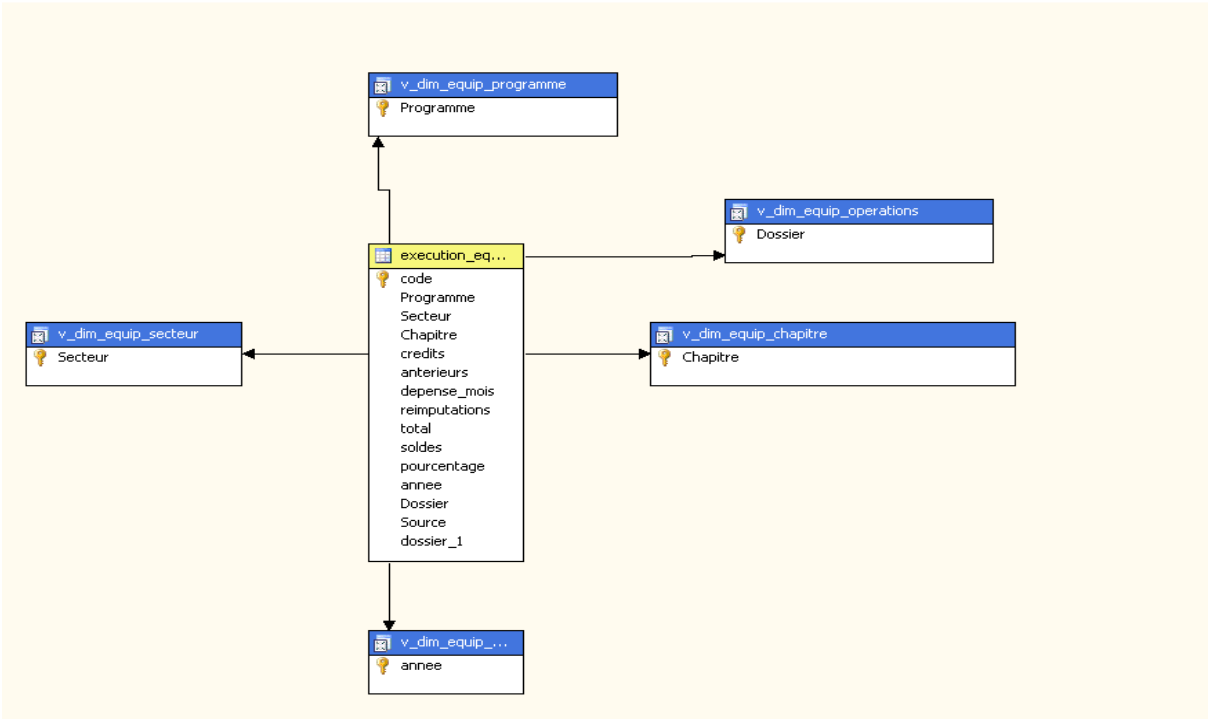


He provides system OLAP for the audit teams within the Algerian Court of Accounts is a data model related to the data provided by the central accounting assistant to the team. This model includes five cubes, which are:

- budget Preparation.
- budget Management.
- Budget Management According to nature Expenses.
- Budget Management According to the address.
- Budget Operation According to State.

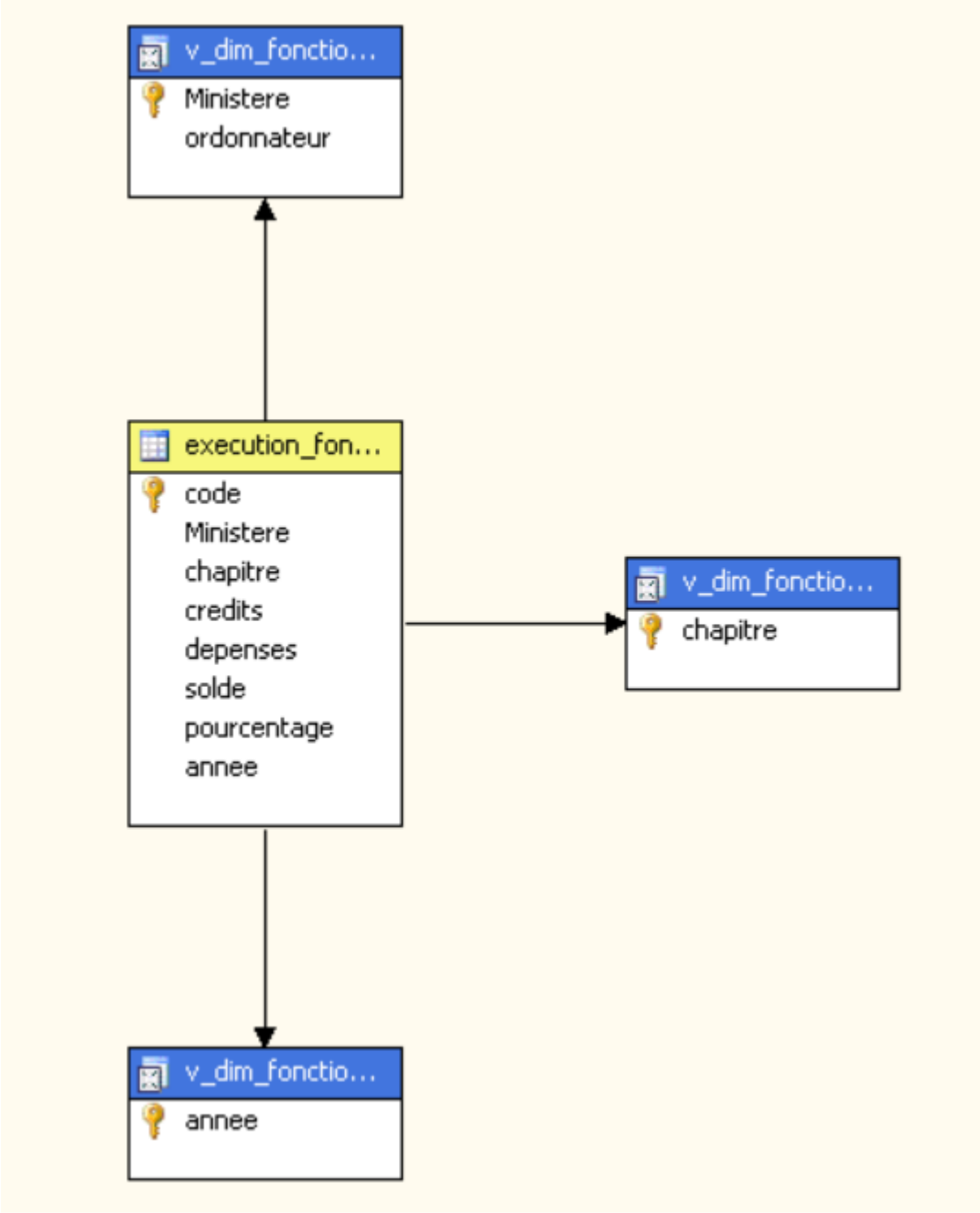
Equipment budget cube:

Availability shape below looks General on cube Related On budget Preparation.



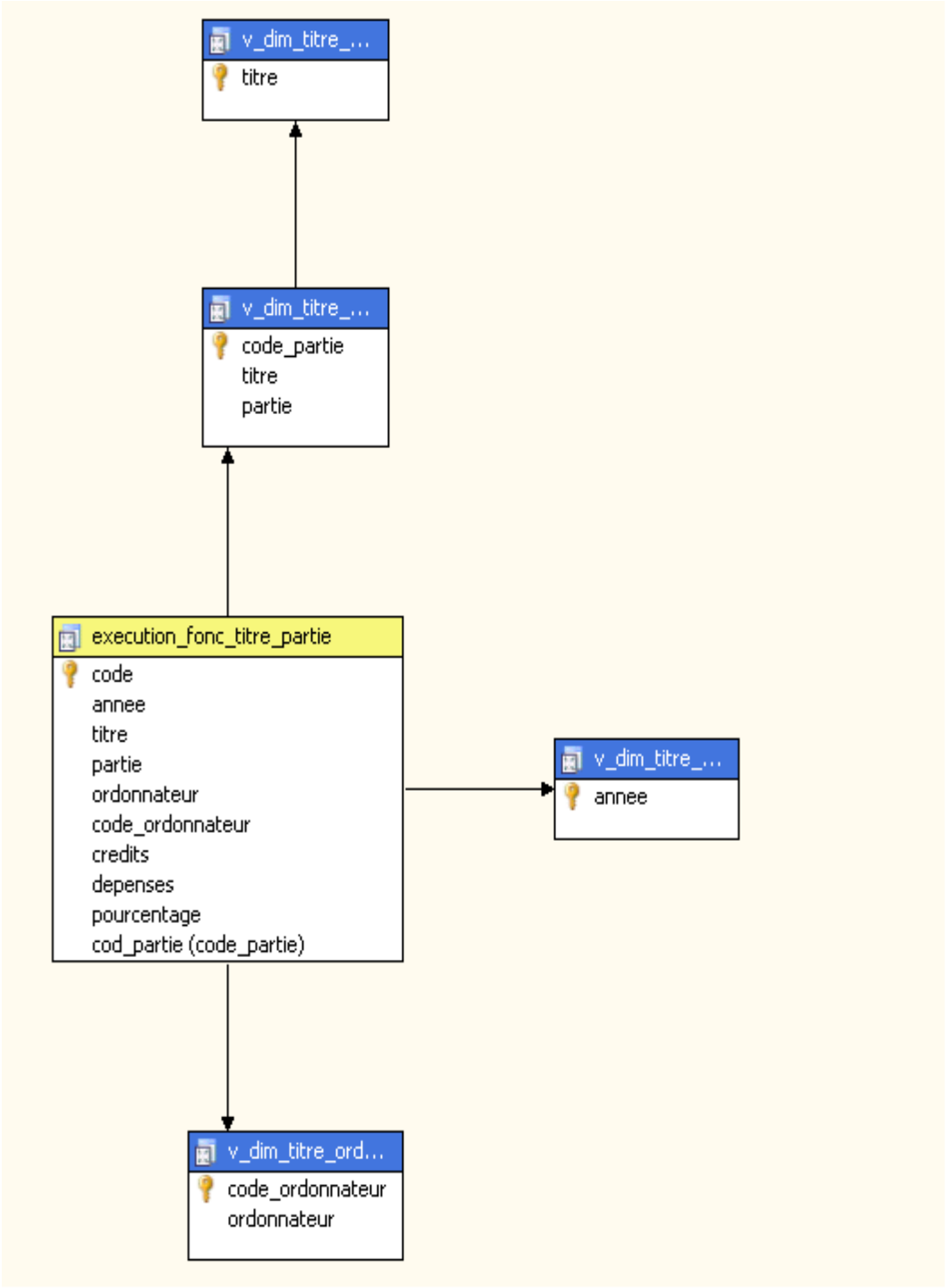
Operating budget cube

Availability shape below looks General on cube Related On budget Management.



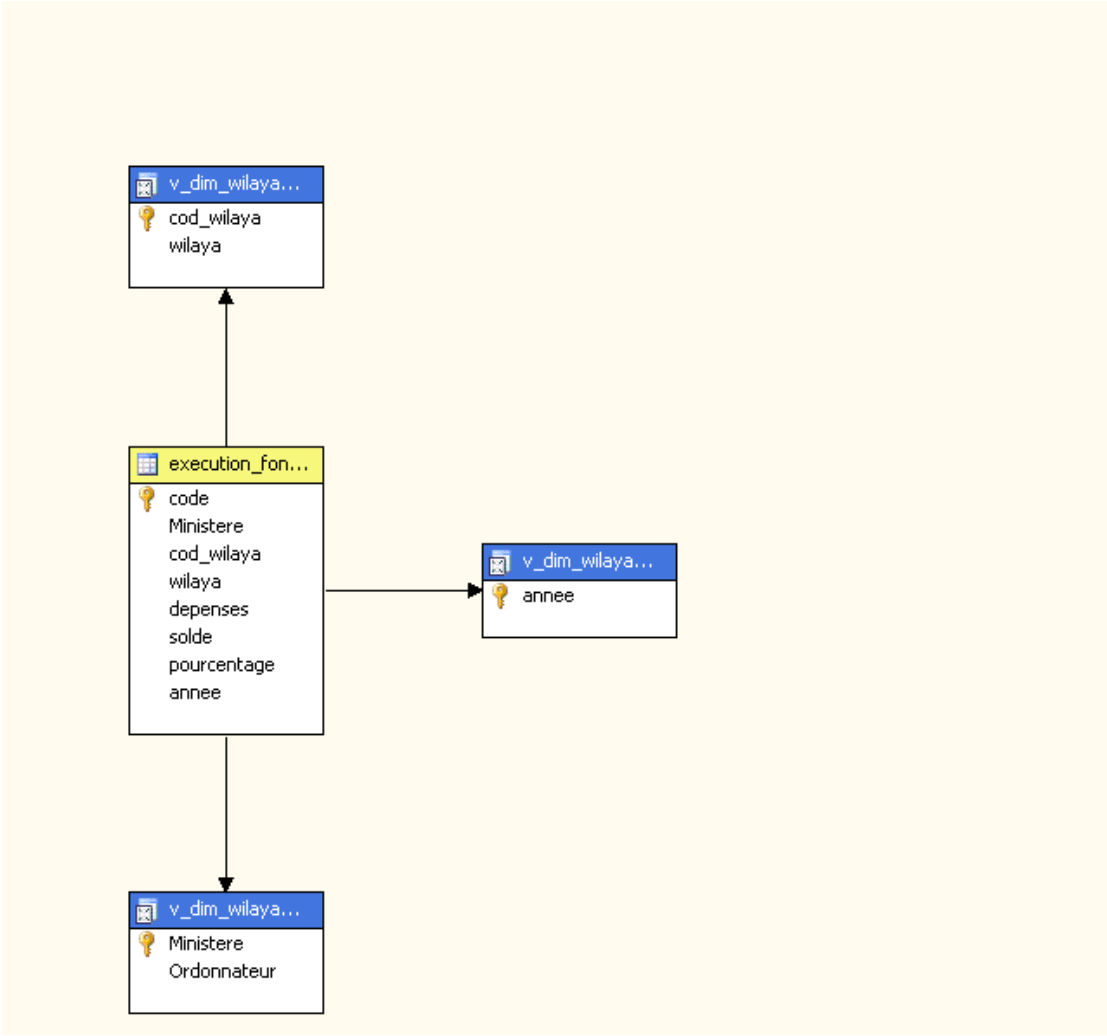
Operating budget cube by title

The figure below provides an overview of the operating budget cube broken down by heading.



Operating budget cube by state

The figure below gives an overview of the operating budget cube, broken down by state.



Steps for applying data analysis techniques in auditing processes:

The steps for applying data analysis methods in audit processes should include the following:

Defining objectives: We begin by defining the audit objectives and identifying potential challenges, based on the most important directives of the Finance Law for the basic year, as well as the guidance note of the Chairman of the Audit Board.

1. **Data collection:** we collect data from multiple sources, such as accounting systems, databases and digital documents, based on the cards

attached to the methodological guide for controlling the budget settlement law, in addition to the most important laws and reference decrees such as the annual finance law and the supplementary finance law, decrees for distributing credits, decrees for transferring and transferring credits, in addition to the data sent by the central accounting officer of the treasury and the central treasury, and the data sent by the ministries..

2. **Data cleaning** we clean and format data to ensure its accuracy and effective use. This is done using the advantages of direct analytical processing. (OLAP).
3. **Data analysis:** Using data analysis tools, we analyze data to uncover patterns and important information, relying on direct analytical processing.(OLAP), by including risk-based audit principles within the framework of preparing for the audit of the Budget Control Law.

The use of big data analytics techniques can significantly contribute to enhancing the quality and effectiveness of financial auditing, and therefore, these techniques should play an increasingly important role in future audits.

Conclusion:

Through our study of the topic of "Modern Scientific Methods and Innovation in Supervisory Work," we tried to shed light through the applied study on the information system and big data analysis by presenting the following forms:

What are the modern scientific methods that can help in innovation in supervisory work in the light of? To Rapid technological developments?

The regulatory world is witnessing a huge revolution thanks to the rapid developments in modern scientific methods, which has led to a qualitative shift in the work of financial oversight and other regulatory bodies. These methods are new and unique tools to enhance the efficiency of oversight and achieve its objectives more effectively, by combating various types of fraud, deception and financial crimes accurately and quickly. With the continued development of these methods and the development of the skills of those working in the field of oversight, they will contribute significantly to enhancing the efficiency of financial oversight and achieving greater financial stability in the future.

We also highlighted the modern scientific methods adopted by the Algerian Court of Accounts at the present time, especially with the technological development in all fields and the digitization of all sectors. The focus was on the information system and big data analysis, as their importance lies in improving the quality of accounting information for use in the auditing process by the Court of Accounts as the supreme supervisory institution over the financial operations of state accounting, and this is through the implementation of the general budget, and it also aims to achieve the objectives set for it effectively, which are represented in preserving public funds.

The most important results obtained:

*Improving control efficiency: These methods have reduced the time and effort spent on control operations.

*Increased control accuracy: These modern methods allow for the analysis of huge amounts of data and the identification of patterns.

Suspicious more accurately, which contributes to detecting fraud and financial crimes faster.

*Big data is a major resource for the industry to provide important information that is used in the audit process by the Accounting Board.

*Big data is handled in the Audit Board by eliminating unnecessary data, analyzing necessary data and using it in the audit process.

*It is done use electronic data in the information system of the Court of Accounts in document shortage case and supporting documents, or lack of reliability, to collect and analyze financial data.

There are also challenges and difficulties when using information systems and big data:

-There is difficulty in transferring, storing, processing and auditing the rapidly growing big data and how to deal with big data despite its availability.

There is a difficulty in security and privacy in the information system, as protecting data from hacking and theft is one of the most important challenges facing information systems.

Recommendations:

-The necessity of using modern scientific methods in the auditing process, as they have an impact on increasing efficiency, effectiveness and saving time.

- The necessity of keeping pace with developments and following up on modern systems, especially in the field of auditing and control systems, and training employees on them by raising their efficiency, and the necessity of involving auditors and reviewers when developing the electronic technologies used in

control work, considering this as one of the basic requirements for quality control.

- Holding workshops and training courses for researchers and introducing them to the importance of applying modern scientific methods in supervisory work.

-Strategic position and to manage big data and information systems to benefit from them in improving public performance at the level of those in charge of governance.

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