



Author Notification
29 July 2022
Final Revised
30 July 2022
Published
02 July 2022

Execution of Blockchain in The World of Archive

Satrio Dimas Wijaksono¹, Ramadhan Hadi Trianto², Awal Febri Ikhtiarman³, Rizka Amalia⁴, Fadiyatul Jannah⁵

Computer Technology, University of Raharja^{1,2,3}

Information Systems, University of Raharja⁴

Computerized accounting, University of Raharja⁵
Indonesia

e-mail: satrio.dimas@raharja.info, ramadhan.hadi@raharja.info, awal.febri@raharja.info,
rizka.amalia@raharja.info, fadiyatul@raharja.info

Dimas Wijaksono, S., Hadi Trianto, R., Febri Ikhtiarman, A., Amalia, R., & Jannah, F. (2022). Execution of Blockchain in The World of Archive. Blockchain Frontier Technology, 2(1), 64–71.

DOI: <https://doi.org/10.34306/bfront.v2i1.115>

Abstract

Archiving certification, especially in electronic archiving, remains a problem in the archiving world. The solution to this problem is the blockchain technology first used in digital currencies. Blockchain is believed to have had a significant impact on archive management. This study aims to consider the application of blockchain technology in archiving, including Features, application examples, opportunities, and challenges related to blockchain technology inconsistencies in archive science. This study uses a qualitative approach using literature data sources from various disciplines related to the basic concepts of archival science as the basis for analysis. The results of this study show that various possibilities can be developed on the blockchain. The contradiction between the implementation issues, especially in Indonesia, and the basic concepts of blockchain technology and archive science. This study concludes that further research is needed to ensure that blockchain technology adheres to archive science's basic concepts and principles, especially concerning reliability.

Keywords: Blockchains, Electronic Archives, Archive Authenticity, Archive Binding, Electronic Archive Preservation.

1. Introduction

Blockchain is not very new conceptually, but it has recently been discussed and trended in various areas. Blockchain began to evolve in the 2010s and was characterized by a digital currency (cryptocurrency) bubble. The most popular currency is Bitcoin, launched by individuals/groups under the pseudonym Satoshi Nakamoto for digital currency purposes. The concept of blockchain was initially applied to the world of Bitcoin, but there is a paradigm, and the concept of blockchain can be used in various fields[1]. One of them is the archive field. Thus, blockchain technology has become a new trend among archivists in developed countries, and in Indonesia, the concept of blockchain technology is still dominated by discussions and discussions in the digital finance world, especially in Bitcoin. Blockchain is a fixed and shared ledger that facilitates recording wealth transactions on business networks. These can be tangible or intangible assets such as intellectual property, patents, copyrights, trademarks, etc. It can be said that all worthy entities can be tracked and traded on the blockchain network (Gupta, 2018)[2]. This allows you to enter any information into your blockchain network in a simple language.

A blockchain consists of three main components: block (block), chain (chain), and network (network). Block : A list of recorded transactions recorded in the ledger at a specific time. Each block's size, duration, and the trigger will vary from blockchain network to

blockchain network[3]. Not all blockchains have a primary goal of recording and protecting every transaction. However, each blockchain records a transaction or token movement. The transaction process here is the process of collecting data. Determines the value of the block that will be used later as a reference for interpreting the data recorded in the block. Chain: A hash that connects one block to another and mathematically "chains" the blocks. The concept of hashes is the most difficult to understand because it interconnects blocks and allows them to establish trust based on mathematical numbers. Blockchain is a relatively new innovation, but the notion of hashing is not. Hash has been around for over 30 years. Hashes are used to create a single function that cannot be written[4].

Hash is an algorithm that returns a fixed-length value from a string data variable. Hash functions create mathematical algorithms that map data to fixed-sized bit strings. Bit strings are typically 32 characters long and represent hashed data. SHA-256 is a commonly used algorithm for generating 256-bit hashes. A simple image is a hash fingerprint used to protect data on a blockchain network[5]. Network: A network consists of existing points (nodes). For example, a computer running an algorithm to protect your network. Each point consists of a complete record of all transactions in the blockchain network. Each point is distributed worldwide, and anyone can operate it. All these points are complex, expensive, and time-consuming, so people who do them do not do them for free. There are blockchain algorithms that reward those who run the blockchain network. Rewards are generally offered in digital currencies (cryptocurrencies) such as Bitcoin (Laurence, 2017)[6].

It is important to note that the content, form, and intermediaries in a digital archive may differ. For example, when a digital archive is in a cloud storage location when accessed, the content is displayed on the screen, while the physical form is somewhere in the corner of the hard drive, and the medium is over Wi-Fi. -Fi basic. The requirement for a document to be considered archival is when the document meets the criteria of compliance, completeness, completeness, materiality, completeness, accuracy, authenticity, and inviolability (Kennedy & Schuder, 1998)[7]. The unique feature of digital archives is that they cannot be manipulated and depend on a specific system and tool to read them. As a result, this often creates confusion and uncertainty about its authenticity. The main problem with digital archives is that they are unreliable and hard to access, which is a real irony in the modern information age, where computers are everywhere (Duranti, 2010). Previously, Luciana Duranti introduced the concept of "storage association." Repository association is a networked relationship in each repository with other records in the same repository set. While Duranti refers to an entity that can be considered an archive if it has three main things, namely the originality of a document when it was created, it has a fund. Necessary (required) a document can be considered an archive if an associated repository requires the document and Identified (specified) when the repository may be eligible to support a function in an activity's repository aggregation[8].

In blockchain technology, all transactions or records are recorded as a distributed, decentralized ledger, and anyone can view and verify them. In many circles, blockchain is considered a tamper-proof system and cannot be hacked because of the distributed nature of entities, so if someone wants to change it, they have to change everything in the network—all systems. Therefore, if something is modified without knowledge or verification, it is automatically rejected by the system in general[9]. So, with these characteristics, blockchain is considered a problem solver. The archival sector recognizes that the main problem of archives that can be solved with blockchain technology is the notion of trust that archives need to be authentic. Repositories need a trust engine for the repository to be considered trusted and can be trusted by multiple parties. Because blockchain differs from previous verification methods where transaction records or records are centralized, there is one party that all users trust who has complete control over the system and manages all transactions. By using encryption and digital signatures to prove identity, authenticity, and supporting read/write permissions across the network (Boucher, Nascimento, and Kritikos, 2017), trust in the blockchain is based on mathematical and computational systems[10]. So, in some countries where the level of mutual

trust is low between the government, private sector, and the public, blockchain usage can be very influential (Lewis, Larsen, Goh, & Tan, 2017)[11].

Implementing blockchain in the storage field or different areas that use storage as the backbone to run a business and its functions are starting to emerge. The most important sector is finance, as blockchain was born from the advent of digital currencies, government, and crucial sectors like healthcare and education[12]. It does not rule out the use of blockchain in various fields. Blockchain implementations can be a solution to repository management problems, and they can also be a contradiction and create new problems. Archivists, records managers, educators, and decision-makers in the archival sector need to know and respond to blockchain technology, especially its impacts on the storage field. Since blockchain technology is becoming increasingly trendy in many countries, Indonesia may also begin to implement it on a larger and more impactful scale[13]. Unfortunately, globally, few policymakers in the storage sector specifically discuss and consider the implications of blockchain technology in the storage sector, particularly in Indonesia. Therefore, the main goal of this article is to explore the application of blockchain technology in the storage sector, including how it works, application examples, opportunities, and challenges in implementing blockchain technology. In the storage field, blockchain technology's contradictions in the storage science. Hopefully, policymakers in the storage sector will be better prepared and more conscious of the future implementation of blockchain technology[14].

This research is limited to the application of blockchain technology that has been made in several countries and public blockchain implementation models. These limitations create the possibility of a loss of information regarding blockchain implementations made within a closed framework that could have been implemented and implemented in Indonesia. Therefore, this study can be further developed into a more specific discussion of the application of blockchain in certain fields. Let the presentation be more specific and explain the impact of blockchain usage in real terms.

2. Research Method

This research is limited to the application of blockchain technology that has been made in several countries and public blockchain implementation models. These limitations create the possibility of information loss related to blockchain implementations performed in a closed environment, which could have been studied using a literature review method. This approach is taken because not many people are practicing and implementing blockchain technology in Indonesia, especially in the storage sector. Literary or documentary research collects data by analyzing and reviewing sources such as existing books, documents, reports, and records to obtain the necessary data related to the problem—the topic under discussion (Nazir, 2003)[15].

This study uses basic blockchain concepts and fundamental storage science theories related to authentication and digital storage. The words archive and archive in this text refer to dynamic repositories commonly known as "records" in the private sector. As a result, the terms of storage and recording often overlap. Data collection techniques are used in the literature in the form of notes, books, journals, diaries, and other written materials relevant to the topic of discussion. The data analysis techniques used are as follows. First, a description to explain and describe a situation, event, object, person, or anything about the variable that can be explained. This study used descriptive analysis and literature review. The descriptive analysis presents objects about the reality in the study area, and a systematic method is used to describe the object further through the data collected for analysis[16]. The document will explore data according to the needs of research conducted and carried out in Indonesia. Therefore, this study can be further developed into a more specific discussion of the application of blockchain in certain fields. Let the presentation be more specific and explain the impact of blockchain usage in real terms.

3. Result and Discussion

3.1 How blockchain technology works in Archives

Blockchain consists of three main components: block, chain, and network. The block contains a list of transactions, which can be tracked by type of activity. Typical use is tracking goods, purchases, or assets. The rule is that the network will be formed when the size limit or several transactions is reached. When the block reaches the maximum size limit, the block is connected using a hash function. If the hash value is entered from one block to the next, the 2 blocks will be connected. Iterating over a hash of immutable data will always return the same fixed length value. So, if there is a forced modification to a block on the network, the other block will read the data as an untrusted modification because the required modification block produces a different hash value than the other block. The hash in blocks can be generated multiple times and then converted to a unique hash or Merkle root (Bhatia & Wright de Hernandez, 2019). The blockchain network consists of nodes (nodes) containing complete documents of all transactions[17].

No copy is centralized, and no one is more reliable than another. Data integrity is managed and maintained at all nodes in the blockchain network. There are three types of networks: public, authorized, and private. The network is public so anyone can join (Bhatia & Wright de Hernandez, 2019). Suppose you refer to the blockchain model on the bitcoin coin. Anyone who can theoretically download and run the program on the bitcoin network can start validating transactions and creating blocks and nodes[18]. If the computer is already connected to the bitcoin network (in other words, the blockchain), the computer can do various things, including: download the blockchain, store the blockchain, hear/see transactions happening, verify execute transactions, transmit valid transactions, listen/watch blocks, confirm blocks, transmit valid blocks, generate blocks, and my blocks (Lewis, 2015). This process can be done without any verification from anyone, and the people on the blockchain network remain anonymous unless the blockchain network goes down.

3.2 Blockchain Implementation in Archives

Several sectors have started to use blockchain technology, including government, healthcare, and education. Initial blockchain implementations focus on digital currencies and commodity trade, so it will be more interesting to explore the uses of blockchain in the storage sector in government, healthcare, and education. One of the things that the government can use for the use of blockchain technology is to record transactions and track asset ownership. The use of blockchain will make the process more efficient and transparent. The verification process becomes more efficient because the verification is done by a mathematical process in the blockchain network. Blockchain also helps make land records immutable and explains the ownership and authenticity of these records (Thakur, Doja, Dwivedi, Ahmad, and Khadanga, 2019)[19].

A specific example is the registration of land ownership by the Land Rights Administration in the United Kingdom in 2019 (HM Land Registry, 2019). The UK has also created a system called "Distributed Ledger Technology: Beyond Blockchain," which says the distributed ledger concept can help reduce corruption, intentional and unintentional errors, and embezzlement while making processes more efficient. They also claim that blockchain can change the relationship between government and citizens by creating a more transparent and trustworthy system[20].

The world of education often emerges because of the problem of fake degrees. Blockchain is considered by many to be able to solve this problem. Some universities like MIT, Harvard, and the Delft University of Technology, are trying to create a consortium to provide a model for verifying credentials via a blockchain network (Bhatia & Wright de Hernandez, 2019). In addition, the application of blockchain technology in the world of education includes blockchain, e-Portfolio, and book copyright. Blockcert is one of the tools (tools) created by MIT

that can be used to create, issue, and verify blockchain-based certificates (Winarno, 2019). The industry aims to independently and reliably cross-check qualifications through the blockchain network. If we look at the above trends, we can conclude that one of the main goals of various blockchain implementation areas is to enhance trust and credibility, which is considered unsolvable. Using only conventional or digital repositories that are not incorporated into the blockchain network[21].

3.3 Blockchain Implementation Opportunities and Challenges in the Archives

One of the main arguments for using blockchain technology in records management is that blockchain provides confidence in the validity of records. To date, the public sector has always been concerned with trust in government and the concerns of marginalized communities about the potential for government abuse of power. These issues make blockchain technology very attractive to many entities and entities looking to allow a record to be authenticated and challenging to alter. However, as tested by Victoria Lemieux, one of the leading researchers in the blockchain field with a background in archival documents, has said that blockchain technology can only prove that the record cannot be tampered with. Changes once when it is connected or connected to the blockchain network (Bhatia & Wright de Hernandez, 2019).

For storage practices, blockchain provides similar opportunities for document management. Regarding traceability, blockchain provides an opportunity to prove ownership of archives as every movement and change of data is recorded and time stamped on the blockchain network (Bhatia & Wright de) (Hernandez, 2019). Another advantage considered a special one can be achieved with blockchain technology that conventional documents cannot achieve, i.e., documents that are historically created and immutable, showing the right to actual ownership and their age. Allows a document issuing authority to verify documents using cryptographic methods. Therefore, if a document is lost or misused, it will be detected as a stolen document (Laurence, 2017). How many times forged documents, whether identity documents or things related to the ownership of goods[22].

On the one hand, many conditions require people to be undocumented, such as refugees or marginalized groups. Many poor people also have identity problems; the lack of identification makes it difficult to access verification requirements such as banks, which is common, especially in developing countries; Indonesia is one of them. Some of the above are different benefits that can be achieved if a community, agency, or government adopts and uses blockchain technology in records management to support business processes and functions.

3.4 Challenge

However, each technology has its challenges, as does blockchain technology. By far, blockchain is considered by many to be the most needed technology, especially in developing countries. Developing countries need more technology to develop but are not supported by the resources and policy environments that allow innovation to flourish in grassroots communities. For example, in some countries, efforts are made to limit excessive technology use; another example, the State does not trust technology products and services provided from abroad; In more severe cases, the political system takes advantage of the inefficiencies and ambiguity of the state system. The widespread use of the Internet of Things thanks to mobile phones is also impacting. The rapid prevalence of mobile phone use makes life in developing countries change very rapidly, especially as many developing countries are not yet ready with their legal tools. This phenomenon has allowed many startups to progress rapidly in developing countries by taking advantage of gaps or gray areas in regulations on various topics. This condition is reinforced by the fact that developing countries often do not have many leaders who dare to make decisions, so if there is an organization or a startup with the power to change, anything can happen. In Indonesia, for example, startups such as GoJek, Tokopedia, and Traveloka have changed the way Indonesians see many aspects of social life. As people get used to

using these services, the government is slow to react, causing many regulations to not comply with the conditions created when using these startups' services.

The potential of blockchain may vary in some developing countries, depending on many variables that may arise, but on the one hand, in the application of blockchain technology, industries and commerce want blockchain as a technological achievement. In contrast, developing countries focus on the trust factor. Blockchain can provide (Underwood, 2016). One path that can be taken is cooperation or cooperation, as India has done. India is working with Singapore on blockchain implementation as Singapore is considered a well-planned city, so despite its dense population, the standard of living is high with good technology-related infrastructure. Finally, if blockchain implementation is underway, a Decentralized Autonomous Organization (DAO) ecosystem will emerge, a decentralized autonomous organization that can be understood as a collection of contracts. A smart contract, until the culmination of its implementation, is that all rules or policies in this location (deployed DAO) will automatically enforce the rule or policy through the blockchain (Boucher et al., 2017). However, while smart contracts are an extreme measure, they cannot interpret the intent of the contracting entity. The computer can only recognize the code but cannot understand the intent of the contract as if a human were reading the contract (Laurence, 2017). Therefore, there is still a need for regulations and legal frameworks regarding implementing blockchain technology in countries that are adopting the technology.

3.5 Blockchain Contradiction with Archives

Blockchain technology is very likely to change the paradigm regarding whom to trust in the case of storage we initially trust, the agency, individual, or organization that publishes and is responsible for the transferred storage. To trust the codes and numbers that exist on the blockchain network. Therefore, the use of blockchain cannot guarantee trust in a record. A new registration can be considered trusted if it is trustworthy and authentic. According to Lemieux (2016), blockchain does not provide a solution to record reliability, and many blockchain features harm the authenticity of the information itself.

Blockchain technology is possible to change the paradigm regarding whom to trust in the case of archives. Initially, we trust that the agency, individual, or institution that issues and is responsible for the archives is shifted to trust in the codes and numbers that exist on the blockchain network. So using blockchain cannot ensure trust in a record. A new record can be reliable if it is reliable and authentic. According to Lemieux (2016), blockchain does not provide a solution to the reliability of a record, and many features on the blockchain harm the authenticity of the information itself.

Another problem is that each new node created to strengthen the network and increase its working capacity requires a lot of computing power. System crashes are very likely to occur when the network is extensive, so appropriate mitigation measures are needed to prevent this from happening (Thames & Schaefer, 2017). Blockchain networks do not keep records of all transactions; blockchains only store hashes of those records. The blockchain cannot copy the original record from a hash stored on the blockchain network because the hash cannot be generated to copy the record. This concept is an argument for those who believe that records can solve the problem of archive authenticity. This is a concern in the preservation of digital archives, where the transfer of archives takes place in electronic form; the bond of the archive must be maintained so that its authenticity remains. Precise and reliable (Duranti, 1997). So Lemieux (2018), one of the pioneer blockchain researchers with a background in the science of storage, argues that using blockchain can pose significant risks, especially in the long run, and ensures that the record's authenticity can be trusted in the future.

4. Conclusion

New technology is always interesting to follow as it offers many advantages and updates over previous methods. Blockchain is one of the most popular technologies and has recently

become a buzzword. Many parties seem competing to implement it and see blockchain as a savior. One of them is in the field of storage; the presence of blockchain technology seems to be a solution to the most decisive problem in digital storage, which is authenticity. Blockchain, in general, can help solve digital repository validation problems due to the distributed system model. In short, it can be said that blockchain can solve this problem.

On the one hand, blockchain brings impacts and problems that can arise when its implementation is associated with long-term use. Some storage experts argue that blockchain cannot provide certainty in long-term use; one of the most basic is that blockchain does not keep its digital archives intact but is divided into many places. Moreover, this causes the death of the blockchain network (for various reasons), which can reduce authenticity and be unreliable.

Often, decision-makers are preoccupied with trends and image issues when implementing technology without carefully considering the impact of deploying technology in the distant future. It is best for storage stakeholders to review basic standardized storage concepts to see if technology can fit and align with the rules and regulations. Basic storage concept or not. Without thinking of blockchain as something to be avoided or feared. However, they want to implement blockchain to further enhance records management in general. The researcher hopes this paper can be used as an argument to investigate whether blockchain technology is more consistent with storage principles so that blockchain technology can be applied in the future.

References

- [1] A. Shahnaz, U. Qamar, and A. Khalid, "NutBaaS: a blockchain-as-a-service platform," *IEEE Access*, vol. 7, pp. 147782–147795, 2019.
- [2] E. Tijan, S. Aksentijević, K. Ivanić, and M. Jardas, "Blockchain technology implementation in logistics," *Sustainability*, vol. 11, no. 4, p. 1185, 2019.
- [3] M. A. Ferrag, M. Derdour, M. Mukherjee, A. Derhab, L. Maglaras, and H. Janicke, "Blockchain technologies for the internet of things: Research issues and challenges," *IEEE Internet Things J.*, vol. 6, no. 2, pp. 2188–2204, 2018.
- [4] H.-N. Dai, Z. Zheng, and Y. Zhang, "Blockchain for Internet of Things: A survey," *IEEE Internet Things J.*, vol. 6, no. 5, pp. 8076–8094, 2019.
- [5] M. Andoni *et al.*, "Blockchain technology in the energy sector: A systematic review of challenges and opportunities," *Renew. Sustain. energy Rev.*, vol. 100, pp. 143–174, 2019.
- [6] S. Saberi, M. Kouhizadeh, J. Sarkis, and L. Shen, "Blockchain technology and its relationships to sustainable supply chain management," *Int. J. Prod. Res.*, vol. 57, no. 7, pp. 2117–2135, 2019.
- [7] M. K. Lim, Y. Li, C. Wang, and M.-L. Tseng, "A literature review of blockchain technology applications in supply chains: A comprehensive analysis of themes, methodologies and industries," *Comput. Ind. Eng.*, vol. 154, p. 107133, 2021.
- [8] X. Pan, X. Pan, M. Song, B. Ai, and Y. Ming, "Blockchain technology and enterprise operational capabilities: An empirical test," *Int. J. Inf. Manage.*, vol. 52, p. 101946, 2020.
- [9] H. Feng, X. Wang, Y. Duan, J. Zhang, and X. Zhang, "Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges," *J. Clean. Prod.*, vol. 260, p. 121031, 2020.
- [10] J. Xie *et al.*, "A survey of blockchain technology applied to smart cities: Research issues and challenges," *IEEE Commun. Surv. Tutorials*, vol. 21, no. 3, pp. 2794–2830, 2019.
- [11] A. A. Monrat, O. Schelén, and K. Andersson, "A survey of blockchain from the perspectives of applications, challenges, and opportunities," *IEEE Access*, vol. 7, pp. 117134–117151, 2019.
- [12] H. Albayati, S. K. Kim, and J. J. Rho, "Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach," *Technol. Soc.*, vol. 62, p.

- 101320, 2020.
- [13] S. Saurabh and K. Dey, "Blockchain technology adoption, architecture, and sustainable agri-food supply chains," *J. Clean. Prod.*, vol. 284, p. 124731, 2021.
 - [14] R. Zhang, R. Xue, and L. Liu, "Security and privacy on blockchain," *ACM Comput. Surv.*, vol. 52, no. 3, pp. 1–34, 2019.
 - [15] U. Bodkhe *et al.*, "Blockchain for industry 4.0: A comprehensive review," *IEEE Access*, vol. 8, pp. 79764–79800, 2020.
 - [16] M. N. M. Bhutta *et al.*, "A survey on blockchain technology: evolution, architecture and security," *IEEE Access*, vol. 9, pp. 61048–61073, 2021.
 - [17] R. L. Rana, C. Tricase, and L. De Cesare, "Blockchain technology for a sustainable agri-food supply chain," *Br. Food J.*, 2021.
 - [18] H. Sun, X. Wang, and X. Wang, "Application of blockchain technology in online education.," *Int. J. Emerg. Technol. Learn.*, vol. 13, no. 10, 2018.
 - [19] J. Golosova and A. Romanovs, "The advantages and disadvantages of the blockchain technology," in *2018 IEEE 6th workshop on advances in information, electronic and electrical engineering (AIEEE)*, 2018, pp. 1–6.
 - [20] M. Warkentin and C. Orgeron, "Using the security triad to assess blockchain technology in public sector applications," *Int. J. Inf. Manage.*, vol. 52, p. 102090, 2020.
 - [21] P. Garg, B. Gupta, A. K. Chauhan, U. Sivarajah, S. Gupta, and S. Modgil, "Measuring the perceived benefits of implementing blockchain technology in the banking sector," *Technol. Forecast. Soc. Change*, vol. 163, p. 120407, 2021.
 - [22] A. Esmat, M. de Vos, Y. Ghiassi-Farrokhfal, P. Palensky, and D. Epema, "A novel decentralized platform for peer-to-peer energy trading market with blockchain technology," *Appl. Energy*, vol. 282, p. 116123, 2021.