The Role of Artificial Intelligence in Improving the Efficiency of Financial and Accounting Performance: A Field Study on some Sudanese business organizations

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Citation: Hammad, S. M. (2025). The Role of Artificial Intelligence in Improving the Efficiency of Financial and Accounting Performance: A Field Study on some Sudanese business organizations. *Journal of Economic, Administrative and Legal Sciences, 9*(6S), 101–118. https://doi.org/10.26389/AJSRP.M100225

Abstract: The main objective of the study is to know the role that artificial intelligence, with its various technologies, can play in improving financial and accounting performance. To achieve the study's objectives, the researcher adopted inductive approach, historical approach and the descriptive analytical approach in analyzing field study data, and obtaining results, in addition, (150) questionnaire forms distributed to some employees in some Sudanese business organizations in Port Sudan and Atbara, only (140) questionnaire forms collected, which represent (93.3%). The study's findings revealed that, using artificial intelligence to prepare accurate and transparent financial reports facilitates understanding financial status of Sudanese business organizations and developing financial strategies. Moreover, using artificial intelligence the digital transformation of accounting transactions save the time and reduces accounting errors in Sudanese business organizations. The study recommended that, Sudanese business organizations should adopt artificial intelligence technologies into their financial and accounting operations in order to improve the efficiency of their financial and accounting performance. In addition to conducting more studies to determine the impact of artificial intelligence on the auditing, financial analysis profession and rationalizing decisions.

Keywords: Artificial Intelligence, Efficiency, Financial Performance, Accounting Performance.

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دور الذكاء الاصطناعي في تحسين كفاءة الأداء المالي والمحاسبي: دراسة ميدانية على بعض منظمات الأعمال السودانية

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المستخلص: الهدف الرئيسي للدراسة هو معرفة الدور الذي يمكن أن يلعبه الذكاء الاصطناعي بتقنياته المختلفة في تحسين الأداء المالي والمحاسبي لمنظمات الأعمال السودانية. لتحقيق اهداف الدراسة اعتمد الباحث على المنهج الاستقرائي، المنهج التاريخي، والمنهج الوصفي التحليلي في تحليل بيانات الدراسة الميدانية والحصول على نتائج، بالإضافة الى توزيع عدد (150) استمارة استبيان على بعض العاملين في بعض المنشآت ببورتسودان وعطبرة، وقد تم استعادة (140) استمارة فقط، وتمثل بنسبة (93.3%). أظهرت نتائج الدراسة أن استخدام الذكاء الاصطناعي لإعداد تقارير مالية دقيقة وشفافة، يسهل فهم الحالة المالية لمنظمة الأعمال، ووضع الاستراتيجيات المالية. كما أظهرت نتائج الدراسة أن استخدام الذكاء الاصطناعي في التحول الرقمي للمعاملات المحاسبية يؤدي الى توفير الوقت ويقلل من الأخطاء المحاسبية. أوصت الدراسة باعتماد منظمات الأعمال السودانية لتقنيات الذكاء الاصطناعي في طبيعة معاملاتها المالية والمحاسبية من أجل رفع كفاءة أدائها المالي والمحاسبي. بالإضافة الى اجراء مزيداً من الدراسات عن أثر الذكاء الاصطناعي على المراجعة، مهنة التحليل المالي وترشيد القرارات.

الكلمات المفتاحية: الذكاء الاصطناعي، كفاء، الأداء المالي، الأداء المحاسبي.

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1.   Methodology of the study

1.1. Introduction

The world has recently witnessed tremendous and rapid technological developments, especially in the field of information technology, where many modern technologies have emerged, most notably artificial intelligence, which has developed in recent years, and has multiple methods and techniques applied in many scientific and applied fields. In the past few years, interest has increased in using artificial intelligence technologies in the financial arena and benefiting from them in improving the financial and accounting performance of organizations. This interest in artificial intelligence and its uses in the financial and accounting field came because it provides great opportunities for accountants, financial departments and financial analysts and saves them the trouble of searching through large and huge amounts of financial and accounting data on a daily basis while performing their various jobs. Therefore, this study investigate the role of artificial intelligence in increasing the efficiency of financial and accounting performance, considering that the application of artificial intelligence technologies in the financial and accounting field is inevitable, and will undoubtedly lead to significant changes in the field of accounting and financial fields in general.

1.2. Study's Problem

Despite the development of information technology which led to emergence of artificial intelligence with various advantages and uses in many activities. In addition to reliance of many organizations on artificial intelligence to improve their financial and accounting performance, many Sudanese business organizations have not yet benefited much from these developments in increasing the efficiency of their financial and accounting performance for various factors. Accordingly, the study problem formulated in the following questions:

Q1. Do artificial intelligence technologies contribute to improving the efficiency of financial performance of Sudanese business organizations?

Q2. Do artificial intelligence technologies contribute to improving the efficiency of accounting performance of Sudanese business organizations?

1.3. Importance of the study

The scientific importance of the study lies in learning how to use artificial intelligence techniques and programs to improve the financial and accounting performance of Sudanese business organizations. The study also contributes to studying and analyzing one of the recent developments to maintain the continuity of developing financial and accounting thought. In addition, the study will contribute to raising the level of professional awareness of accountants and financiers of the importance of artificial intelligence and modern technologies in general. As for the practical importance of the study, it lies in explaining how economic organizations in the Sudanese business environment apply artificial intelligence techniques to raise the efficiency of their financial and accounting performance. The practical importance of the study also lies in the fact that it will allow financiers in general and accountants in particular to address shortcomings in their use of artificial intelligence in the nature of their work.

1.4. Study's objectives

The main objective of the study is to show the role that artificial intelligence with its various technologies can play in improving financial and accounting performance of Sudanese business organizations. In addition to following sub-objectives:

1.4.1.   Contributing to spreading the concept of artificial intelligence and highlighting its importance and various advantages.

1.4.2.   Shedding light on artificial intelligence methods, areas of use, and their suitability for financial and accounting performance in Sudanese business organizations.

1.4.3.   Studying the relationship between artificial intelligence technologies and the efficiency of financial and accounting performance in Sudanese business organizations

1.4.4.   The possibility of getting results in light of which appropriate recommendations made.

1.5. Study's Hypotheses

To achieve the study objectives, the following hypotheses were tested:

H1. Artificial intelligence techniques contribute to improving the efficiency of financial performance in Sudanese business organizations.

H2. Artificial intelligence techniques contribute to improving the efficiency of accounting performance in Sudanese business organizations.

1.6. Study's Methodology

The study relied on the inductive approach in presenting the problem and formulating hypotheses, the historical approach in reviewing previous literature related to the study variables, and the descriptive analytical approach in analyzing field study data, and obtaining results and recommendations.

1.7. Sources of data collection

The primary source of data represented into the questionnaire form, while the secondary sources included references, scientific periodicals, and university theses related to the study topics, in addition to the Internet.

1.8. Study's limits

The objectivity limits of the study represented in focusing on the role of artificial intelligence in increasing the efficiency of financial and accounting performance of the organizations in the Sudanese business environment. The spatial limits represented in some Sudanese business organizations in Port Sudan and Atbara, while the human limits represented in financial managers, financial analysts, internal auditors and accountants in some Sudanese business organizations. As for the temporal limit, it included the year 2024.

2.   Previous studies review

There are many studies conducted by writers and researchers has addressed the issue of artificial intelligence and its impact on different fields, the most important of these studies is the study of (Emetaram, Uchime, 2021) aimed to examine the impact of artificial intelligence on the accounting profession. The study findings revealed that Artificial Intelligence artificial intelligence has positive impact on the accountancy profession, and artificial intelligence has a positive impact on accountancy profession in the sense of the accountants. The study recommended that, accountants should actively be ready to alter their thinking process, abandon the accounting function of traditional accounting, adapt to the current trends, and make a good prediction of current and future economic prospects of various enterprises. As the study of (Yaeshi, Meadari, 2022) aimed to clarify the extent of the contribution of Artificial Intelligence to the development of financial technology by improving the performance of some financial organizations. The results of the study showed that there is a statistically significant effect of artificial intelligence on financial technology in the banks and artificial intelligence has an effective role in the development of financial technology. Among the proposed recommendations is that, all financial organizations, especially traditional ones, must adopt modern systems and new technologies to maintain their stability. In addition, the study of (Stancu, Duțescu, 2022) aimed to understand the impact of Artificial Intelligence solution in accounting by conducting a qualitative research based on relevant literature review, of the last years. The results of the study showed that, accountants are using technology to improve their activity but using artificial intelligence will improve the investment decisions and quality of the business and the accounting profession has the chance now, by implementing artificial intelligence to become a more dynamic and appealing profession. The study recommended that, the potential changes Artificial Intelligence could bring to the accounting jobs and the necessary steps to conduct in order to prepare for the new jobs, in which Artificial Intelligence solutions will be present.

In addition, the study of (Gouda, 2023) aimed to identifying artificial intelligence and its relationship to improving logistical performance and developing financial performance, with application to the Youth and Sports Directorates in the governorates of Upper Egypt. The results of the study revealed that there is a lack of using artificial intelligence in the youth and sports directorates of Northern Upper Egypt. Moreover, it revealed that, there is a low level of logistical performance in the youth and sports directorates in Northern Upper Egypt. In addition to the weak financial performance in the youth and sports directorates in Northern Upper Egypt, the existence of a significant positive correlation between artificial intelligence and both improving logistical performance and developing financial performance in the youth and sports directorates in the governorates of northern Upper Egypt. One of the most important recommendations is to train workers on artificial intelligence applications, especially human resources management, in order to raise the

efficiency of administrative systems for human resources management. Moreover, the main objective of (Al-Qadi, 2023) study represented into Study and analysis of the application of artificial intelligence systems techniques to improve the transparency of financial reports, and study and analysis of artificial intelligence systems of its types and the risks and obstacles to their application. It also aims to study the concepts of financial reporting transparency and its measurement indicators. The most important result of the study is that, the application of artificial intelligence systems contributes to improving the credibility and transparency of financial reports in telecommunications, media and information technology companies, in terms of the accuracy of measuring and objectivity of the financial position. The study's findings also showed that, improving the profitability of financial performance, increasing the level of disclosure and transparency, and contributing to the preparation of sufficient and accurate indicators to evaluate performance. The study recommended the need for more Egyptian companies to meet the requirements for applying digital transformation technologies in general, and artificial intelligence systems as one of the digital transformation technologies in particular. Lastly, the study of (Zamain, Subramanian, 2024) aimed to discuss benefits of artificial intelligence to the accounting; auditing profession and its employees this paper discussed the risk of artificial intelligence and challenges to Accounting firms and their employees. The study findings revealed that, when artificial intelligence implemented smartly, it would allow the company to generate income; artificial intelligence practiced in most industries in which modeled to detect fraud with intelligent advice and data protection. The study recommended that, accountants should look forward to how much artificial intelligence can offer instead of fearing artificial intelligence will replace them.

By reviewing previous studies, the researchers note that the studies of (Emetaram, Uchime, 2021), (Yaeshi, Meadari, 2022), (Stancu, Duțescu, 2022), (Gouda, 2023), (Al-Qadi, 2023) and (Zamain, Subramanian, 2024) focused on artificial intelligence, as an independent variable, and its impact on different fields. Moreover, the current researchers' study differs from those studies in that, it addresses the role of artificial intelligence in improving the efficiency of financial and accounting performance, in addition to the differences in spatial limits, time limits, human and objectivity limits.

3. Theoretical framework of artificial intelligence

3.1. Concept of artificial intelligence

It is difficult to define the concept of artificial intelligence accurately. Intelligence defined as the ability to achieve goals, and people have different levels of intelligence. Based on the definition of intelligence, (Sakhrawi, Alami, 2023, 3) defines artificial intelligence as advanced technologies that represent the development of computer functions, and aim to have the computer simulate the intelligence processes that occurred within the human mind. It needs a data system used to represent information and knowledge, algorithms that it needs to draw a way to use this information, and a software language used to represent both information and algorithms, so that the computer has the ability to solve problems and make decisions in a logical and organized manner. (Bakari, 2022, 290) also defines artificial intelligence as a branch of computer science through which computer programs can be created and designed that simulate the method of human intelligence, so that the computer can perform some tasks that require thinking, understanding, hearing, speaking and movement in a logical and organized manner, instead of a human instead of a human. (Al-Jaber (2020, 17) also confirmed in his study that artificial intelligence is an attempt to make the machine capable of thinking like a human being by developing complex systems.

Based on the previous definitions, the researcher can define artificial intelligence as a concept that refers to systems or devices that simulate human intelligence in performing tasks. Artificial intelligence aims to enhance human capabilities and contributions, making it a valuable business asset.

3.2. Importance of artificial intelligence

(Al-Ghoul, 2021, 36) believes that the importance of artificial intelligence represented in the following:

3.2.1.   Providing financial services with high efficiency.

3.2.2.   Reducing costs, improving quality, and raising levels of employee satisfaction.

3.2.3.   Enhancing financial inclusion.

3.2.4.   Increasing analytical capacity.

It becomes clear to the researcher that the importance of artificial intelligence is that it helps increase the volume of production and services provided with high efficiency, which means increasing the profitability of organizations. It also helps financial departments in financial planning processes and preparing accurate financial reports at any time, in addition to helping in financial analysis processes.

3.3. Characteristics of Artificial Intelligence

(Jabari, 2017, 123) believes that artificial intelligence has a set of characteristics, which are as follows:

3.3.1.　Symbolic representation: Artificial intelligence software generally characterized by its use of non-numerical symbols, which contradicts computer code that relies on the numbers (0, 1).

3.3.2.　Diligence: Artificial intelligence software characterized by the absence of a specific and known algorithmic solution to the problems it addresses, so diligence must use to choose appropriate solution methods with the possibility of changing solutions in the event that the first method is inefficient.

3.3.3.　Incomplete information: Artificial intelligence software characterized by its ability to reach solutions to problems even in the absence of information in order to save goals as well as the ability to make decisions in the event of uncertainty.

3.3.4.　Knowledge representation: It expresses the correspondence between the external world and the symbolic reasoning processes in the computer.

3.3.5.　Conflicting data: Perhaps the most important feature of artificial intelligence software is its ability to deal with data that may contradict each other.

The researcher believes that one of the most important characteristics of artificial intelligence is its ability to deal with difficult and complex cases even in the absence of the necessary information.

3.4. Objectives of Artificial Intelligence

The main goal of AI is to provide a complete scientific explanation for the intelligence of humans, animals, and machines, while clarifying the common principles that distinguish all three types. It should acknowledge that the problem with this is that we know very little about these common principles now. In general, there are three main goals of AI, which are (Sumaia, Manal, 2022, 8):

3.4.1.　Make devices smarter.

3.4.2.　Understanding what intelligence is.

3.4.3.　Make devices more useful.

The researcher believes, in addition to what mentioned that artificial intelligence aims to help accomplish various tasks that humans do, with extreme accuracy and high quality, in the shortest possible time, and at the lowest cost.

3.5. Types of Artificial Intelligence

The study (Dallu, 2018, 3) confirmed that artificial intelligence divided into the following basic types:

3.5.1.　Reactive machines: This is the simplest form of artificial intelligence, where the interactive machine responds to the same situation in exactly the same way every time. The machine directly perceives its environment/situation and acts on what it sees. It has no concept of the wider world. It cannot form memories or rely on experiences to influence current decisions. It is specialized in only one field. This type is suitable for repetitive functions, for example, parking payment systems, ATMs, etc.

3.5.2.　Limited memory: AI machines with limited memory can look back in time, but for memories that are stored, limited memory machines cannot build memories or "learn" from experiences. An example of this is a self-driving car that may decide to change lanes because it suddenly notices an obstacle in its path. (Al-Qadi, 2023, 1018)

3.5.3.　Theory of mind: Theory of mind refers to the idea that a machine can recognize that others it interacts with have thoughts, feelings, and expectations. A machine embedded with the third type of AI will be able to understand the thoughts, feelings, and expectations of others and be able to adjust its behavior accordingly (Ali, 2023, 28).

3.5.4.　Self-awareness: The machine embedded in the fourth type of artificial intelligence will be self-aware. An extension of the "theory of mind", a conscious or self-aware machine will be aware of itself, know its internal states and be able to predict the feelings of others. It is clear to the researcher from the above that artificial intelligence systems can understand things just like a human. They will be able to learn, understand and respond as any person can, but the last type of artificial intelligence (self-awareness) is out of reach under current circumstances, however it may be possible to achieve it in the future, as it is similar to the human brain in that, it is aware of itself.

3.6. Techniques of Artificial Intelligence

A group of key technologies in the field of artificial intelligence will be highlight, their components and how these components interact presented. These technologies are as follows:

3.6.1. *Self-learning:* Self-learning is an integral part of artificial intelligence and is so common that it is often confused with artificial intelligence. It deals with improving learning based on data. Ultimately, it is about the extent to which tasks solved well by the machine and using training data and algorithms in particular. It is worth noting how machine learning works, as the machine or program can learn to perform certain tasks if it has previously gained experience in the form of relevant data. So with this data and with each completed task, the machine's experience increases - in other words, it learns. Algorithms in machine learning divided into three categories (Ukpong, 2019, 3):

3.6.1.1. *Supervised learning:* It is the simplest learning model. Supervised learning involves creating a function that is trained using a training set and can then applied to new data (Weber, 2020:49):

3.6.1.2. *Unsupervised learning:* In this algorithm, outputs predicted based on the similarity between input vectors. This method used when the data is not classified. Unsupervised learning includes two learning categories: clustering and association.

3.6.1.3. *Reinforcement learning:* Where a computer program learns directly from experiences, or it is algorithm that learn behavior by observation and then adapts, receives the result from its environment and continuously improves its future steps (Al-Jaber, 2020, 26)

The researcher believes that artificial intelligence, through self-learning, radically transforming the way businesses done for the better, especially financial management. Routine tasks automated so that financial management specialists can focus on important matters, namely identifying the next growth markets.

3.6.2. *Deep learning:* It is a deep form of machine learning, it is a way to create artificial intelligence unlike machine learning, humans no longer have to intervene here, it only provides information and data for learning, and the machine independently performs predictions and makes decisions, deep learning is a more complex algorithm. It can make connections with multi-layer networks deep learning relies on very large amounts of data and the use of artificial neural networks.

3.6.3. *Neural network:* The neural network is a device in addition to a software system that follows the structure of the human brain. The neural network usually consists of a large number of processors that perform their work in parallel and arranged in a large number of layers. The different layers in turn divided into an input layer and sub-layers, called hidden layers. The first layer, which is also similar to the human optic nerve, has raw data at its disposal. The following layers have the output of the previous layer. The result is that artificial intelligence undergoes a learning process from one layer to another. The results of the artificial intelligence system can see based on the output layer. (Suad, Salima, 2019, 45)

3.6.4. *Expert systems:* It is one of the artificial intelligence programs adopted in the eighties and reaches a degree of expertise such that it is able to replace human specialization in a specific field of decision-making. The structure of expert systems consists of (Al-Jaber, 2020, 24):

3.6.4.1. *Knowledge base:* It contains specialized knowledge about a specific field that makes the person who possesses it a true expert in this field. This knowledge derived from experts and then enters the knowledge base using the latest knowledge representation techniques, databases are one.

3.6.4.2. *Inference engine:* A process similar to thinking, the role of the inference engine is to deal with the available information in the working memory and the information in the knowledge base to extract new information and data related to the problem. This process is somewhat similar to the mechanism of humans in processing information and reaching a conclusion.

3.6.4.3. *Explanation attachment:* Some problems that expert systems address require a justified explanation for their results.

3.6.4.4. *User interface:* The expert system is software that provides expert advice from multiple workstations to users, and the programs in the expert system address the beneficiary in his language and give him advice (Raqeeq, 2015, 32).

3.6.5. Natural language processing: A computer-aided analytical technique aims to automatically analyze and understand human language and allows scientists easily extract useful ideas from text data sets while avoiding tedious computational work. The role of natural language processing in accounting is to influence customers as customers use online platforms to express their opinions about companies or brands such as Twitter (Kang, et. al., 2020, 1).

The researcher believes that this information and the accompanying sentiment can influence the purchasing behavior of other customers and the investment behavior of investors as tweeters or commentators have different influence mechanisms. For example, investors increase their holdings of stocks in indexes, in response to an increase in positive sentiment in twitter.

3.6.6.   *Internet of things:* It is a network formed from physical objects electronically linked to sensors, monitoring and interaction devices within the economic unit, in order to achieve greater flexibility, clarity and tracking of information with the aim of facilitating planning, monitoring and schedule management in all projects. It is purposeful, coordinated cooperation carried out by sensors, communication technologies, in order to achieve common goals. Accordingly, the Internet of Things is a long-term vision, as it has a tremendous impact on society from technological and social aspects as well, as the Internet of Things constitutes an infrastructure for the information society, as it produces the linking of physical objects to virtual ones through interoperable information and communications technology (Khamis, Mohammed, 2021, 1418)

The researcher sees the internet of things as the connection between physical objects and the digital world. The physical structure of the internet of things technology consists of things, which are anything that can be connected to the Internet, and radio frequency identification technology, whose waves are located within the perception layer, wireless networks, and cloud computing, which works to store data generated by sensors and access it when needed.

3.6.7.   *Robotic process automation:* A technology automates standard and rule-based activities using scripts. Robotic process automation and artificial intelligence are interrelated terms that have had and will continue to have a significant impact on accounting practices (Ali, 2023, 34).

It becomes clear to the researcher that process automation differs from artificial intelligence in that it based on processes while artificial intelligence based on data.

4. Theoretical framework of financial performance

4.1. Concept of financial performance

(Al-Khatib, 2010, 45) defines financial performance as the narrow concept of organizational performance, focusing on the use of financial indicators to measure the extent of achievement of objectives. Financial performance expresses the performance of the organization, as it is the main supporter of the various activities practiced by the organization, and contributes to providing financial resources and providing the organization with various investment opportunities. (Dabbash, Qaddouri, 2013, 7) defines it as the extent of the organization's ability optimally exploits its resources and sources in long-term and short-term uses in order to form wealth. (Rafiq, 2011, 133) also defined financial performance as the exploitation of the financial resources available to the organization in a way that enables it to achieve the objectives of the financial function, and this depends on the financial policy adopted by the organization.

The researcher defines financial performance as type of organization's performance to show its financial position, in order to know the extent of its ability to achieve its goals stated with financial indicators and ratios, in addition to the dashboard, which considered an effective tool in the process of evaluating the actual performance of the organization.

4.2. Importance of financial performance

The importance of financial performance in general is that it aims to evaluate the performance of organizations from several angles and in a way that serves data users who have financial interests in the organization to identify the strengths and weaknesses of the organization and benefit from the data provided by financial performance to rationalize the financial decisions of users. Moreover, the importance of financial performance lies in the process of following up the organization work, examining its behavior, monitoring its conditions, evaluating its performance levels and effectiveness. In addition to directing performance towards the correct and desired direction by identifying obstacles, stating their causes, proposing corrective measures, rationalizing the organization's general uses and investments in accordance with the organization's general objectives, and contributing to making sound decisions to maintain the continuity and survival of the organization (Al-Khatib, 2010, 46-47)

It becomes clear to the researcher that the importance of financial performance lies in providing a set of information that enables the company to know its financial position, which contributes to helping it make appropriate decisions in the future. In addition, it helps in evaluating the efficiency of the administrative apparatus and its effectiveness in achieving the company's goals.

4.3. Objectives of financial performance

Financial performance can achieve the following objectives for investors (Bin Nazir, 2017, 8):

4.3.1. The investor can follow up and know the activity and nature of the organization, and it helps to follow up the surrounding economic and financial conditions, and estimate the impact of financial performance tools such as profitability, liquidity, activity and indebtedness on the share price.

4.3.2. It helps the investor to conduct the process of analysis, comparison and interpretation of financial data and understand the interaction between data to make the appropriate decision for the organization's conditions.

It becomes clear to the researcher that the main objective of financial performance is to obtain information used for appropriate analysis purposes to make decisions and choose the best stock through the organization's financial performance indicators.

4.4. Factors influencing financial performance

There are several internal administrative and technical factors affecting financial performance, which we will summarize below (Al-Bashir, 2011, 72):

4.4.1. *Organizational structure:* The organizational structure influences the performance of organization by helping to implement plans successfully through identification of tasks and activities carried out and allocating resources to it. In addition to facilitating, the definition of roles for individuals in the organization and helping in making decisions within the specifications that facilitate the organization's management to make decisions more effectively and efficiently.

It becomes clear to the researcher that the organizational structure is the container or framework in which all variables related to companies and their businesses interact. In which communication methods, powers, responsibilities, methods of exchanging activities and information are determined. The organizational structure includes administrative density, which is the administrative functions in organizations, and vertical differentiation, which is the number of administrative levels in the organization. As for horizontal differentiation, it is the number of tasks that resulted from evaluating the work and geographical investment from the number of branches and employees.

4.4.2. *Technology:* The organization must determine the type of technology that is appropriate for the nature of its business and consistent with its objectives, because technology is one of the most prominent challenges facing organizations, which requires these organizations to adapt to technology, absorb it, modify and develop its performance in order to harmonize technology with performance. Technology works on the comprehensiveness of performance because it covers multiple aspects of competitiveness and reducing costs and risks in addition to increasing profits and market share (Al-Khatib, 2010, 51).

The researcher believes that technology is the methods, skills and methods adopted by the organization to achieve the desired goals that work to link resources to needs. A number of types integrated under technology, such as on-demand production technology, which is according to the specifications requested by the consumer; continuous production technology, which adheres to the principle of continuity; and large batch technology.

4.4.3. *Organizational environment:* Management should encourage employees to take self-initiative during performance. As organizational environment based on ensuring the integrity of performance in a positive manner and its efficiency from the administrative and financial aspects, and providing information to decision-makers to determine a picture of performance and identify the extent to which administrators apply performance standards when disposing of the organization's funds (Al-Bashir, 2011, 73).

The researcher believes that the organizational climate expresses the transparency of the organization and decision-making in the management style and directing performance and developing the human element, i.e. the employees' awareness of the organization's objectives; tasks and activities with their connection to performance, and decision-making must be in a rational manner.

4.4.4. *Size:* Size considered one of the factors affecting the performance of organizations. Size may constitute an obstacle to the performance of the organization. In addition, increase in size makes the process of managing the organization more complex. Thus its performance becomes less effective, and in a positive way in that the larger the size of the organization, the more the number of financial analysts interested in the organization increases, and the price of information per unit contained in the financial reports decreases with the increase in the size of the organization. Several studies conducted on the relationship

between size and the performance of organizations, which showed that the relationship between size and performance is a direct relationship (Bin Nazir, 2017, 10). The researcher believes that size means classifying organizations into small, medium, or large-sized organizations, as there are several measures to classify or measure the size of the organization.

5. Theoretical framework of accounting performance

5.1. Concept of accounting performance

Accounting performance refers to the goals or outputs that the system seeks to achieve or accomplish goals and direct productive resources in the right direction to reach these goals that may revolve around productivity, added value, return on invested funds, profitability, marketing position, social responsibility, marketing opportunities, etc. (Al-Shahada, 2010, 283). (Hal, 2014, 23) defined accounting performance as reaching a sound methodological basis for evaluating and assessing the use of funds and available resources effectively and efficiently within the organization, and is based primarily on the concept of the financial function. As for (Bin Belghit, Tawhar, 2005, 98), he believes that distinguished accounting performance is a means of proof to others of the security and guarantee it provides necessary in the business world, and a basis for decision-making with the effective, appropriate and credible information it provides.

The researcher believes that distinguished accounting performance is a means of proof to others, as it provides the necessary security and guarantee in the world of business and digital technologies, and a basis for decision-making, as it provides effective, credible and appropriate information for the continuity of the organization in carrying out its business and achieving its goals.

5.2. Importance of accounting performance

The importance of accounting performance is as follows (Ijeoma, 2015, 350):

5.2.1.   Performance evaluation helps to achieve the principle of continuity of the company by taking corrective measures.

5.2.2.   Regularly evaluate past performance to analyze whether all strategic objectives achieved, and if there is a difference between the planned and achieved values, further analysis is required.

5.2.3.   Different stakeholders need different information for decision-making.

5.2.4.   Help to develop a real and useful strategic plan for a longer period.

The researcher believes that the accountant is one of the most important and contemporary positive approaches, which has the ability to control returns in the past and predict their trends in the future, while taking into account fulfilling the commitment towards the client due to its connection to performance in the future.

5.3. Objectives of accounting performance

Accounting performance and digital accounting aim to achieve the following (Hajjaj, Ajila, 2022, 40):

5.3.1.   Reduce the chances of committing errors and fraud in accounting data.

5.3.2.   Produce reliable data that is consistent with generally accepted accounting principles.

5.3.3.   Provide appropriate data for performance evaluation and decision-making.

5.3.4.   Producing and achieving the quality of reports and financial statements for these economic organizations.

The researcher believes that accounting performance aims primarily to provide useful information using advanced methods that help in making sound decisions and enable the measurement of sound financial and accounting performance.

6. Role of artificial intelligence in improving financial performance

Investing in artificial intelligence for financial management processes has a significant impact on improving the organization's ability to make data-driven decisions and keep pace with the continuous change in various areas related to its activities. The most prominent areas of use of artificial intelligence in financial management, which helps improve financial performance, are as follows: https://safq.journals.ekb.eg/article_249846.pdf

6.1.   *Financial data analysis:* Artificial intelligence used to analyze financial data accurately and quickly, which facilitates the extraction of financial patterns and trends.

6.2.   *Providing financial forecasts:* It used to provide accurate financial forecasts based on historical data and current economic factors, which facilitates future decision-making.

6.3. *Audit and control improvements:* It used to improve audit and control processes by comprehensively analyzing data and detecting any potential inconsistencies or errors.

6.4. *Budget management:* It helps prepare and manage budgets with high efficiency, which facilitates tracking spending and ensuring compliance with financial goals.

6.5. *Security and privacy:* It provides a secure environment for storing and processing financial data confidentially and securely.

6.6. *Tax consulting:* Companies use artificial intelligence tools to generate predictive insights, which helps clients plan for future tax impacts based on their financial decisions. In addition, artificial intelligence provides a strategic role for tax professionals and allowing providing value-added services.

The researcher concluded that, organizations deploying artificial intelligence driven digital assistants that make it easier to find information and get work done, no matter where you are. For example, financial organizations can leverage digital assistants to notify teams when expenses are out of line or automatically submit expense reports for faster reimbursement. Today's digital assistants are contextually aware, conversational, and available on virtually any device. Employees do not have to remember complex query language or transaction codes. Instead, they can interact with the enterprises resources planning (ERP) system using plain, natural language.

7. Role of artificial intelligence in improving accounting performance

The areas of use of artificial intelligence to improve accounting performance are as follows: https://www.oracle.com/ae-ar/erp/ai-financials

7.1. *Automation of accounting processes:* Artificial intelligence used to automate routine processes such as processing invoices and classifying expenses, saving time and reducing errors.

7.2. *Improving reporting processes:* It used to generate accurate and transparent financial reports, which facilitates understanding the company's financial status and making strategic decisions.

7.3. *Conclusion:* The future of accounting with AI offers a tremendous opportunity for accountants to streamline processes, increase accuracy, and provide vital insights for strategic decision-making.

7.4. Accountants may focus on higher-value fees such as financial analysis and advisory services by using (AI) technologies.

7.5. *Increased efficiency:* AI enables the automation of tasks such as data entry and invoice processing, reducing the time required.

7.6. Artificial inelegance allows accountants to focus on deep analytics.

The researcher believes that artificial intelligence helps accountants prepare and present detailed and simplified financial reports for a better understanding of the financial status, which means that artificial intelligence plays a huge and important role in improving the accounting and financial performance of organizations, by using it efficiently to accomplish tasks accurately in all financial and accounting activities and operations. In addition, financial management must take the lead in leveraging machine learning and artificial intelligence to provide real-time insights, make informed decisions, and increase efficiency across the organization. That is why financial management is one of the first areas to see the impact of these technologies on daily activities, in everything from automating payments to calculating risks, and using detailed analytics to review operations automatically and alert teams to exceptions.

8. Field Study

8.1. Field study procedures

(SPSS) was used to analyze the data and reach the objectives set within the framework of this study, and it was based on the significance level (5%) corresponding to confidence (95%) to interpret the results of the tests that were conducted. Several statistical methods used, the most important of which are the reliability test (Cronbach alpha), descriptive and analytical statistical methods, percentages and the t-test in addition to Ms. Excel.

8.1.1.   Community and sample of the study

The community   of the study consists of the employees of some Sudanese business organizations in Port Sudan and Atbara. The study sample selected randomly from the study community, and the questionnaire distributed randomly to the sample, the sample size was determined with the help of expert arbitrators to include various job titles and administrative levels. Among (150) Questionnaires that distributed, (140) retrieved represent (93.3%). This percentage considered very large from a statistical point of view, which will lead to the acceptance of the study's results, circulation to its community, and accurate results as much as possible. The

researcher is highly interesting in the diversity of the study sample members, and this diversity in the characteristics of the respondents related to their opinions for Artificial intelligence and its role in improving the efficiency of financial and accounting performance of Sudanese business organizations.

8.1.2.   *Stability and validity of the study tool:* To ensure the apparent honesty of the questionnaire, the validity of its statements in terms of wording and clarity, the questionnaire presented to a number of academic arbitrators and specialists in the field of the study. The stability and validity test of the questionnaire phrases conducted using Cronbach -alpha and the result was (.0954) and (0.935) respectively, which means that there is stability and validity of the data as shown in table (1) below:

Table (1): Alpha Cronbach coefficient of the questionnaire's stability and validity

No	Axis	Number of phrases	Stability coefficient	Validity coefficient
1	First hypothesis	6	0.994	0.965
2	Second hypothesis	6	0.914	0.905
	Total phrases	12	0.954	0.935

Source: Information obtained from the output of SPSS program, 2025

It is clear to the researcher from table. (1), that, the percentage of the stability coefficient and the percentage of the validity's coefficient, according to the split-half coefficient, used the Spearman equation for each of the study's hypotheses separately. The total result is greater than (50%) and very close to (100%), this indicates the power and validity of the questionnaire form, and then the possibility of relying on it in testing the study hypotheses.

8.2. Data analysis and hypotheses testing:

The hypotheses tested by finding the weighted arithmetic means (answer power) and standard deviations for each of the questionnaire statements. All hypotheses are descriptive questions according to the five-point Likert scale. The variable that expresses the options (strongly agree, agree, neutral, disagree, strongly disagree) ordinal scale. In addition, weighted averages calculated according to Likert scale through a number of steps. Firstly, assign each value in Likert scale is a specific weight (strongly agree 5, agree 4, neutral3, disagree 2, strongly disagree 1). Secondly find the result by multiplying the number of the sample by the weight, and in the third step find the sum of the totals of multiplication results, then find the arithmetic mean by dividing the sum of the totals of multiplication results in the previous step / the number of the sample, to get the arithmetic mean. For analyzing the sample, there is a so-called hypothetical average, which is equal to the sum of the weights divided by their number (the scale items), that is, the hypothetical mean = (5 + 4 + 3 + 2 + 1) /5 = 3. Accordingly, the averages were distributed according to their positive or negative deviation from the hypothetical mean, and the distribution of the averages becomes as follows (1 to 1.79 strongly disagree, from 1.80 to 2.59 disagree, from 2.60 to 3.39 neutral, from 3.40 to 4.19 agree, and from 4.20 to 5 strongly agree).

8.3. First hypothesis testing

H1. "Artificial intelligence technologies contribute to improving the efficiency of financial performance of Sudanese business organizations".

Table (2): The frequency distribution of the responses of the sample members of the study for the first hypothesis terms

No	Phrases	Frequency and percentage%									
		Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
		f	P	F	p	f	P	f	P	F	p
1	Using artificial intelligence to prepare and manage budgets with high efficiency, facilitates monitoring of spending and ensures compliance with financial goals	50	36%	67	48%	6	4%	11	8%	6	4%
2	Using artificial intelligence to analyze financial data accurately and quickly, facilitates the extraction of financial patterns and trends	52	37%	64	46%	8	6%	10	7%	6	4%

No	Phrases	Frequency and percentage%									
		Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
		f	P	F	p	f	P	f	P	F	p
3	Using artificial intelligence to analyze data comprehensively and detect any potential discrepancies or errors, leads to improving financial control processes	58	41%	55	39%	11	8%	12	9%	4	3%
4	Using artificial intelligence to prepare accurate and transparent financial reports, facilitates understanding the financial status of the organization, and developing financial strategies	61	44%	60	43%	6	4%	7	5%	6	4%
5	Using artificial intelligence to generate predictive insights, helps the organization plan for future tax impacts based on financial decisions	60	43%	51	36%	12	9%	9	6%	8	6%
6	Using artificial intelligence to provide accurate financial forecasts based on historical data and current economic factors, facilitates making future financial decisions	59	42%	56	40%	7	5%	10	7%	8	6%
	Total	340	40%	353	42%	50	6%	59	7%	39	5%

Source: Information obtained from the output of SPSS program, 2025

It is clear to from table. (2), regarding the recurring distribution of the answers of the study sample members that the majority of the answers were at the levels of "agree" and "strongly agree" and this will ensure the validity of the first hypothesis, which stated, "Artificial intelligence technologies contributes in improving the efficiency of financial performance of Sudanese business organizations ".

Table (3): The mean and the mode of the responses of the sample members of the study for the terms of the first hypothesis

No	Phrases	Arithmetic mean	Standard deviation	Chi square	Degree of freedom	Probability value	Interpretation
1	Using artificial intelligence to prepare and manage budgets with high efficiency, facilitates monitoring of spending and ensures compliance with financial goals	4.12	1.09	40.103	5	0.000	Strongly agree
2	Using artificial intelligence to analyze financial data accurately and quickly, facilitates the extraction of financial patterns and trends	3.97	1.11	36.033	5	0.000	Strongly agree

No	Phrases	Arithmetic mean	Standard deviation	Chi square	Degree of freedom	Probability value	Interpretation
3	Using artificial intelligence to analyze data comprehensively and detect any potential discrepancies or errors, leads to improving financial control processes	4.15	1.08	40.054	5	0.000	Strongly agree
4	Using artificial intelligence to prepare accurate and transparent financial reports, facilitates understanding the financial status of the organization, and developing financial strategies	3.98	1.32	30.302	5	0.000	Strongly agree
5	Using artificial intelligence to generate predictive insights, helps the organization plan for future tax impacts based on financial decisions	4.11	1.26	54.533	5	0.000	Strongly agree
6	Using artificial intelligence to provide accurate financial forecasts based on historical data and current economic factors, facilitates making future financial decisions	3.59	1.38	56.010	5	0.000	Strongly agree
	Total	3.99	1.19				Strongly agree

Source: Information obtained from the output of SPSS program, 2025

Table (3) showed that the standard deviation of the phrases ranges between (1.08-1.38), where we find that the difference is less than the correct one, and this indicates the homogeneity of the respondents' answers for the statements of the first hypothesis. Looking at the probabilistic value, it found less than the level of significance (0.05) for all phrases, and thus it is a function in all phrases, that is, there are statistically significant differences at the level of significance (0.05) for the respondents' answers for the first hypothesis phrases. According to the five-point Likert scale, we find that the direction of the respondents' answers is highly agreeable in all phrases. Moreover, the general trend of the hypothesis is "strongly agreed" with an arithmetic mean (3.99) and a standard deviation (1.19), which proves the validity of the hypothesis that stated "Artificial intelligence technologies contributes in improving the efficiency of financial performance of Sudanese business organizations".

8.4. Second hypothesis testing:

H2. "Artificial intelligence techniques contributes in improving the efficiency of accounting performance of Sudanese business organizations ".

Table (4): The frequency distribution of the responses of the sample members of the study for the second hypothesis

No	Phrases	Frequency and percentage%									
		Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
		f	P	F	p	f	P	f	P	F	p
1	Using artificial intelligence to simplify accounting processes and increase accuracy contributes to providing vital ideas for strategic decision-making	49	35%	62	44%	12	9%	10	7%	7	5%
2	Using artificial intelligence in financial analysis allows accountants to focus on deep analysis	56	40%	60	43%	12	9%	7	5%	5	3%
3	Using artificial intelligence to process accounting data confidentially and securely helps provide a secure environment for storing financial data	60	43%	55	39%	11	8%	9	6%	5	4%
4	Using artificial intelligence to automate accounting processes saves time and reduces accounting errors	62	44%	59	42%	11	8%	7	5%	1	1%
5	Using artificial intelligence to save and extract accounting information reduces the time required to complete accounting transactions	60	43%	58	41%	12	9%	9	6%	1	1%
6	Using artificial intelligence to automate tasks such as entering invoices contributes to increasing the efficiency of accounting processes	62	44%	55	39%	4	3%	12	9%	7	5%
	Total	349	42%	349	42%	62	7%	54	6%	26	3%

Source: Information obtained from the output of SPSS program, 2025

It is clear to the researchers from table. (4) Regarding the recurring distribution of the answers of the study sample members to the phrases of the second hypothesis that the majority of the answers were at the levels of "strongly agree" and "agree", and this validates the second hypothesis, which stated that: "Artificial intelligence techniques contribute to improving the efficiency of accounting performance of Sudanese business organizations".

Table (5): The mean and the mode of the responses of the sample members of the study for the terms of the second hypothesis

No	Phrases	Arithmetic mean	Standard deviation	Chi square	Degree of freedom	Probability value	Interpretation
1	Using artificial intelligence to simplify accounting processes and increase accuracy contributes to providing vital ideas for strategic decision-making	4.01	1.16	28.013	5	0.000	Strongly agree

No	Phrases	Arithmetic mean	Standard deviation	Chi square	Degree of freedom	Probability value	Interpretation
2	Using artificial intelligence in financial analysis allows accountants to focus on deep analysis	3.59	1.02	54.700	5	0.000	Strongly agree
3	Using artificial intelligence to process accounting data confidentially and securely helps provide a secure environment for storing financial data	3.96	1.29	59.033	4	0.000	Strongly agree
4	Using artificial intelligence to automate accounting processes saves time and reduces accounting errors	4.11	1.18	33.309	5	0.000	Strongly agree
5	Using artificial intelligence to save and extract accounting information reduces the time required to complete accounting transactions	4.09	1.19	60.020	5	0.000	Strongly agree
6	Using artificial intelligence to automate tasks such as entering invoices contributes to increasing the efficiency of accounting processes	4.13	1.07	48.104	5	0.000	Strongly agree
	Total	3.98	1.11				Strongly agree

Source: Information obtained from the output of SPSS program, 2024

Table (5) showed that the standard deviation of the phrases ranges between (1.02-1.29), where we find that the difference is less than the correct one, and this indicates the homogeneity of the respondents' answers for the statements of the second hypothesis. Looking at the probabilistic value, we find that it is less than the level of significance (0.05) for all phrases, and thus it is a function in all phrases, that is, there are statistically significant differences at the level of significance (0.05) for the respondents' answers for the second hypothesis phrases. According to the five-point Likert scale, we find that the direction of the respondents' answers is highly agreeable which proves the validity of the hypothesis that stated, "Artificial intelligence techniques contribute in improving the efficiency of accounting performance of Sudanese business organizations ".

9. Discussion:

The main objective of this study is to investigate the contribution of artificial inelegance in improving the financial and accounting performance of Sudanese business organizations. Moreover, the results of (Yaeshi, Meadari, 2022) study, showed that artificial intelligence has an effective role in the development of financial technology, also the results of (Gouda, 2023) study, revealed that the existence of a significant positive correlation between artificial intelligence and both improving logistical performance and developing financial performance. While the findings of (Al-Qadi, 2023) study, showed that the application of artificial intelligence systems contributes to improving the credibility and transparency of financial reports improving the profitability of financial performance. All these findings agreed with the first hypothesis of the study, which stated, "artificial intelligence technologies contribute to improving the efficiency of financial performance of the organizations". On the other hand, the findings of (Emetaram, Uchime, 2021) study, showed that Artificial Intelligence has positive impact on the accountancy profession, in addition, the findings of (Stancu, Duțescu,

2022) study, revealed that the accounting profession has the chance now, by implementing (AI) to become a more dynamic and appealing profession. Also, the results of (Zamain, Subramanian, 2024) study revealed that (AI) practiced in most industries in which modeled to detect fraud with intelligent advice and data protection. All these findings agreed with the second hypothesis of the study, which stated, "Artificial intelligence techniques contributes in improving the efficiency of accounting performance of Sudanese business organizations"

This agreement between the findings of the current study and a number of previous studies presented by the researcher confirms the validity of the study's hypotheses, and confirms the importance of the role played by artificial intelligence techniques in increasing the efficiency of financial and accounting performance of Sudanese business organizations. Accordingly, the researcher recommends conducting more studies to determine the impact of artificial intelligence on the auditing and financial analysis profession and rationalizing decisions.

10. Results and Recommendations:

11. Results of the study:

After completing the theoretical framework and testing filed study's hypotheses, the researcher reached the following results:

11.1. Using artificial intelligence to prepare accurate and transparent financial reports facilitates understanding the financial status of Sudanese business organizations, and developing financial strategies.

11.2. Using artificial intelligence to automate accounting processes saves time and reduces accounting errors of Sudanese business organizations.

11.3. Using artificial intelligence to prepare and manage budgets with high efficiency facilitates monitoring of spending and ensures compliance with financial goals of Sudanese business organizations.

11.4. Using artificial intelligence to save and extract accounting information reduces the time required to complete accounting transactions of Sudanese business organizations.

11.5. Using artificial intelligence to analyze financial data accurately and quickly facilitates the extraction of financial patterns and trends of Sudanese business organizations.

11.6. Using artificial intelligence to automate tasks such as entering invoices contributes to increasing the efficiency of accounting processes of Sudanese business organizations.

11.7. Using artificial intelligence to provide accurate financial forecasts based on historical data and current economic factors facilitates making future financial decisions of Sudanese business organizations.

11.8. Using artificial intelligence in financial analysis allows accountants to focus on deep analysis.

12. Recommendations of the study:

Based on the results of the study, the researcher recommends the following :

12.1. Sudanese business organizations should work to introduce artificial intelligence technologies into their financial and accounting operations in order to improve the efficiency of their financial and accounting performance.

12.2. There is a need for special legislations and standards to be issue by Sudanese authorities to organize the adoption of artificial intelligence by business organizations to get its advantages in improving their financial and accounting performance.

12.3. The Accounting and Auditing Regulatory Authority in Sudan should work to issue the necessary regulations to regulate the operations of using artificial intelligence technologies in financial management and accounting in a way that serves its purpose.

12.4. The regulations of accounting and financial practices of Sudanese business organizations should adapted to secure the databases of financial and accounting systems based on artificial intelligence and protect them from hacking and penetration operations on the one hand, and achieve efficiency and effectiveness on the other hand.

12.5. Continuous training for accountants, administrators, financial analysts and auditors in the Sudanese business organizations on how to use artificial intelligence technologies and benefit from their multiple advantages in the nature of their work.

12.6. Conducting more studies to determine the impact of artificial intelligence on the auditing and financial analysis profession and rationalizing decisions.

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