УПРАВЛЕНИЕ СОЦИАЛЬНО-ЭКОНОМИЧЕСКИМИ СИСТЕМАМИ

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ИССЛЕДОВАНИЕ РОЛИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ОБЕСПЕЧЕНИИ КАЧЕСТВА АУДИТА В КОНТЕКСТЕ ТЕХНОЛОГИИ БЛОКЧЕЙН

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Аннотация
Технологии в современном мире существенно повлияли на профессиональную среду всех профессий. Несмотря на существующие трудности, аудиторы также начали использовать новые технологии для повышения качества своей деятельности. Цель исследования – проанализировать роль искусственного интеллекта (ИИ) в обеспечении качества аудита в контексте технологии блокчейн путем обощения результатов 63 внутренних исследований, проведённых с 2010 по 2025 год, и 36 внешних исследований, проведённых с 2017 по 2025 год. Результаты исследования показали, что аудиторы вынуждены использовать технологии ИИ в своей профессии для поддержания общественного доверия. Для достижения этой цели аудиторам также доступны технологии блокчейн, позволяющии им выполнять свои обязанности в безопасной и прозрачной среде. Проведённые в рамках данного исследования результаты подтвердили преимущества использования технологий ИИ в повышении качества аудита. Кроме того, они был предоставлены аудиторам в качестве документа по использованию технологии блокчейн для повышения качества их деятельности.

Ключевые слова: искусственный интеллект, качество аудита, блокчейн, возобновляемые источники энергии.

REVIEW OF THE ROLE OF ARTIFICIAL INTELLIGENCE ON AUDIT QUALITY IN THE CONTEXT OF BLOCKCHAIN TECHNOLOGY

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Abstract
Technology in today's world has significantly affected the environment of all professions. The auditing profession has not been separate from this, and has always been forced to accept and compromise with technology to maintain its place in society. Despite the challenges ahead, auditors have started to use new technologies to improve the quality of auditing.The study aims to review the role of artificial intelligence (AI) on the quality of auditing in the context of blockchain technology by categorizing and concluding 63 internal research from 2010 to 2025 and 36 external research from 2017 to 2025. The results of the research review showed that auditors are forced to use AI technology in the profession to maintain the survival and sustainability of public trust. To achieve this, blockchain is also available to auditors so that they can perform their duties in a safe and transparent environment. The reviews carried out in this research proved the merit of the presence of AI technology in improving audit quality. In addition, it was made available to auditors as a document for the use of blockchain technology to improve the quality of auditing.

Keywords: Artificial intelligence, Audit quality, Blockchain, Renewable energies.

1. Introduction

The vision of the business world in recent years shows a fundamental transformation in the competitive structure of organizations [1]. The auditing profession plays an important role in this competitive environment in ensuring compliance with the accounting rules, regulations and standards of organizations because organizations are subject to various regulatory requirements and must adhere to accounting principles and reporting frameworks [2]. In fact, auditors have always sought to meet the needs of users of financial statements through improving the quality of reports so that they can maintain their position in the society while gaining public trust [3]. So it's necessary to address the dimensions of quality improvement [4]. Audit quality is a system in which audit reports are goods and the quality of these goods is evaluated from the level of compliance with the established standards [5]. In this regard, audit companies are potentially affected by the advances in Information Technology [6]. This shows that auditors cannot optimize decision-making without a quality factor, and therefore inevitably use new methods to present their tasks [7]. Research shows that several traditional factors such as human capital status, audit fees, flexibility and social connections of auditors play a role in audit quality [8],[3],[9]. However, reviewing the role of emerging technologies, including artificial intelligence (AI) and blockchain, can allow for more action in this process. Improving quality is the first goal for using AI in auditing that audit companies invest in [10]. AI can replace manpower while improving audit quality and reducing costs [11]. It is therefore a new management tool for auditors that facilitates the audit process by automating repetitive and intensive work [12]. AI technology provides the potential to streamline audit procedures, improve risk assessment processes, and facilitate the identification of fraudulent anomalies, providing auditors with a deeper understanding in understanding the organisations they evaluate [13]. Although AI systems have significantly changed the audit process, opponents of the AI revolution see this growth as a step backwards because they believe that many auditors cannot adapt to this new environment and are left behind [14]. However, the overall goal of AI is to develop human algorithms, including learning, decision-making, and analysis of the direction of application in the machine [15]. Blockchain is a very diverse technology that has advantages over other technologies including transparency, immutability, anonymity and fast transactions [16]. In blockchain technology, data is stored as a chain of blocks, and by creating a new transaction, a block that is connected to the rest of the chain is built [17]. So blockchain technology can play a huge role in the audit quality process [2]. Blockchain is now the fifth pillar of the information technology (IT) revolution, which is expected to become the next generation of the internet as a base technology in the future [18]. In other words, blockchain is a database solution for removing intermediaries [19]. Such as intermediary activities related to the audit process [20]. In view of the material presented and the examination of the different dimensions of the audit quality element, it is worth noting that equal to traditional influencing factors, new factors also have significant impact potential. So the author decided to specifically examine the role of emerging information technologies to take a step towards completing this research gap and answer the question of how new AI and blockchain technologies play a role in audit quality.

2. Theoretical Framework

2.1. Artificial intelligence

The advancement of computer technologies in various ways is expanding dramatically, and the auditing profession is no exception [21]. Because the audit profession requires an error free accurate and reliable process to execute its reassurance role [6]. It is achieved through measures such as electronic data transfer or image processing by replacing traditional procedures with new procedures [22]. This replacement in auditing will lead to increased efficiency and effectiveness [23]. Given the

evolving nature of artificial intelligence (AI) technology and its widespread application in various professions, there is still no universal definition of AI [24]. AI can mimic human capacities such as seeing, hearing, conducting logical experiments, learning, and solving problems [25] and make advanced decisions by observing the environment [14]. AI is the science of training programs and machines to complete tasks that typically require human intelligence [26]. Among the advantages that AI has for the audit profession is data entry, which can properly analyze entries by reducing human intervention and detecting fake data [27]. AI is also revolutionizing the audit process in order to conduct complex audits much more efficiently and accurately than humans [28]. Features that index AI in the profession include data mining, which means detecting hidden information from a mass of data, considering all the features of a system, adapting to changes in the environment, and correctly describing data [29]. Given the qualitative changes that AI makes to audit procedures [30]. It is better for auditors to use AI in analyzing the quality of information [7] and the need to achieve this is that auditors are widely exposed to AI technologies [31] as a centralized function [32]. In fact, auditors should strive to embrace the new environment and achieve the necessary skills and techniques by changing their mindset [33]. However since the late 1990s, the profession had to Computerize its process to promote efficiency and reduce costs [34]. And now the application of AI is still in its emerging stages in the audit profession, although evidence of increased adoption is slowly visible [35]. On the other hand, there are ethical challenges of AI-based decision-making such as reliability, accountability, transparency, privacy, and impartiality [36]. The disadvantages of using AI suggest that new auditors ' knowledge may be prevented from advancing, or that system maintenance and updating may incur significant costs [37]. However, the change in audit procedures caused by the use of AI significantly affects the results of the audit process of financial statements [38]. The audit process is widely mixed with the judgments, emotions, and individual characteristics of auditors, in which AI as an emotion-free nervous system can smooth the decision-making process and stabilize data [39]. There are several reasons for auditors to use AI, the most important of which is to reduce the risks of over-testing because the auditor is looking for mass sampling of information, so AI can test the entire community and improve the quality of auditing by collecting more targeted information for the auditor's planning scope [40]. The existence of such an advantage leads large audit institutions to benefit from AI as a core component in Integrated Audit automation systems in the process of their judgments [41]. AI applies to four forms of passive machines, self-aware machines, mind-theorized machines, and machines with limited memory in the audit industry, which makes the audit process more efficient and improves quality by providing and covering greater compatibility in the work of auditors [42]. On the other hand, the characteristic of automating repetitive activities by AI prevents the mental exhaustion of the auditors ' intellectual power [43]. AI has a close relationship with various sciences including engineering, logic and mathematics [44]. And it can even be more accurate in predicting corporate bankruptcy than pure statistical science [45], [46], [47], [48]. So with the advent of the Fourth Industrial Revolution and the birth of AI, the pulse of transformation in various sciences was formed, which led to the birth of the fourth generation of the audit profession [49].

2.2. Audit quality

Nothing is more important in audit practice than the concept of audit quality [50]. There are several definitions of audit quality, the most common of which is the definition of DeAngelo (1981), which says that if the auditor discovers a distortion of importance and reports this distortion, then the audit quality is formed [51]. Global institutions see the lack of detection of significant distortions as due to the excessive workload of auditors, as the excessive workload of auditors increases the possibility of mistakes and thus endangers the quality of the audit [52]. In such a situation, it is necessary that empowerment tools such as AI instead of humans facilitate this process and improve quality [7]. The

quality of the audit is evaluated from two dimensions: the input and output of the audit process, the input of which is the value of the skills and knowledge of the auditors, and the output of which is issues such as executive actions after the audit [53]. In the dimension of quality measurement input, higher quality auditors are more inclined to expose errors and abuses and avoid giving in to unusual practices [54]. In the aftermath of the audit process, the demand for quality is realized. three roles of auditing include the supervisory role in order to minimize agency costs, the information role as a tool to increase the quality of information and the guaranteeing role to guarantee managers against others [55]. So that stakeholders can make decisions with greater reliability than financial statements [56] and avoid their information risk [57]. On the other hand, the quality determines the performance of auditors in terms of their professional capabilities and capabilities [58]. One of these professional abilities of Auditors is to maintain independence, which has a significant impact on the quality of the audit [59]. In fact, given the concept of quality, it can be said that the detection of distortion is done with importance based on the competence of the auditor and the possibility of reporting this distortion on the back of the auditor's independence [60]. The concept of audit quality is expressed from two perspectives, real quality and impression of quality, which is measured by users due to the invisibility of real quality [61]. However, proof theories have not yet reached a broad insight into audit quality [62]. and despite the importance of audit quality and the existence of techniques to evaluate it, a comprehensive concept has not yet been presented for it [63]. Many factors affect the quality of auditing, which Behzadian and IzadiNia [64] in their research have identified these factors in three general groups: the characteristics of the audit operations field (such as documentation, audit continuity, use of audit services), the characteristics of the audit group (such as proper training of the audit group for information and technical ability, the size of the audit institution and the quality of management of the audit group), and the characteristics of the audit regulation field (such as the need to rotate the auditor's courses, the limitation of personal and financial communication with the employer, the Prohibition of providing unsecured services) they're counted. The best case of audit quality is created when there is constructive engagement among participants in the financial reporting supply chain [65]. The biggest obstacle to this is the conflict of interest between the manager and the employer, which leads to the personal interest of the manager in the quality of profit and prevents auditors from achieving the desired quality in reporting [66]. However, auditors can significantly reduce these agency costs and improve the efficiency of investments by practicing to improve the quality of auditing [67], [68], [69], [70], [71]. Because the higher the quality of the audit, the more investors will be attracted to the organizations [72]. In general, audit quality is classified into two attitudinal categories of applicants and suppliers, in which applicants look for factors affecting users of financial reports, and suppliers look for auditor's ability to provide audits [73]. Users of financial reports can also fall into four areas, including business units, legislative bodies, auditors as creditors to financial statements, and users of audited financial statements [74]. Despite threats such as audit fees, long-term auditor-client relationships, non-audit services, and customer importance [69]. the new audit quality approach states that merely unfavorable comment is not the criterion of lack of quality in the audit, but the effectiveness of the audit plays a role even after the work is completed [75]. The existence of such factors makes the auditing profession to survive in the business world use new tools such as AI to analyze audit data to rebuild the audit process and improve quality [10].

2.3. Blockchain

In 2008, with the start of changes in transaction processing by Cryptocurrencies and Bitcoin, blockchain technology was first introduced as the basis for cryptocurrency [16]. It then opened its way to most industries and auditing in particular because auditing is rooted in society and is inevitable to adapt to environmental developments and cannot take a passive approach to survival [76]. Blockchain is a blockchain of digital information stored in a public database [77] that shares a subscription to all

digital events implemented among participating agents [78]. In fact, blockchain can be simply defined as a digital ledger that allows transactions made between multiple parties to be recorded in real time and act as a decentralized database in which each participant holds an identical copy of the ledger [79]. Blockchain can be private(presence of contributors with a specified identity), public (without the need for a known identity), licensed(writing only by predefined contributors) and unlicensed (free writing for the public) [80]. Blockchain technology is a state-of-the-art technology that offers benefits for the auditing profession such as very easy and fast acquisition of customers ' data, maintaining the potential necessary to apply integrated [81] and secure auditing and preventing fraud [82]. Although auditing provides reliability for financial statements, users cannot actually see the accounting process of companies or be informed of financial events in a timely manner, which was overcome by the birth of blockchain because transactions are stored in different locations and each transaction is visible to participants [10]. Auditors must adapt to the new conditions of this technology so that they can use its significant potential and remain in this Profession [83]. One of the main advantages of this technology is its absolute security, because it does not belong to any institution or organization, and whenever the data is encrypted, it is no longer possible to change it [84]. On the other hand, the implementation of any new technology requires a huge expense, which makes organizations hesitate to accept it [85]. Blockchain applications come in three categories: cryptocurrency network (alternative to common dollar and euro currencies), smart contract network (no intermediary intervention), and more advanced smart contract network to decentralize independent organizations [86]. Similar to the way the World Wide Web was gifted to the world without any rights blockchain technology was injected into the world in the same way [87], and due to its capabilities, many organizations may be encouraged to use it [88]. Blockchain has replaced the information-based economy with the commodity-based economy, giving deeper meaning to indicators of sustainability [89]. The technology has provided a secure framework for the accounting system and minimized the likelihood of mistakes or fraud because blockchain is based on a predetermined set of internal controls [90]. Blockchain can help audit to develop new services and eliminate useless services, and also bring benefits such as improved productivity, real-time reporting, focus on value added [91]. In such a situation, blockchain brings a right, safe and efficient space for transactions [92]. which will ultimately create transparency and improve the quality of audits [93].

3. Background

3.1. Internal background

Hemti [94] studied the impact of blockchain and AI on Audit Quality in a study. He stated that blockchain and AI lead to more accurate reports and thus improve audit quality as powerful tools. These technologies help establish a transparent audit system in organizations.

Abdoli Abatari et al. [6] studied the future of auditing from the perspective of information technology, changing the relationship between the auditor and the customer and changing the concept of auditing. They considered their statistical community university professors and professionals in the audit profession. The results indicated that with the advancement of technology in the future, users will trust automatic auditing more than manual auditing and recommend that the government implement the necessary infrastructure in this direction.

Hamzeh and Ramsheh [47] studied auditing in the digital age using Delphi-fuzzy and mabak methods in Iran among 26 audit experts. They conducted the future of auditing in the form of a broad scenario focusing on three big data technologies, blockchain and AI. The results showed that experts believe that new technologies will not replace auditors but will be placed next to them like an auxiliary arm.

Khanmohammadi [33] examined intelligent factors in independent auditing. The statistical community in this study was the official accountants working in the audit organization and audit institutions, who collected opinions through questionnaires. The results of the study showed that the auditing profession in Iran does not use intelligent agents due to factors such as ambiguity about judgment, lack of appropriate software for auditing, lack of sufficient texts on the use of intelligent agents, lack of correct estimation of the costs of using intelligent agents and lack of sufficient awareness of intelligent agents.

Mohammady Navareh et al. [46] studied the impact of digitization on independent auditors and audit institutions in Iran. They targeted 20 unstructured interviews and 13 audit institutions. The results showed that digitization improves information security and therefore audit quality by eliminating traditional methods and replacing new ones.

In a study, Nazarpour [29] examined the use of AI in tax auditing. They surveyed 1,186 companies admitted to the stock exchange during the years 2014 to 2016. The results stated that tax officers face limitations when handling tax cases, which can be paved if AI is used, and dramatically increase the accuracy of detecting tax evasion.

Yoosefpoor et al. [23] reviewed the emerging audit prospects in the era of the Fourth Industrial Revolution. They evaluated the dimensions of the Fourth Industrial Revolution, which led to the acquisition of the digital economy, while counting industrial revolutions and specifically the dimensions of the Fourth Industrial Revolution.

3.2. External background

Musa and Lefkir [95] studied the role of AI in achieving audit quality for small and medium-sized enterprises in the kingdom of Saudi Arabia. The data was collected via an internet questionnaire from 80 accountants and 40 audit firms from Small and large Saudi companies to achieve these research objectives. The study's findings showed that external accountants and auditors believe that the use of AI improves audit quality. Also, it was discovered that there was no statistically significant difference in the way accountants and auditors evaluate AI in audit quality.

Saeed Qader and Cek [2] studied the impact of blockchain and AI on Audit Quality in Turkey. respondents were randomly tested, and the results showed that the use of AI and blockchain has a positive impact on the quality of the audit, creating confidence for investors.

Adeoye et al. [96] in a study entitled AI and audit quality: its implications for accountants paid among 641 participants. Their results showed that AI had a positive impact on Audit Quality, and the researchers recommended embracing and taking action on it because of AI's significant impact on quality.

Fedyk et al. [32] in research sought answers to the question of whether AI would improve the audit process؟ to answer this question, they measured 36 large audit companies and found that investing in artificial intelligence helps improve audit quality and ultimately brings efficiency.

Saad [97] studied the role of AI techniques in achieving audit quality in a study. His statistical community includes 104 auditors in Palestine, and the results showed a significant relationship between AI and improving the quality of professional audit performance.

Albawwat and Frijat [14] studied the analysis of auditors ' perceptions of AI and its contribution to audit quality among 124 auditors in Jordan. Their research showed that auditors have adopted AI systems to make their work easier and more accurate, and consider it a benchmark for raising the quality level.

Munoko et al. [98] studied the ethical consequences of using AI in auditing and stated that while embracing new technologies such as AI, the ethical consequences of using these emerging technologies should also be considered. They also examined the role of governments in this chapter.

4. Conceptual framework

Professional literature suggests that research has always continued to expand the dimensions of technology in the field of auditing, although these advances, along with themselves, promise to increase the quality of auditing. So auditors use digital technologies to analyze data and evaluate fin ancial statements to provide their reports fairly. This process can both increase the skill of auditors and create resistance to the adoption of digital technologies such as blockchain and AI. Figure 1 shows this concept.

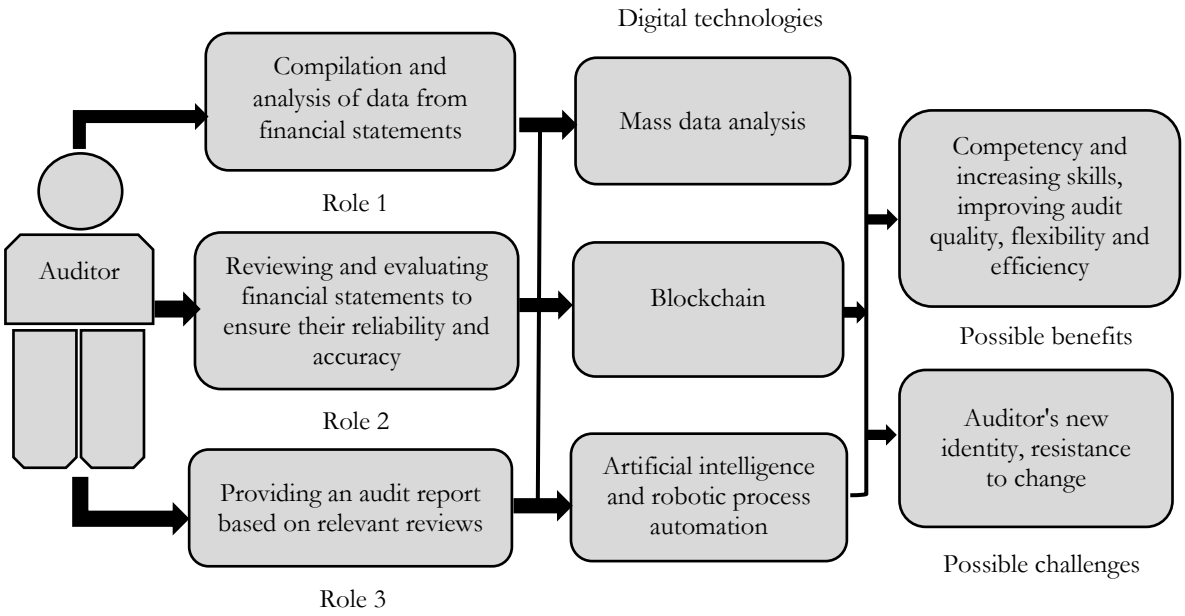

Fig. 1. Model of the benefits and potential challenges of digital technologies in auditor roles [46]

The actual use of the system is the point where humans use technology. The technology adoption model is an information systems theory that outlines how users adopt and use technology. When new technology is offered to users, the model claims that a range of factors influence their decision on how and when to use it. It actually expresses how people see AI technology, how they use it and how they think about it. The technology adoption model in Figure 2 shows how people interact with and accept AI.

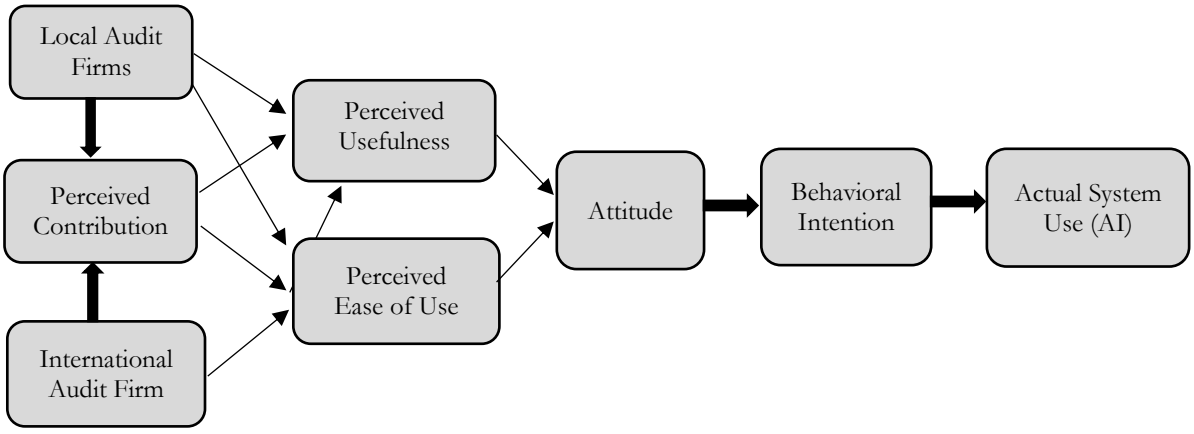

Fig. 2. Model of adoption of artificial intelligence technology [28]

Researchers see achieving quality as the integration of AI and blockchain, and therefore consider the economic sphere (including cost-effectiveness assessment, productivity improvement, and the possibility of non-intermediation in diverse businesses) and the social sphere (including inter-organizational trust,

governance, and regulatory compliance) to achieve a comprehensive approach in addition to technology (including scalability, security, and interoperability dimensions). Figure 3 shows this concept.

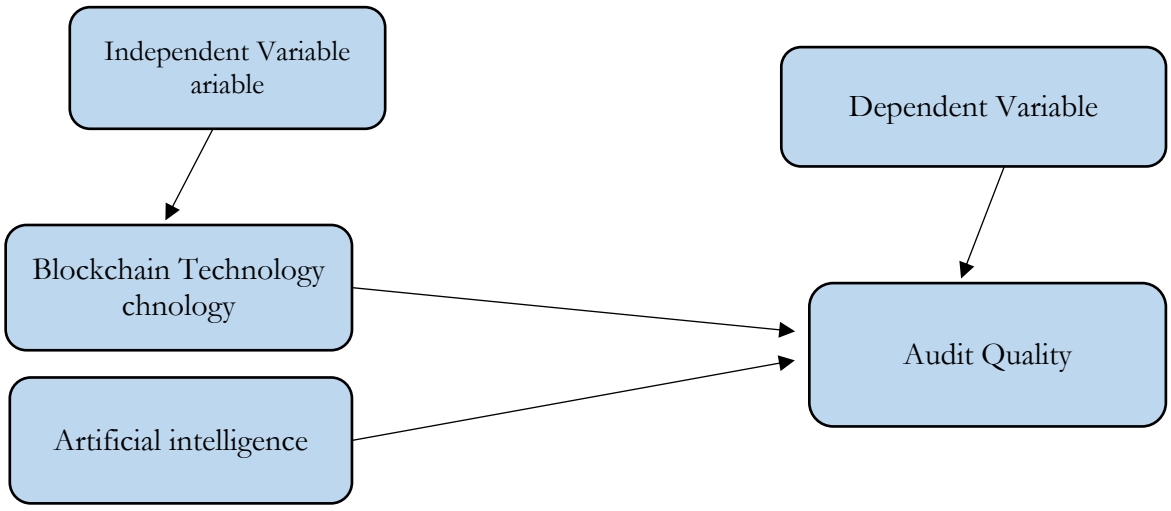

Fig. 3.The role of artificial intelligence and blockchain in audit quality [2]

The study found that measuring audit quality and AI alone is not enough, and the role of information technology infrastructure should also be considered in these surveys. Figure 4 shows how AI affects the quality of the audit process, taking into account the effectiveness of information technology infrastructure.

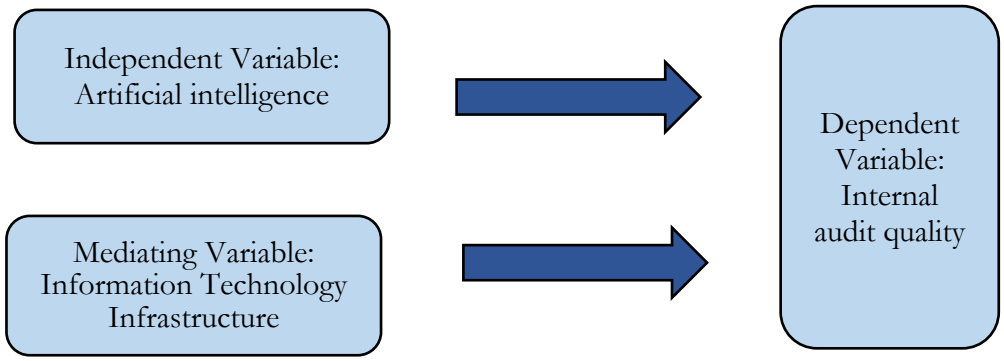

Fig. 4.The role of information technology infrastructure in audit quality [99]

It can be acknowledged that measuring a group of factors can deliver more realistic results. In the study of the impact of AI on audit quality, factors such as the quality of the audit process can help save time and by facilitating complex audits, the efficiency of Auditors is increased and thus the optimal quality of the audit is achieved. Figure 5 shows this concept.

Different levels can be identified and categorized according to the components derived from information technology. In fact, it can be seen that the first-level components are placed in the dependent area, which means they have very little penetration power, but a very high degree of dependence on other components. The second-level components that are placed in the bonding area also have almost high penetration and dependence, and the third-level components that are substituted in the penetration area have high penetration power with minimal dependence. Figure 6 shows this and it should be said that the existence of such a model can be a beacon for auditors to improve the quality of auditing.

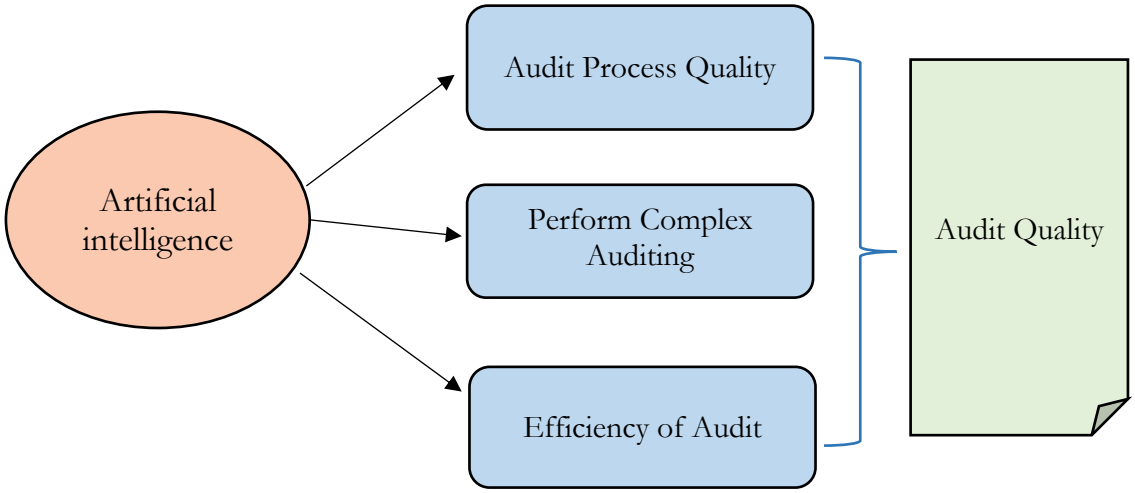

Fig. 5.The role of artificial intelligence in audit quality [97]

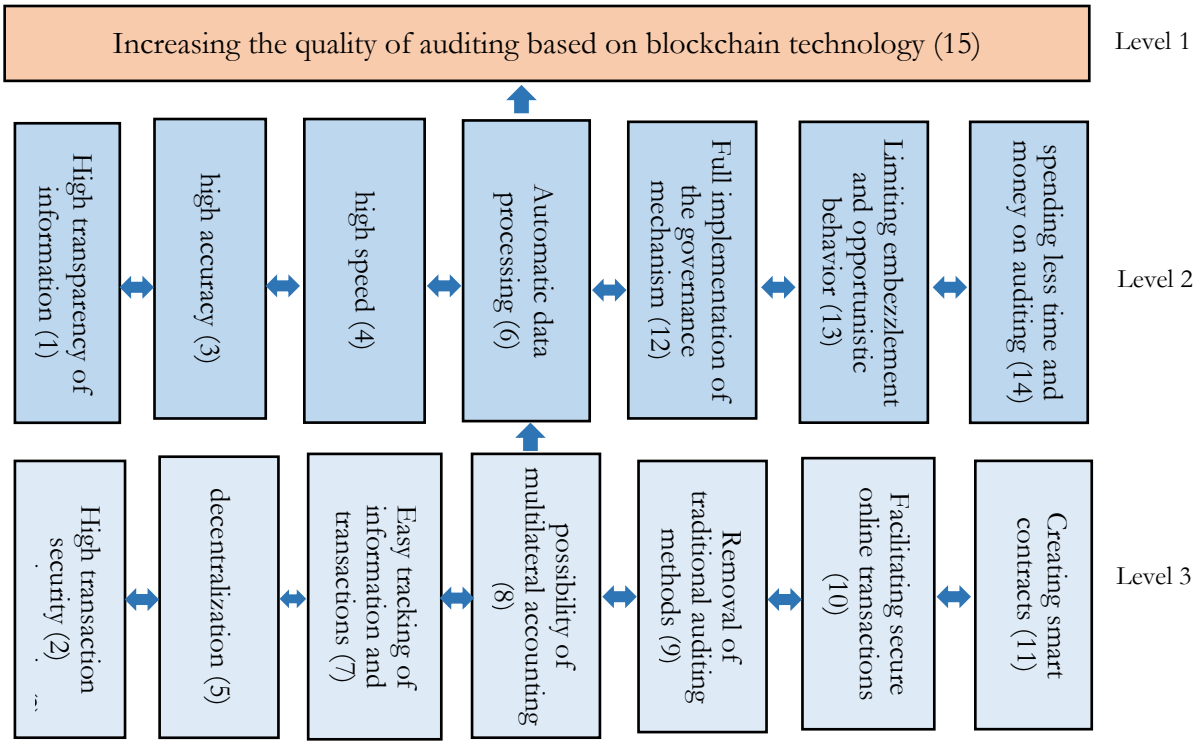

Fig. 6. Blockchain technology-based audit quality model [83]

The integrity of auditors and the presence of a transparent audit process can help ensure the quality of the audit. Blockchain technology plays an important role in this triple system. Thus, emerging blockchain technology improves and enhances the impact of auditor integrity and the transparency of the audit process on Audit Quality. Figure 7 shows this concept.

Blockchain not only changes the way financial transactions and information are recorded, processed and stored, but it is also a way for audit firms to enhance their careers. Studies show that blockchain technology and audit company size have an impact on the quality of the audit process. Blockchain, as one of the techniques produced by the digital environment, can make dramatic changes in the auditing profession and change the process of policies adopted due to the size of companies. Figure 8 shows this concept.

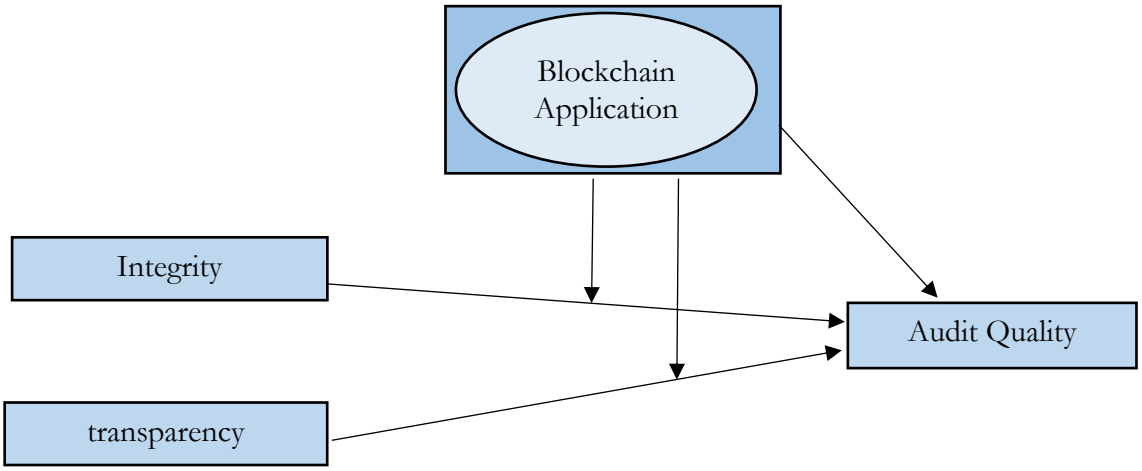

Fig. 7.The role of integrity and transparency in audit quality [93]

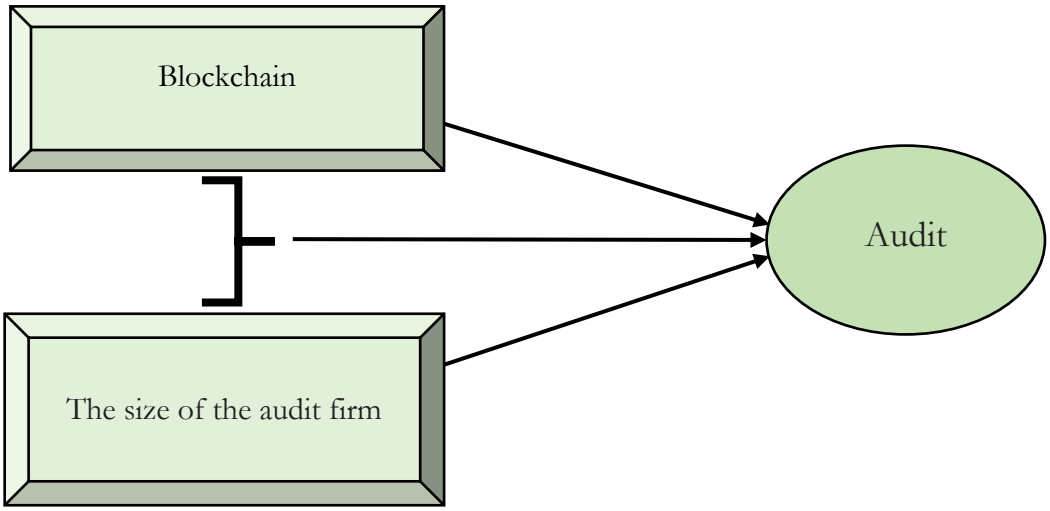

Fig. 8. The role of blockchain and the size of the audit firm in audit quality [87]

5. Conclusion

In the audit profession, social and organizational communication is significantly changed by emerging technologies. If we consider the most important role of auditors in society to be the validation of financial statements, the adoption of these technologies by auditors can be a turning point in maintaining quality in the presentation of auditors ' statements. The auditors ' opinion, which results from their professional judgment, is usually influenced by individual and environmental stimuli by challenges that can overshadow the quality of the audit. In the audit process, the auditor encounters a mass of data that must be analyzed rationally to obtain useful information for decision-making. artificial intelligence (AI) technology, with its tremendous power in analyzing countless data as a smart tool, paves the way for the auditor and drives him to higher risk data. Given the increasing noise around AI and blockchain technologies, it is important that auditors understand how this technology affects the profession and, more importantly, how they can take advantage of its advantages.

Blockchain is available to auditors as a joint ledger so that they can perform their duties in a safe and transparent environment. The fact is that AI has been open to the validation and inventory of the

audit profession with the support of blockchain, and in particular the preservation of its quality over time. The audit profession, like other industries, has been separated from its traditional body by the birth of AI and blockchain, and is embedded in a new shell. To prove this fact, factors affecting the possibility of using blockchain technology from different angles can be mentioned: organization (support of senior managers of the organization in the use of blockchain), technology (data integration and adaptation to the needs of users) and environment (needs and pressure of customers). In an era known as the information technology era, the role of blockchain, which is a transformative factor in the profession, cannot be ignored. This factor increases the efficiency of Auditors, which is followed by organizational effectiveness in the profession.

The process of applying AI and blockchain formulas has always been the path to reducing the time of application and error in increasing the accuracy and correctness. Despite all the benefits of using information technologies, these technologies require future developments over time to develop and adapt. It should be known that this toddler cannot achieve maturity without the support of managers, decision makers, government and all stakeholders. It's better to have the organizational values of audit institutions that support technologies. This support may First cost the resident, but what matters is the growth of the profession with the support of technologies. The use of technologies has also provided new possibilities in risk assessment and fraud detection because ensuring data privacy and creating transparency are the main tasks of AI and blockchain.

The future of auditing is intertwined with AI capabilities and, if implemented responsibly, will promise to reform audit procedures and strengthen stakeholder trust. Integrating AI into audit practices requires a change in auditors ' competencies and skills, which relies on updated training from companies and legislative bodies. To help the quality of auditing and maintain the position of the profession in society, policymakers must take steps to expand and deploy new AI and blockchain tools by auditors. Managers in the public and private sectors should consider the benefits and importance of implementing technologies to improve productivity in relation to training their employees. In fact, it can be acknowledged that today, quick and accurate access to financial information is the main criterion for the progress of organizations, and on the other hand, innovation in advanced technologies, including AI and blockchain, is of particular importance in all the activities of today's world. In general, what the review of the research proves is the merit of the presence of AI and blockchain in extracting the data required by auditors and achieving the preservation of audit quality.

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