

Analysis of the Application of Blockchain and Artificial Intelligence to Overcome Accounting Fraud in Islamic Banking

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Abstract: Blockchain and Artificial Intelligence (AI) are current technologies that provide increased efficiency and performance for all aspects of human life, especially in the Islamic banking sector. This study aims to analyze the concepts of blockchain and AI in accounting and find out the benefits and opportunities when applied simultaneously to accounting information systems in Islamic banking. This study uses a qualitative approach, with basic-research based research by utilizing data sources in credible published papers. This study explains that blockchain and AI can reduce risk and overcome accounting fraud in accounting information systems in Islamic banking. As well as providing transparency, security guarantees and real time transaction recording.

Keywords: blockchain; artificial intelligence; accounting fraud; Islamic banking.

1. Introduction

Technology is a means whose presence can affect all aspects of human life today, one of which is the development of the industrial revolution 4.0 triggered by the development of digital and information technology. Some new technologies that drive the industrial revolution 4.0 include Big Data, Machine Learning, Blockchain and Artificial Intelligence (AI) are technologies that are currently widely used by various groups such as the use of Chat GPT, Midjourney which is a program of artificial intelligence or AI and innovative payments such as Bitcoin which is a distributed network derived from Blockchain.

The emergence of Blockchain and Artificial Intelligence (AI) as disruptive technologies is said to be the most influential technology in the future. This makes these two technologies the target of investment in various sectors both in government and private. In the financial services industry, one of the Islamic banking in the United Arab Emirates (UAE), Emirates Islamic Bank, has applied AI to Panda's HR program that can help 50% of the bank's recruitment process and can select the right candidate for the required position based on communication identification and skills. Then Al Hilal Bank is also the first Islamic bank to apply *blockchain* technology in sukuk seller transactions (Antova, 2022).

In the financial services industry in Indonesia, blockchain has been applied in banking information systems as reported on the Permata.com website, the First Bank is the first bank

to apply blockchain to banking for efficient and transparent Trade Finance transactions (Asri, 2021). Then reported from CNBCIndonesia.com, Bank Mega has also implemented Artificial Intelligence (AI) in banking operations, including preventing money laundry actions and mitigating fraud (Astutik & Hastuti, 2021). While the combination of the two is still not found. The application of these two technologies is indicated to have an optimal impact on various aspects, especially in overcoming accounting fraud cases.

Accounting fraud is a phenomenon related to irregularities committed by certain parties against the accounting process. One of the accounting fraud cases can be seen from the Toshiba Company scandal, where the company inflated funds of 151.8 billion yen or 1.22 billion US dollars (Triantonno, 2019). Then fraud cases also occurred at Bank Syariah Mandiri (BSM) for the distribution of credit funds amounting to Rp 102 billion to several customers, including fictitious customers who caused large losses to the bank (Junaedi & Maulana, 2014). This phenomenon is certainly very contrary to the positive laws of banking and also Islamic principles in Islamic banking. Sharia principles emphasize purity, fairness, and transparency of a transaction to provide benefits to all parties concerned.

Therefore, research on the application of blockchain and Artificial Intelligence (AI) to overcome accounting fraud was raised with the aim of analyzing the potential application of blockchain and AI in accounting information systems in Islamic banking to detect anonymous transactions and ensure that accounting data is transparent and cannot be manipulated. Then this study also included a flowchart diagram that provides an overview of the process of storing data and verifying transactions in accounting information systems in Islamic banking that have been integrated with blockchain technology and AI.

2. Literature Review

2.1. Blockchain

Blockchain is a distributed ledger-based data storage system for all transactions per block or unit. So that transactions can be carried out safely because they do not require intermediaries (Triantonno, 2019). This means that the blockchain here acts as a database where individuals or groups cannot change the data that has been stored in the blockchain system. This can certainly prevent fraud or the emergence of anonymous transactions because blockchain ensures that transactions or stored data remain safe, transparent, and cannot be hacked by other parties because the data is stored permanently (Ihsan, 2022).

Blockchain consists of four types namely public blockchain, private blockchain, hybrid blockchain and consortium blockchain, these types have the same function but with different ways of working. Private blockchains allow data stored in the blockchain system to only be accessed by certain individuals or entities that have been incorporated into the system by invitation. This type of blockchain provides security for private data that cannot be accessed publicly. Public blockchain is a type that allows data to be accessed by the public who are members of the blockchain system. Hybrid blockchain is a combination of public and private blockchains, this type allows public access to data but for private data can be accessed by verifying through smart contracts available in the blockchain system. Then the consortium blockchain is a type of blockchain used by several entities or organizations incorporated in a system that allows each entity to exchange information. Usually, this type of Blockchain is used by banks and government organizations (Paul, Aithal, Saavedra, & Ghosh, 2021).

2.2. Artificial Intelligence (AI)

Artificial Intelligence (AI) or artificial intelligence is a branch of computer science created by

John McCarthy. AI is an experimental computer engineering program to create machines that can work and have intelligence like humans (Ramadhan & Putri, 2018). That is, AI has the ability to imitate actions and ways of thinking like humans in solving problems to a more complex level.

Artificial Intelligence (AI) is a technology that requires a lot of data and intelligent algorithms to work. AI algorithms are used to process data autonomously and provide decisions automatically. In addition to data and theory, there are also several technologies that support AI systems such as machine learning, neural networks, deep learning, computer vision, and natural language processing (NLP). So that with the combination of these subsections, AI can work like a human such as verifying, giving decisions, finding solutions to solve problems and others.

2.3. Accounting Fraud

Accounting Fraud or accounting fraud is an act of fraud deliberately carried out with the aim of benefiting actors who can harm stakeholders such as investors, stakeholders, companies and even customers. Fraud can occur by manipulating, falsifying, and altering documents and supporting evidence for financial records. Accounting fraud is a crime committed by internal companies that can be classified into 3 types, namely management fraud, employee fraud and computer fraud. These actions are usually motivated by motives of interests either personal or corporate interests such as manipulating taxes, misuse of assets, manipulation of costs and expenses and financial statements, debt hiding and false income recognition (Putri, 2012).

2.4. Accounting Information System

An Accounting Information System is a system that has a function to process data, organize records and reports needed to present the necessary financial information. According to Krismiaji in Endaryati (2010), Accounting Information System is a system that processes data and transactions to produce useful information for planning, controlling, and operating a business. A computer-based accounting information system is an information system that uses computer technology in managing company data or transactions into appropriate, accurate, and relevant information in decision making (Endaryati, 2021).

2.5. Sharia Banking

Islamic banking is a bank that operates in accordance with Islamic sharia principles. The basic concept of Islamic banks is based on the Quran and Hadith, and all products and services offered must not contradict the contents of the Quran and Hadith (Junaedi & Maulana, 2014). Islamic sharia principles that guide Islamic banking include the principles of justice and balance (*'adl wa tawazun*), benefit (*maslahah*), universalism (*alamiyah*), and do not contain *gharar*, *maysir*, usury, tyranny and haram objects. Islamic banks carry out business activities based on sharia principles or Islamic legal principles. Islamic banks do not charge interest nor pay interest.

Several discussions regarding research on blockchain and *artificial intelligence* have been examined. Most of the research discusses the application of a combination of theoretical shows the approach taken is qualitative with the type of *basic research* to develop a new theory. In this study, previous studies were presented which became the basis for writing as follows:

Table 1. Previous Research

No	Title	Authors	Discussion
1.	Analisis Penerapan Blockchain Dalam Rangka Pencegahan Accounting Fraud (Jurnal Ilmiah Mahasiswa FEB UB, Vol 7, no 2, Tahun 2019)	Triantonno	Discusses theoretically the influence of Blockchain if applied to accounting to overcome Accounting Fraud
2.	The Impact of Artificial Intelligence and Blockchain on the Accounting Profession (IEEE Access PP (99):1-1. 2020)	Yingying Zhang, Feng Xiong, Yi Xie, Xuan Fan and Haifeng Gu	Examines the impact of AI and Blockchain and their influence on the accounting profession.
3.	Blockchain in Accounting: Challenges and Future Prospects (International Journal of Blockchains and Cryptocurrencies Vol. 2, No. 1 2021)	Asif Iqbal Baba, Subash Neupane, Fan Wu, Fanta F. Yaroh	Discusses the concept of Blockchain in accounting as well as challenges and suggestions for the development of Blockchain technology in the future.
4.	Artificial Intelligence and Blockchain Integration in Business: Trends from a Bibliometric-Content Analysis (Journal of Information Systems Frontiers, 2022)	Satish Kumar, Weng Marc Lim, Uthayasankar Sivarajah, Jaspreet Kaur	Identify four groups namely supply chain, healthcare, secure transactions and finance and accounting if applying AI and Blockchain.
5.	Accounting and auditing with blockchain technology and artificial Intelligence: A literature review (International Journal of Accounting Information Systems 48 (2023))	Hongdan Han, Radha K. Shiwakoti, Robin Jarvis, Chima Mordi, David Botchie	Assessing the impact of AI and Blockchain on accounting and auditing.

3. Research Methods

This research uses a qualitative approach. According to Moleong, qualitative research is used to understand phenomena holistically by means of descriptions in the form of words and language, in a natural special context and by utilizing various scientific methods. According to Arikunto, using a descriptive approach to collect information about the status of a symptom is not intended to measure a particular hypothesis, but only describes what it is about variables, symptoms, and circumstances.

a) Types of Research

In this study, basic research types were used. This research aims to examine a scientific topic to develop existing theories or find new ideas. In this study, the problem is described in general to specific by providing a design using a *flowchart* as a form of development and suggestions for the problem under study.

b) Data Collection Techniques

In this study, a collection technique was used, namely a literature study as a guideline for collecting and reviewing existing data. Literature study is a research technique that collects data from credible literature such as published papers, namely books and scientific articles and articles published in mass media (Gunawan, 2021). With these references, the discussion of this issue was raised.

4. Results and Discussion

4.1. Application of Blockchain in Accounting Information Systems

Blockchain is the innovation that underpins cryptocurrencies like bitcoin. According to the current consensus, blockchain is a distributed ledger or database where every transaction affecting every organization is recorded. Blockchain is a type of organized block that can be used like a page in a ledger. Blockchain can be used to strengthen security and integrity in accounting information systems. Some of the benefits of blockchain in accounting information systems are as follows:

- a) **Accurate and reliable transaction recording**
Blockchain enables distributed and immutable recording of transactions, ensuring the integrity and security of transaction data. This helps improve the performance of accounting information systems.
- b) **Efficiency in the audit process**
With a blockchain-based accounting information system, all transactions are recorded in real time and can be accessed by trusted parties. This simplifies the audit process and ensures compliance with the law.
- c) **Increase the efficiency of financial transactions**
Blockchain allows transactions to take place between specific parties without the need for a third party or intermediary. This can reduce the time and cost required to complete a transaction.
- d) **Smart Contract pada Blockchain**
Smart contracts are software that is executed automatically based on predefined rules. Smart contracts can be used in accounting information systems to automate processes such as payment, product delivery, or contract fulfillment that can increase the efficiency of the information system.
- e) **Improve data security**
Blockchain uses advanced cryptographic technology to protect data. Every transaction on the blockchain is encrypted and connected to transactions that have happened before, making it difficult to manipulate. This helps improve data security in accounting information systems.

4.2. Application of Artificial Intelligence in Accounting Information Systems

Artificial Intelligence (AI) is a technology that allows machines to learn from experience, adapt to new inputs, and carry out tasks like humans. In accounting information systems, AI can be used to improve the efficiency and accuracy of accounting processes. Its application can be done in various ways, such as the use of chatbots to provide accounting information to clients, the use of OCR technology to recognize and process data from accounting documents, the use of machine learning technology to predict trends and patterns in financial data, and the use of blockchain technology to strengthen the security and reliability of accounting information systems. Here are the benefits of AI in Accounting Information systems:

- a) **Speed up the accounting process.**
By using AI technology, the accounting process can be done more quickly and efficiently. AI can help in data processing, data analysis, and financial report generation.
- b) **Improve data accuracy and reliability.**
AI can help in recognizing and correcting human errors in data processing. This can improve the accuracy and reliability of data in accounting information systems.

- c) Reduce human error in data processing
In accounting information systems, human error can lead to fatal errors in data processing. By using AI technology, human error can be reduced and the data processing process can be carried out more accurately.
- d) Increase efficiency in decision making.
By using AI technology, decision making in accounting information systems can be done more quickly and efficiently. AI can help in data analysis and provide information necessary for decision making.
- e) Improve data security
In accounting information systems, data security is very important. By using AI technology, information security risks such as fraud and data leakage can be reduced.

4.3. Application of Blockchain and Artificial Intelligence to Overcome Accounting Fraud in Islamic Banking

Islamic banking is banking that applies the principles of sharia or Islamic law to its operational activities. These principles prohibit riba (interest), speculation, and investment in business sectors that are forbidden by Islam. Islamic banking focuses on the principles of fairness, sustainability, and adherence to Islamic values in all aspects of its operations. Like conventional banking in general, Islamic banking in carrying out its activities is assisted by information systems, one of which is the accounting information system. Accounting information systems are used in Islamic banking to record, manage, and report financial transactions in accordance with sharia principles. This system assists Islamic banking in managing assets, liabilities, and capital by ensuring compliance with Islamic accounting standards. Accounting information systems also enable Islamic banks to produce accurate and transparent financial statements.

There are accounting information system standards that need to be met by Islamic banking such as Islamic Financial Accounting Standards (SAS) which regulate the recognition, measurement, presentation, and disclosure of financial transactions in Islamic banking. As well as Internal Control Standards (SPI) which regulate internal control in accordance with regulations (Pratiwi, 2022). These standards help Islamic banks to run an accounting information system in accordance with sharia principles. Even so, it is undeniable that the possibility of accounting fraud in Islamic banking still exists. Some factors that can cause accounting fraud in Islamic banking include lack of internal supervision, weaknesses in accounting information systems, and unethical behavior from internal parties. So that a solution in the form of innovation is still needed in the future that can minimize or prevent the occurrence of accounting fraud as has happened in previous fraud cases.

There are so many technologies emerging today, which can be a solution to overcome accounting fraud in Islamic banking including blockchain and Artificial Intelligence (AI). By implementing blockchain in Islamic banking accounting information systems, it can provide convenience to record transactions in a distributed, transparent, and immutable manner. Then the application of AI can be a solution to analyze transaction data deeply and detect suspicious anonymous transactions. AI can also monitor transactions in real-time and provide early warnings of suspicious actions. So that both blockchain and AI, have their own advantages that can complement each other to be able to help improve data security, prevent manipulation in recording transactions and detect and prevent accounting fraud.

The application of blockchain and AI if both are combined, it will provide many benefits to Islamic banking, especially in increasing trust from related parties, increasing business value, and maintaining purity and implementing the principle of justice as stated in sharia

law. Apart from the benefits of implementing both technologies, there are challenges in the application of blockchain and AI in accounting information systems in Islamic banking such as considerable implementation costs so that investment is needed for technology infrastructure improvement and human resource training. Then there is still a lack of researchers and experts in the management and development of blockchain and AI-based systems. And there is no definite standard related to the application of these two technologies in accounting information systems in Islamic banking. So that in the future, it is hoped that these challenges can be overcome and become a driver for Islamic banking to become part of technology development in the financial services industry.

4.4. Application of Blockchain and Artificial Intelligence (AI) to Prevent Accounting Fraud in Islamic Banking

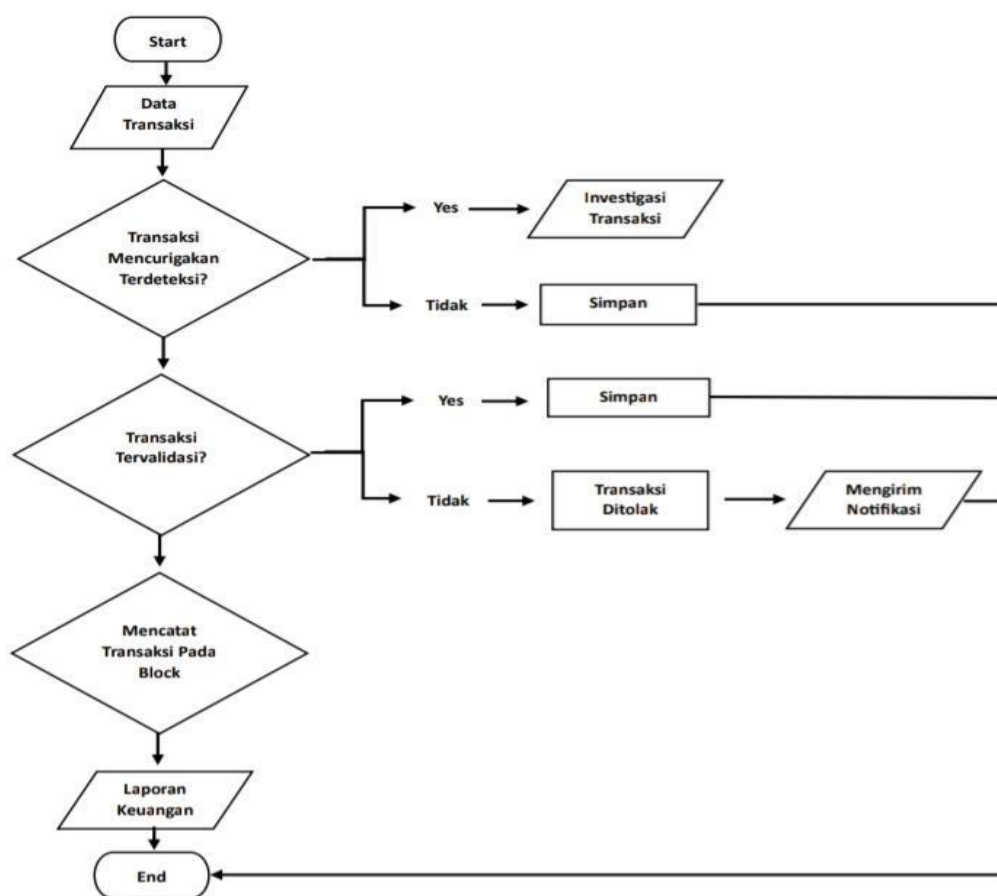


Figure 1. Blockchain and AI-Based SIA flowchart

The following is an explanation related to the Blockchain and AI-based Accounting Information System Flowchart:

- Transaction data is entered into the accounting information system by the user.
- Accounting information systems use AI and blockchain technology to process transaction data. AI technology analyzes the transaction data that has been entered.
- If AI detects suspicious transactions, the accounting information system notifies users to conduct further investigations. If no suspicious transactions or patterns are found, the

transactions are stored on the blockchain block.

- d) Stored transactions will be validated or verified for validity using AI. If appropriate, the transaction is saved. If it is invalid, the transaction is rejected and the accounting information system will send a notification to the user.
- e) Stored transactions will be recorded in blocks, so that transparency and data security are guaranteed.
- f) Users can process transactions recorded on the blockchain to generate accurate and trustworthy financial report data.
- g) The process is complete.

The flowchart is a basic design related to the steps in recording transactions in accounting information systems that use AI and blockchain, so experts are needed in both technologies in order to create perfect *flowcharts* and systems. By using AI technology, accounting information systems can detect suspicious patterns in transaction data, while by using blockchain technology, transactions can be recorded in a decentralized and transparent manner. This helps overcome accounting fraud by increasing the security and reliability of recording transactions.

4.5. Discussion

Several studies related to AI and blockchain have been widely researched, some of which discuss one of them or a combination of the two if applied to Accounting and Auditing. Research written by (Triantonno, 2019), concludes that Blockchain provides innovation in accounting. The application of blockchain can prevent accounting fraud or accounting fraud in financial statements by ensuring the authenticity and integrity of data. Blockchain is also considered capable of providing transparent record keeping and accountability, explained also Blockchain's efforts in overcoming accounting fraud by dividing the two concepts of blockchain application, namely *Internal Blockchain* and *External Blockchain*, which internal concept is intended by the company to store nodes for each division. While the external concept is used by companies to secure transactions with outside parties.

Research conducted by Zhang, Xiong, Xie, Fan, & Gu (2020), discusses the combination of AI and Blockchain technology in the accounting profession. The article explains that the technology introduced major changes to the accounting profession. The positive impact of its application such as re-engineering accounting procedures, reducing errors and distortions of accounting information, and increasing accounting efficiency. In accounting and auditing, it is also explained that blockchain and AI help in large-scale audits with real-time can and can improve the transformation of corporate data security. In agreement with these studies, (Han, Shiwakoti, Jarvis, Mordi, & Botchie, 2023) and (Kumar, Lim, Sivarajah, & Kaur, 2023) which discusses the combination of the two that can create transparent and efficient records for an organization can also trigger its use in the accounting and auditor profession and become a challenge for the field of blockchain and AI experts to apply to accounting information systems.

Research conducted by Baba, Neupane, Wu, & Yaroh (2021) discusses the challenges and future prospects of implementing blockchain in accounting. *Blockchain* can provide benefits in improving efficiency, transparency, and data security, but it is undeniable that challenges such as data security, standardization, regulation and application are not yet possible in small-scale organizations. Then the researcher added that the prospect of blockchain in the future is a combination of blockchain and AI that can overcome the problems of transaction data security, scalability and others. Both enhance each other's weaknesses and strengths so that they provide many benefits if applied to accounting.

Based on these studies, it can be understood that blockchain and AI are technological innovations that can facilitate and improve accountant performance. Not only for the accounting profession, the application of this technology provides security and overcomes the possibility of fraudulent transaction recording that can harm various parties. Its application to accounting information systems has not been widely applied to company operations, especially in Islamic banking. The application of both in banks or companies is still separate because it takes time and experts who can combine the two into an integrated system for accounting information systems. Then, this research is based on previous research developed with literature studies of various sources, so there are still many shortcomings in research on the application of these two technologies. This is expected to be a trigger for continued in-depth research related to blockchain and AI and its application, especially in Islamic banking, especially this research is categorized in new research and its application has not been found so that other studies are needed that can provide real implementation and enrich research for technological innovation in the future.

5. Conclusion

Blockchain and Artificial Intelligence (AI) are today's technologies that when applied to the accounting or financial services industry have many benefits such as efficiency, security and ensuring that the data processed is valid and the data is presented transparently. This is supported by several studies that have examined theoretically related to the benefits and implications if the two technologies are combined and applied to accounting. One of the topics raised in this article is data security and transparency, blockchain and AI allegedly can overcome the phenomenon of *accounting fraud* that may occur in every sector, especially in Islamic banking.

Sharia principles owned by Islamic banking are in line with the benefits of applying Blockchain and AI to accounting information systems. So that when applied to Islamic banking accounting information systems, it can reduce the risk of accounting fraud because blockchain provides a safe and trusted database, while AI can be used to analyze data in real-time and detect fraud more accurately. The limitation of this study is that data collection is based on articles and books that have been published and mass media as a complement. Then the data is processed based on the author's understanding of the results of literacy from relevant sources.

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