Systematic Literature Review and Bibliometric: Blockchain Technology in Archives

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ABSTRACT: Disclosure of information makes it easy for the public to obtain information anytime and anywhere. New solutions for access control and monitoring of archives are urgently needed to keep things safe. Archival institutions as guarantors of the availability of information are expected to provide solutions and new ideas for developments in the implementation of national archives. Archiving in developed countries on blockchain technology is something new. The purpose of this research is to find out the advantages of blockchain technology in archiving and hope that readers or researchers benefit from Blockchain Technology research in archiving, which can be used for other research. Data collection techniques used the literature review method systematically and uses the VOSviewer application in this study and the findings of journal articles sourced from Scopus in 2017-2022.

KEYWORDS: Archives, information, Blockchain technology, Bibliometrics, Systematic literature review.

INTRODUCTION

With information disclosure, archival institutions' guarantors of the availability of information need to create solutions with new thoughts on the development of the implementation of national archives carried out by archival institutions. Blockchain is a fixed distributed ledger that facilitates the recording of asset transactions on corporate networks with tangible or intangible, such as intellectual property rights, patents, copyrights, and trademarks. All units of value can be tracked and traded on the blockchain network (Gupta, 2018 in Noor, 2021:223)

Blockchain consists of blocks, chains, and networks. The list of records in the ledger for transactions at a certain period is called a block. Blockchain each block network has a different size, duration, and trigger. Not all storage and transaction security on a blockchain is the main goal but every transaction or token record. Data storage is an event process that can be assessed on a block and used as a reference for interpreting the data stored in that block (Noor, 2020:26). What makes blockchain special is that can't be tamper-proofed in the process of coordinating, recording, and executing transactions. The blockchain architecture is unique and is where diverse archives of organizations, communities, and individuals in the form of identities, digital assets, and documents are stored. (Bashar, Purnamasari, & Priyanti, 2022: 3023).

Law Number 43 of 2009 concerning Archives states that archives are records of activities or events in various forms and media by developments in information and communication technology made and received by state agencies, local governments, educational institutions, companies, political organizations, organizations society, and individuals in the implementation of social, national and state life. Explanation of article 3 letter b, reliable archive management is archive management carried out based on a system that can accommodate and respond to the needs of the times.

Blockchain is a filing technology that generates new forms of archiving and new modalities of archiving that archivists need to do. The security of storing data in archives is an implication of blockchain technology. Authentic records of all network activity are distributed in network components and linked to a series of data blocks, also known as the blockchain (Christidis & Devetsikotis, 2016: 2292). According to Laurance (2017) in Septianda, et al (2022: 2629) Currently, there are several types of blockchain;

a. Public Blockchain
   Blockchain is widely used and works with native tokens it is open source so anyone can contribute to its preservation.

b. Permissive Blockchain
   Blockchain develops systems in a network by providing conditions for developers. Open or closed is the nature of the source code provided.

c. Private Blockchains

A low-use blockchain that does not require native tokens is popular among association participants with trusted members. Blockchain has three characteristics;

1. Not centralized or decentralized, a system that runs without control, has a hash code, and contains blocks for making transactions, so it doesn't involve servers in the blockchain.
2. The blockchain technology that is immutable or changeable on the platform never gets lost and remains securely stored as the hash pointer data combination enters the block and creates a connected chain.
3. Open source and transparent means data can be seen and accessed. Other people can access it, but it is verified with blockchain technology cryptographic keys, so authorized people cannot change it, so you can see whether the data is genuine or fake. (Oganda, F. P., Rahardja, U., Aini, Q., Hardini, M., & Bist, A. S., 2020: 308).

Archival institutions must develop technology in the archiving field because Information Communication Technology (ICT) plays a role in the survival of society and needs to be supported by various parties and cannot work alone. The more uncontrolled the flow of information obtained by the public, the more there must be a new solution for access control (security) and monitoring of archives. The current problem is whether every opportunity experienced by archival institutions using blockchain is known when viewed from the use of blockchain and whether it is good enough to be used in archival management, both in terms of storage and access security.

Research conducted by Woodall & Ringel (2020: 2200) analyzes the rhetorical mediation of blockchain technology as a filing solution to introduce blockchain to the professional community. Blockchain was relevant as a filing strategy trust defined in terms of integrity, authenticity, and reliability. This is a very prominent characteristic of considered trustworthy digital records and repositories.

Bhatiaa and Wright de Hernandez (2019:75) analyze the implications of blockchain for archiving and archiving comparable to records management. For archiving practices, blockchain presents opportunities similar to those of record management. Blockchain use for records management will provide a means to establish confidence in the validity of a record. For record managers in government, industry, and academia, this technology didn't come from anywhere but came before it, used to record information that must be managed reliably and afford for its entire life cycle. Archivists need to understand how to operate to extract useful information from the system for storage elsewhere or provide a streamlined way to keep the blockchain running for incoming queries against its data. Archiving a blockchain system will require special thought and implementation plans because the longer a system is left alone without an active user community, the less reliable the data stored within it will be due to the blockchain's dependence on its distributed nature to create trust.

Bitcoin is the initial concept of the blockchain, the paradigm shift that occurred makes the rules on the blockchain used in many fields, and archiving is one of them. In developed countries, archives on blockchain technology are new. Automatically use blockchain in archives to overlap with digital archives. Archives on blockchain implementation used as the main thing of the organization include its operations such as finance because blockchain comes from digital currency and governance. In the health and education sectors, this includes the main sectors. Blockchain implementation can be a solution to the problem of record management, but it becomes contradictory and creates new problems (Noor, 2020:86)

In research, Navadkar and Wantmure (2018: 2287) analyze blockchain technology used for government and institutional public service applications (e-government) such as health, education, financial services, and administration. Data exchange, digital verification, public security, simple and low cost, etc.

Changes caused by developments in technology and information for loading and storing archives have changed the conventional model to digital. As a source of information, archives are also used as material for decision-making, evidence, source of legitimacy, and historical references. To maintain the integrity of archive values, in the process of digitizing archives authenticity is prioritized. Archives are said to be original if the structure, content, and context of the conditions when the archive was first made by a person or institution authority. The authenticity of was archive will be lost if the digitization process is not done properly (Satoto et al. 2011:21).

This research aims to enable researchers to benefit from blockchain technology in archives. After knowing in-depth, hope that it can provide benefits to readers or other researchers regarding Blockchain Technology in Archives which can be used for further research. The limitation of this research is the findings of journal articles sourced from Scopus in 2017-2022.

METHODS

A systematic literature review is a method in this study by reviewing the literature review using the VOSviewer application. VOSviewer is used in the bibliometric analysis by looking for opportunities for the topics studied, the most reference sources that can be searched for in certain fields, and can search for data containing bibliographical fields (title, author, author, journal name, and so on). The list of articles was searched by downloading the article findings from Scopus by filtering articles based on keywords according to the title to the abstract criteria. Articles in the 2017-2022 year range are the articles used. After collecting and fulfilling the requirements for analysis in the study, it is inputted into Microsoft Excel and stored in CSV format. Bibliometric maps are used to visualize and analyze trends, after which the article data is mapped from database sources. VOSviewer can also use to create network-based publication maps, country maps, journal maps (co-citations), and keyword maps based on links between networks or existing articles.

Research literature sources are based on the Scopus Portal electronic database to extract the title and abstract information. Several articles were cited in electronic databases using the snowball search technique. Saved articles will be selected. The literature in this review refers to publications from 2017 to 2022.

DISCUSSION

In this study, the planning stage questions were structured based on PICOC criteria (Population, Intervention, Comparison, Outcomes, and Context). Scope identification will be arranged in table 1:

Table 1. Identify the scope of structured questions

Scope	Criteria
Population	Blockchain Technology, Blockchain in Archives
Intervention	Blockchain Technology
Comparison	not applied
Outcomes	Blockchain Technology in Archives, Blockchain in Archives
Context	Review of all literature related to Blockchain Technology in the field of Archives

(**Source:** Research Data, Dec 2022)

The research questions in this paper are as follows;

1. RQ1: How many findings of blockchain technology items and clusters are in the archives on research keyword mapping from VOSviewer?
2. RQ2: How is the development of research publications related to Blockchain Technology in Archives from Scopus search results?
3. RQ3: How many studies have been done regarding blockchain technology in archives?

Search Strategy

The search strategy includes an execution phase. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) is an approach used in research. Information search strategies are expressed by search terms. The online database is a source of information used by entering inclusion and exclusion criteria as well as evaluating the quality of search results, and describing search results. (Handayani, 2017:1).

Structure

(blockchain AND technology AND archives)

This step analyzes the previously collected data, to answer the predefined research questions, as a result of the analysis.

Inclusion and exclusion criteria

Inclusion and exclusion criteria are used to select based on criteria and focus on journal articles that suit the needs of researchers. Items from the inclusion and inclusion criteria provided will be displayed, as shown in table 2:

Table 2. Inclusion and Exclusion Criteria

Inclusion	Exclusion
Literature included in journal articles	Literature is not included in the category of journal articles
Journal articles published from 2017-2022	Journal articles not published before 2017-2022
Journal articles have no duplicates in the database	Journal articles have duplicates in the database
Literature can be accessed in full	Literature cannot be accessed in full

Based on the results search strategy from scientific journals (Scopus) from 2017-2022, there were 91 journals. Furthermore, the researchers made a selection based on exclusion and inclusion criteria so that journal articles that did not include inclusion were not included. The results of journal articles that will be further reviewed based on a selection are as many as 10 articles.
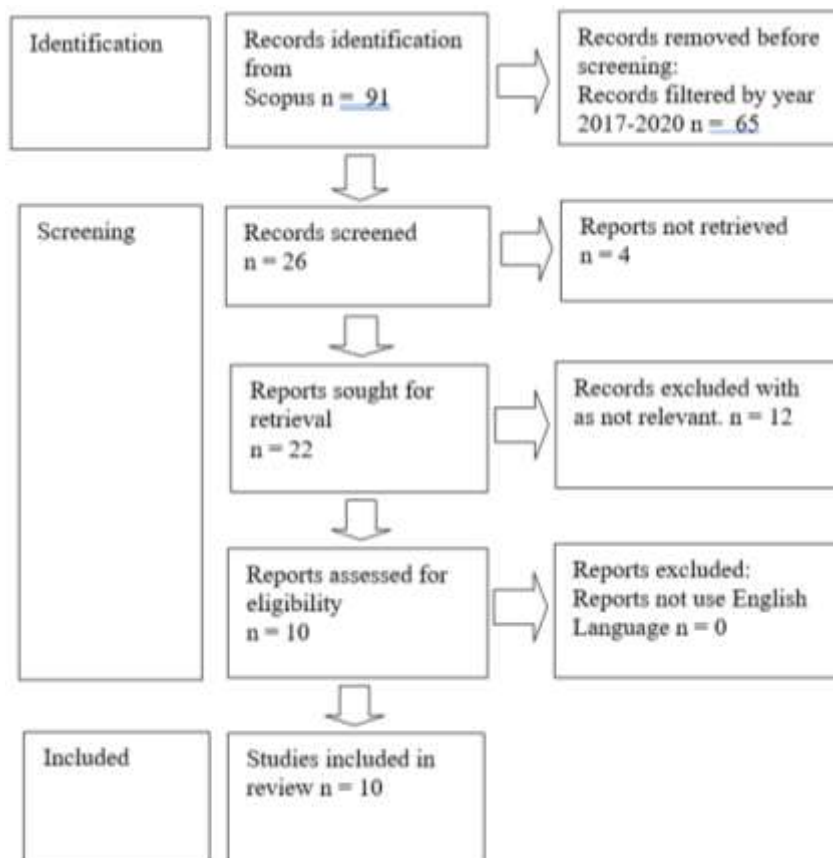

Figure – 1 Article Selection Results Based on the PRISMA Approach
(**Source:** Research Data, Dec 2022)

The data that has been found at this stage is evaluated based on the following questions:

1. RQ1: How many findings of blockchain technology items and clusters are in the archives on research keyword mapping from VOSviewer?

Based on the results of the search conducted, journals were selected and included in the evaluation found 49 items and 7 clusters related to Blockchain Technology in Archives.

Table 3. Mapping Keyword

| Cluster	Keyword	Item
1	archive data, decentralisation, electronic archives, electronic files, file management, human resource management, information management, network security, scalability, security	10
2	archives, blockchain, developing countries, digital libraries, digital technologies, information services, life cycle, peer to peer networks, records management	9
3	authentication, bitcoin, digital archives, internet of things, smart contract, tamper proof, third parties	7
4	decentralization, digital information, ethereum, ipfs, metadata, semantics, trust	7
5	artificial intelligence, big data, block-chain, blockchain technology, decentralised, students	6
6	archive management system, consortium blockchain, cryptography, digital storage, distribution ledger	5
7	access control, content integrity, digital documents, distributed ledger technology, web archive	5

(**Source:** Research Data, Dec 2022)
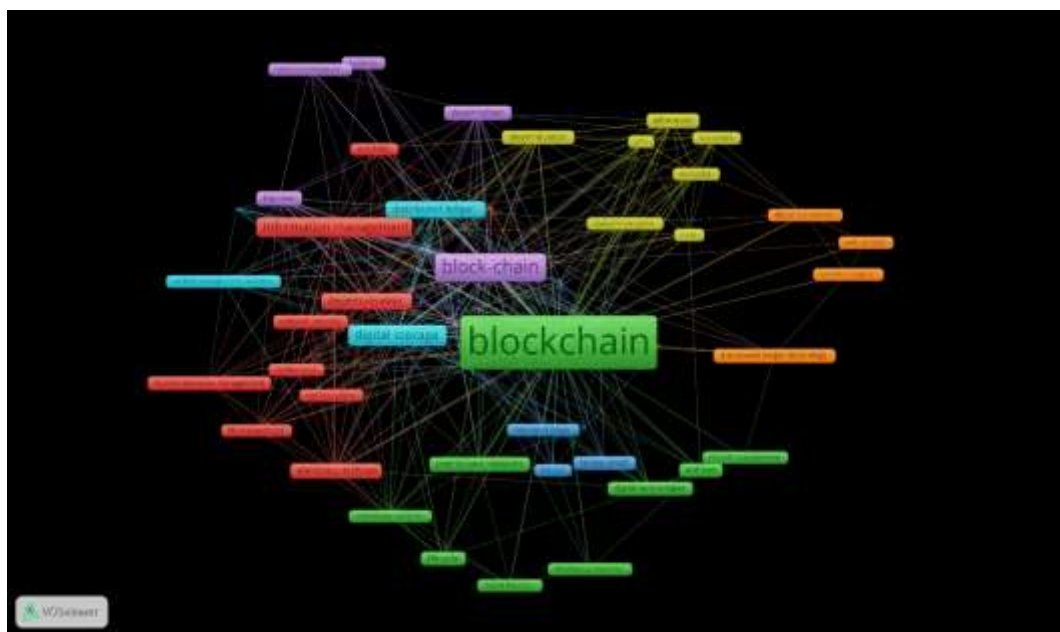
Figure – 2 Network Visualization
(**Source:** VOSviewer, Dec, 2022)

Figure 2 shows the network theme that has been researched regarding Blockchain Technology in Archives. It can be seen that the bigger the keywords, the more they learn, such as Blockchain, Block-chain, Digital storage, Information Management, Cryptography, Distributed ledger, Decentralization, Digital archives, Electronic archives. The smaller the keywords that appear, these themes still receive less attention from researchers, such as metadata, digital documents, archive management systems, blockchain consortiums and others.
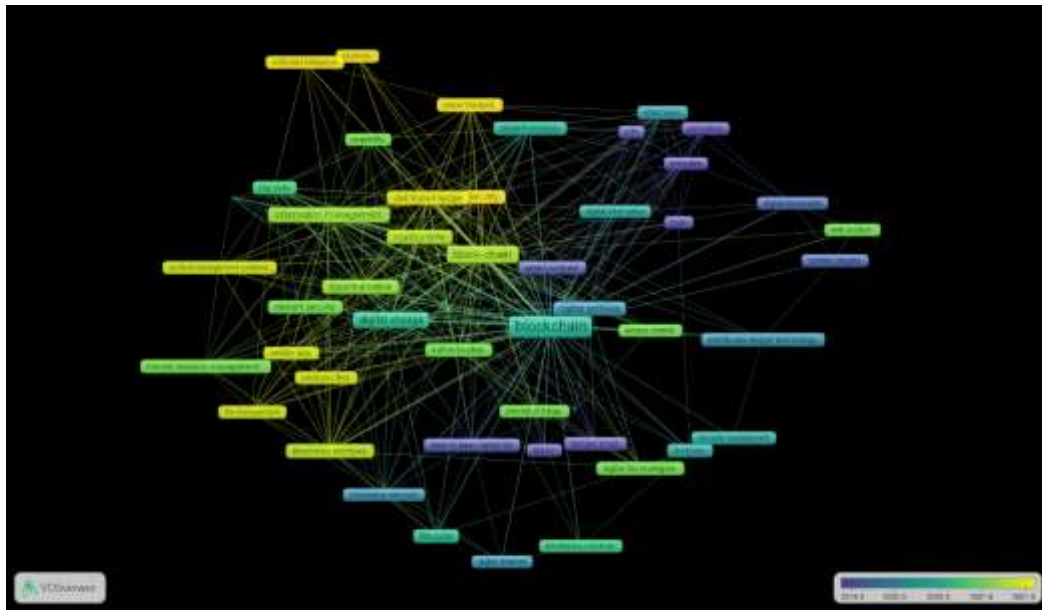
Figure – 3 Visualization Overlays
(**Source:** VOSviewer, Dec, 2022)

Based on Figure 3, you can see the colors in the image show what year these keywords were researched the most, such as in 2019-2020, are given a dark blue color to light blue with keywords such as metadata, semantics, digital documents, trust, ipfs, smart contracts, ethereum, digital archives, bitcoin, peer to peer networks, digital libraries, life cycles, smart contracts, digital information, and others. Then in 2020-2021 the light blue to green with keywords such as blockchain, digital storage, internet of things, big data, blockchain consortium, web archive, authentication, human resource management, and others. The year 2021 is colored green to yellow with the keywords blockchain, cryptography, distributed ledger security, artificial intelligence, decentralized, archive data, archive management systems, electronic files, electronic archives, and others
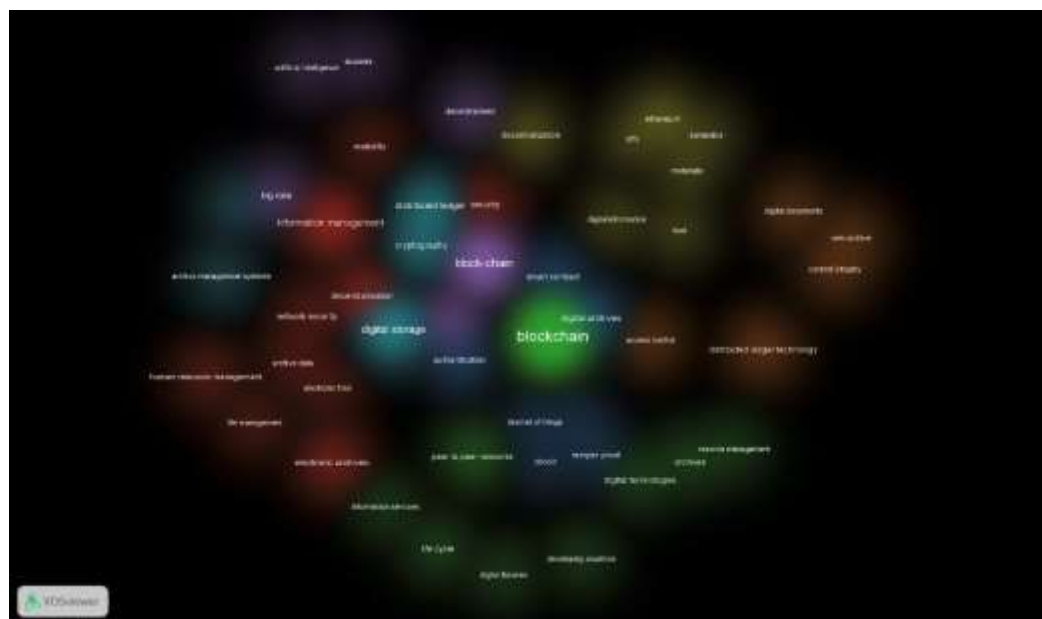

Figure – 4 Density Visualization
(**Source:** VOSviewer, Dec, 2022)

The keywords shown in Figure 4 explain that themes are far from being big circle themes are still under-researched, such as life cycles, digital technologies, big data, archive management systems, web archives, artificial intelligence, and others. Keywords or variables from the themes of the VOSviewer search results can be used as material for future research and also as research for future researchers.

2. RQ2: How is the development of research publications related to Blockchain Technology in Archives from Scopus search results?

The search results on the Scopus database show that the development of research on Blockchain Technology in Archives during the period 2017 - 2022 has changed, as shown in table 4 and figure 5.

Table 4. Number of research publication developments by year

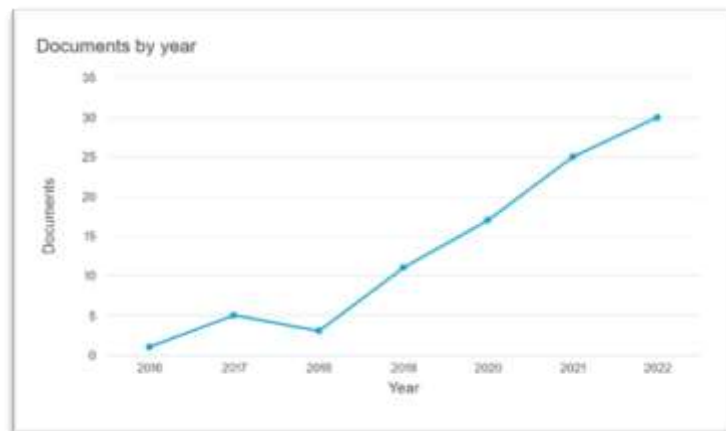| Year of Publication	Total
2022	30
2021	25
2020	17
2019	11
2018	3
2017	5
Total	91

(**Source:** scopus, Dec 2022)

Figure – 5 Graph of documents per year
(**Source:** scopus, Dec 2022)

2. RQ 3: How many studies have been done regarding blockchain technology in archives?

Code	Author	Title	Journal	Year
A1	Li, H., & Yin, J.	Optimization of University Archives Management under the Application of Blockchain Technology in the Digital Age.	Mobile Information Systems.	2022
A2	Wang, H., & Zhang, J.	Security Research in Personnel Electronic File Management Based on Blockchain Technology.	Security and Communication Networks, 2022.	2022

A3	Ngoepe, M., Jacobs, L., & Mojapelo, M.	Inclusion of digital records in the archives and records management curricula in a comprehensive open distance e-learning environment.	Information Development, 02666669221081 812.	2022
A4	Valeonti, F., Bikakis, A., Terras, M., Speed, C., Hudson-Smith, A., & Chalkias, K.	Crypto collectibles, museum funding and OpenGLAM: challenges, opportunities and the potential of Non-Fungible Tokens (NFTs).	Applied Sciences, 11(21), 9931.	2021
A5	Wang, H., & Yang, D.	Research and Development of Blockchain Recordkeeping at the National Archives of Korea.	Computers, 10(8), 90.	2021
A6	Hwang, H. C., Shon, J. G., & Park, J. S.	Design of an Enhanced Web Archiving System for Preserving Content Integrity with Blockchain.	Electronics, 9(8), 1255.	2020
A7	Chen, J., Lv, Z., & Song, H.	Design of personnel big data management system based on blockchain.	Future generation computer systems, 101, 1122-1129.	2019
A8	Bhatia, S., & Wright de Hernandez, A. D.	Blockchain is already here. What does that mean for records management and archives?	Journal of Archival Organization, 16(1), 75-84.	2019
A9	Bell, M., Green, A., Sheridan, J., Collomosse, J., Cooper, D., Bui, T., ... & Higgins, J.	<u>Underscoring archival authenticity with blockchain technology</u>	Insights, 32(1).	2019
A10	Findlay, C.	Participatory cultures, trust technologies and decentralisation: innovation opportunities for recordkeeping.	Archives and Manuscripts, 45(3), 176-190.	2017

CONCLUSION

Based on the results of research analysis on blockchain technology in archives, it can be concluded that the results of research developments and publications related to Blockchain Technology in Archives in recent years have increased from 2017 - 2022. Research searches using Scopus from articles relevant to research topics obtained as many as 10 articles Vosviewer showed 7 clusters and 49 items. The limitation of this research is that the time required is still relatively short from 2017-2022. Research topics on search results regarding Blockchain Technology in Archives still found to have not been widely researched this can provide opportunities for future researchers to study Blockchain Technology in Archives.

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