



**PERCEPTION, AWARENESS, AND READINESS TO OPTIMISE BLOCKCHAIN TECHNOLOGY FOR ARCHIVAL MANAGEMENT IN THE FOURTH INDUSTRIAL REVOLUTION BY NIGERIAN ARCHIVISTS**

**PERCEPCIÓN, CONCIENCIACIÓN Y DISPOSICIÓN DE LOS ARCHIVEROS NIGERIANOS PARA OPTIMIZAR LA TECNOLOGÍA BLOCKCHAIN EN LA GESTIÓN DE ARCHIVOS DURANTE LA CUARTA REVOLUCIÓN INDUSTRIAL**

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**Received:** 6 de marzo 2026

**Reviewed:** 18 junio de 2026

**Approved:** 27 de agosto de 2026

**How to cite:** Tella, A. (2026). Perception, awareness, and readiness to optimise blockchain technology for archival management in the fourth Industrial Revolution by nigerian archivists. *Bibliotecas. Anales de Investigación*;22(Especial), 1-14

**ABSTRACT**

**Objective.** Purpose: The study examined the perceptions, level of knowledge, and willingness of Nigerian archivists to optimize blockchain technology in records management within the context of the Fourth Industrial Revolution (4IR). **Design/Methodology/Approach:** Using a comprehensive sampling method (census), 15 archivists were selected from six archival institutions representing Nigeria's six geopolitical zones. Data were collected via an electronically administered open-ended survey. Responses were analyzed thematically to identify patterns regarding perceptions, knowledge, and willingness to adopt and optimize blockchain technology in records management. **Results/Discussion:** The findings indicate that Nigerian archivists generally hold a positive perception of blockchain technology and recognize its potential to improve records management when properly optimized. Some archivists viewed blockchain as having the capacity to transform archival practice by enhancing efficiency, reducing human error in repetitive tasks, strengthening records management processes, and boosting archival services, while also acknowledging potential workforce displacement. **Conclusions:** Although Nigerian archivists demonstrate knowledge and generally positive perceptions regarding blockchain technology, institutional and workforce concerns may influence their willingness to optimize it for records management. Therefore, successful implementation requires a balanced approach combining technological investment with adequate training, staff reskilling, institutional readiness, and measures to address concerns about job displacement. **Originality/Value:** The study provides qualitative empirical evidence on archivists'

perspectives regarding blockchain technology within the Nigerian archival context—an area that remains comparatively under-researched.

**KEYWORDS:** Blockchain technology; Perception; Awareness; Readiness; Archives; Archivists; Archival management; Nigeria.

## RESUMEN

**Objetivo:** El estudio examinó las percepciones, el nivel de conocimiento y la disposición de los archiveros nigerianos para optimizar la tecnología *blockchain* en la gestión de archivos, en el contexto de la Cuarta Revolución Industrial (4IR). **Diseño/Metodología/Enfoque:** Mediante un muestreo exhaustivo (censo), se seleccionó a 15 archiveros de seis instituciones archivísticas que representaban las seis zonas geopolíticas de Nigeria. Los datos se recopilaban a través de una encuesta de preguntas abiertas administrada electrónicamente a los participantes. Las respuestas se analizaron temáticamente para identificar patrones relacionados con la percepción, el conocimiento y la disposición para adoptar y optimizar la tecnología *blockchain* en la gestión de archivos. **Resultados/Discusión:** Los hallazgos indican que los archiveros nigerianos tienen, por lo general, una percepción positiva de la tecnología *blockchain* y reconocen su potencial para mejorar la gestión de archivos cuando se optimiza adecuadamente. Algunos archiveros consideraron que *blockchain* tiene la capacidad de transformar la práctica archivística al mejorar la eficiencia, reducir los errores humanos asociados a tareas repetitivas, fortalecer los procesos de gestión documental y potenciar los servicios de archivo, además de posibles desplazamientos de la fuerza laboral. **Conclusiones:** Aunque los archiveros nigerianos demuestran conocimiento y percepciones generalmente positivas sobre la tecnología *blockchain*, las preocupaciones institucionales y laborales pueden influir en su disposición para optimizarla en la gestión de archivos. Por tanto, una implementación exitosa requiere un enfoque equilibrado que combine la inversión tecnológica con la capacitación adecuada, la reconversión de competencias del personal, la preparación institucional y medidas para abordar las preocupaciones sobre el desplazamiento laboral. **Originalidad/Valor:** El estudio aporta evidencia empírica cualitativa sobre las perspectivas de los archiveros respecto a la tecnología *\*blockchain\** en el contexto archivístico nigeriano, un área que permanece comparativamente poco explorada.

**PALABRAS CLAVE:** Tecnología *blockchain*; Percepción; Conocimiento; Disposición; Archivos; Archiveros; Gestión de archivos; Nigeria.

## INTRODUCTION

Digital technology is fast advancing, having an impact not only on consumer habits and the digital society, but also on business operations and revolutionizing the processing, retention, and analysis of data supplied and received via the Internet. In recent years, blockchains and other distributed ledger technologies have attracted a lot of attention (Keller, 2018). Blockchain technology is one of the Fourth Industrial Revolution's disruptive technologies.

The act of gathering and archiving records and other things for future generations has a long and varied history. Today's archives are tasked with archiving today's documents so that future generations can better understand modern society. Government archives are the only ones tasked with preserving the official papers produced by the government's internal operations. Sensitive records that could jeopardize government operations if released immediately but would be beneficial for historical analysis in the future are securely preserved until a predefined period has passed, after which they are made available to the general public. Only archivists with the necessary authority can view the artefacts while they are being stored to verify that they are properly preserved.

Other archives, in addition to government official archives, contain archival resources that must be carefully managed and protected. As previously noted, Blockchain is a new technology that has been introduced to the management of these archival materials. Blockchain technology, together with its underlying applications, is a relatively new disruptive technology (Hiesboeck 2016; King 2016) that has piqued the interest of many people because of its "potential to revolutionize everything" (Tapscott 2016, p6). It's a "shared electronic database

with immutable and encrypted data records" (Begley, 2018). It's a "distributed ledger that allows a group of people to record and exchange information" (Deloitte 2016, p.81). Blockchain, according to Tapscott (2016, p6), is "incorruptible" and can be "designed to record not just financial transactions but almost everything of value." It's an 'online database that's regarded as secure, private, and largely hackproof (Gharib, 2017).

Blockchain and other distributed ledger technologies (DLT) use cryptography and distributed networks to create a new type of record-keeping system that is tamper-resistant and immutable. These features made blockchains attractive as a general-purpose technology for use in recordkeeping in a range of industries and industry domains a few years ago and led to experimentation in its application by archives and other organizations for the safekeeping and preservation of documents. Some cultural heritage organizations have just recently begun to generate Non-Fungible Tokens (NFTS), cryptographic digital assets that can be traded across blockchain networks, as new marketing tools, while others have already begun to include these new crypto-assets in their collections.

As Lo-Ducca (2020) pointed out, blockchain technology's initial focus was on cryptocurrencies (i.e., Bitcoin), but it is now shifting to finance and business in general, and it is being gradually extended for a variety of applications in healthcare, government, the Internet of Things, entity and asset management, and archival management, such as Cultural Heritage. A blockchain could be a useful method for storing, protecting, and preserving data regarding tangible heritage throughout time, especially minor tangible heritage, such as aesthetically relevant artworks that aren't as well-known as masterpieces. For example, in the event of a disaster (natural or man-made), the fact that the blockchain is a duplicated registry can be used to retrieve information that would otherwise be lost forever in other circumstances. Furthermore, because information recorded on the blockchain cannot be wiped or tampered with, if the genuine artwork is stolen, related data will remain accessible and can be used to identify the piece if it is attempted to be sold, as well as to detect counterfeits (Lo-Ducca, 2020). As a result, storing digital archives of artworks on the blockchain is a viable field of application.

According to the literature and the preceding description, Blockchain is presently a good technology for archival administration. Blockchain technology was developed from encrypted digital currency, and its development and application are not confined to the financial sphere but can be utilized in a variety of fields including culture and entertainment, social welfare, and data protection (Dong, 2017). Unfortunately, in underdeveloped nations such as Africa, and particularly in Nigeria, archivists' perception and awareness of this phenomenon are low. In addition, in this period of the fourth industrial revolution, the readiness of archivists and archival institutions to optimize Blockchain technology for archival administration has not been documented in the literature, particularly in the context of Records and Archives Management research in Nigeria. The majority of relevant studies have focused on the relevance of Blockchain to records management and record keeping, and the majority of these studies have been concentrated in advanced countries such as Europe and America. As a result, the researchers believe it is critical to perform a study on Blockchain and archival administration from an African perspective. Thus, it is hoped, that the study would make data available from the African context on the use of Blockchain for the archival management of public records. On this point, this study looked into the perceptions, awareness, and readiness of Nigerian archivists to use blockchain technology for archival management in the Fourth Industrial Revolution.

The broad objective of this study was to examine Nigerian Archivists' perception, awareness, and readiness to optimise blockchain technology for archival management in the Fourth Industrial Revolution. The specific objectives of the study were to:

1. Examine the perception of Nigerian archivists on the use of Blockchain for archival management.
2. Determine the awareness of Nigerian archivists on the use of Blockchain for archival management.
3. Determine the readiness of Nigerian archivists on the use of Blockchain for archival management.
4. Identify the challenges envisaged by Nigerian archivists on the use of Blockchain for archival management.

## **METHODOLOGY**

## **Blockchain and Archival Management**

A blockchain is a type of Distributed Ledger that is implemented in a certain way (DL). A distributed ledger (DL) is essentially a database that is shared among network nodes. In practice, all nodes in the network share the same database copy, and every update performed on one node is replicated to all other nodes in a matter of minutes, if not seconds.

Managing digital papers and data boosts productivity and efficiency in the workplace. Version tracking, tracing steps (where/when the document was/is) in the business process, verification of modifications, document structure and contents, and simplified and trusted document interchange are the most often utilized functions of document management (Stancic2018). Several areas of document management operations could benefit from the use of blockchain. When a new document version is developed, for example, it might be registered on the blockchain. Because each new block in the blockchain is time-stamped, it becomes evident which document version was created and when, as well as the changes made, and the structure and contents of the document can be tracked back and validated if necessary. Furthermore, documents are frequently sent to third parties in the course of business. The ability to register a document on the blockchain could give the essential confirmation that it has not been tampered with. Documents, on the other hand, are frequently digitally signed or sealed. They should not be changed once they become records, and their validity, integrity, dependability, and usability should be preserved during records management and archiving, with some retaining non-repudiation, security, and confidentiality qualities.

The basic ideas can be studied to properly comprehend how blockchain and distributed ledger technologies are applied in the context of records management (Stancic, 2018). A blockchain is a decentralized database of (transaction) records that stores documents, information, transactions, and data hash values. It is linked to the distributed ledger technology concept (DLT). The name is made up of two words: "block," which refers to the entire collection of contents, and "chain," which refers to how the blocks are connected (Stancic, 2018). This chain grows linearly, and mining is the process of encrypting a new block in the context of cryptocurrencies. A peer-to-peer network is used to build a blockchain, in which each connected computer (node) maintains data on all transactions (a blockchain does not store data but only its hash values). It's interesting to learn that records management experts and professional bodies are gradually becoming interested in blockchain, according to a report by Pelz-Sharpe, Begley, and Bushell (2018), and that there is an increased discussion focusing on records and information management (RIM) using blockchain.

Decentralized transaction record keeping, functioning with peer-to-peer networks, tamper resistance, and consensus or trust-based transactions are among the fundamental properties of blockchain/distributed ledger outlined by Bhatia, Douglas, and Most (2019). Although blockchains are similar to databases, they are not utilized for storing ordinary data. Instead, they're utilized to keep track of transaction data. Blockchain can sometimes offer proof of transaction legality or contain the transactions themselves. A blockchain is made up of fundamental components. It's a list of transactions that have been recorded; the chain is made up of transactions that have been recorded with a hash that form chains or links, preceding blocks with fresh blocks. A hash is an algorithm that accepts a variable string of data and generates a fixed length value, according to (the National Archives and Records Administration, 2019). The network is made up of nodes, each of which stores all of the transactions in the ledger.

### **Benefits of Blockchain in Archival Management**

Blockchain, according to Bean (2019), is a strong technology that allows a third party to securely deliver a document from a repository and then verify that the document was not intercepted or modified throughout the process. Typically, information is securely encrypted, and for it to pass through any third party, it must ensure that everyone involved in the chain is included in the trail, which includes a ledger that shows who touched the document and what was added to it during the process. The technique is used to verify the authenticity of the document and its contents.

Bean (2019) goes on to say that one of blockchain's strongest features is its ability to promote smart contracts, which allow certain digital processes to take place when certain conditions are met and are used in

manufacturing and supply chain management to automate the movement of materials based on predetermined conditions. The following is a real-life example of records management (FedEx or UP). Smart contracts are used by the corporation to deny the acceptance of supplies from shippers who have failed to verify that their product meets particular criteria or regulations.

Anonymity is another advantage or benefit of blockchain that is worth mentioning. Parties in a blockchain can engage in trusted exchanges without revealing their identities, according to Iron Mountain (2020). The distributed structure also has the benefit of allowing two or more users to build a blockchain without having to register with a central authority. Private blockchains can be built with a variety of specific security definitions that limit what the chain's members can do. The guiding rules are usually decided by the blockchain's members. It's important to highlight, according to Iron Mountain (2020), that blockchain isn't just for documents. It can be used with any type of digital material, including photos, email backups, and video files. Without a doubt, blockchain is gaining traction in the intellectual property industry. It can be used by professional photographers to manage license rights and royalty payments.

In electronic archiving, the following benefits of Blockchain are noticeable (EDICOM, 2018):

- Integrity: When a transaction is created or information is shared, no stakeholder or administrator can change it.
- Security: Each block has a signature with an electronic time stamp, allowing the validity of the data to be checked. The concatenation of hashes is used to verify the security of the infrastructure and the information.
- Traceability and transparency: Every action on the blockchain will be recorded. Operations cannot be changed or abolished.
- Confidentiality: When evidence is registered in a private network, there is more control over the generation and archiving of evidence.

## RESULTS

The utility of a unified resource locator (URL) on the World Wide Web is dependent on the resource being hosted at the same URL in perpetuity, according to De Villiers and Calitz (2020). When URLs are changed or withdrawn, the resource becomes inaccessible, such as an image or document. While web archiving programs aim to avert such a loss of online data, comprehensive web backups remain a tough problem. This article describes the beginning construction and testing of a decentralized application (DApp), tentatively dubbed Repudiation Chain, as a potential solution to overcome the issues posed by changing URLs and shaky web archiving. The repudiation Chain aims to employ a blockchain smart contract method to allow individual users to reject transactions. By constructing a compact, non-reversible representation of the file at the time of its non-repudiation, Repudiation Chain tries to provide unalterable proof that a specific file and its URL existed at a given point in time. If broadly adopted, a solution like this might help decentralize and democratize web archiving.

Both analogue and digital archives, according to Stancic and Bralić (2021), are primarily concerned with preserving records as originals. As a result, immutable data, such as that found in a blockchain data structure, appears to be a reasonable choice when developing such systems. At the same time, archives keep records that may need to be updated in the future. The ability to update records' metadata is a requirement of archival preservation, not only to ensure authenticity after digital preservation actions but also to ensure that relationships to other records, which may be created after an original record has entered the archive (and been registered in a blockchain), can be maintained. A great example of this requirement is the necessity to preserve an archival bond, which is a network of relationships between aggregations of records, i.e., the relationship connecting prior and subsequent records belonging to the same activity. As a result, the authors proposed a supporting database system for realizing the archival bond in the context of a blockchain-based archival system, which allows metadata to be changed as needed while also significantly simplifying searching compared to searching on-chain information while maintaining the immutability of the blockchain.

Lo Duca, Bacciu, and Marchetti (2020) described a theoretical study in which two very different blockchains, Ethereum and Hyperledger, were compared to determine which is better for maintaining a tangible legacy in

digital archives. Following a brief overview of both technologies, a generic application scenario was detailed to determine which of the two technologies best satisfies the scenario's needs. As a result, the comparison of the two blockchains was based on general issues, architectural requirements, and numerous considerations. As a result of the comparison, Hyperledger Fabric was found to be more appropriate in the context of digital archives.

Galiev, Ishmukhametov, and Latypov (2019) suggested ARCHAIN, an unique archival system designed for the Republic of Tatarstan's State Archive-Keeping Committee (Russia). The blockchain is the central component of the system, and it is responsible for storing transactions (facts about document transfers to the archive) securely. Due to the customer's requirement for the presence of a trusted center, the built system uses a permission blockchain approach. In a research on the administration of intangible cultural heritage archives, Lvping (2021) states that archives are an important aspect of intangible cultural heritage protection. Regular archive management approaches cannot be fully applied to the management of intangible heritage archives since they differ from traditional official archives. (This study combines the characteristics of blockchain technology with distributed ledgers, consensus mechanisms, encryption algorithms, and other factors to propose blockchain-based intangible cultural heritage file management for complex, widely dispersed, large-volume, and low-quality intangible cultural heritage files.) Method optimization, the use of blockchain technology to protect the authenticity of electronic archives, and the design and development of an archive management system based on blockchain technology all aid in the resolution of several issues that arise during the management of intangible cultural heritage archives.

Ku-Mahamud et al. (2019) determined awareness, Trust, and Adoption of Blockchain Technology and Cryptocurrency among Blockchain Communities in Malaysia. Through descriptive statistics used in analyzing the data in the third phase, the results demonstrated that the awareness level of blockchain technology and cryptocurrency is at the intermediate level. Balasubramanian et al (2021) reported a readiness assessment framework for Blockchain adoption in a healthcare case study. The findings show the multifaceted significance of government readiness in driving blockchain initiatives. Mamaghani et al., (2022) provided a framework within which organizations can evaluate their readiness to implement Blockchain technology. For this purpose, after a library study and systematic literature review, this study provided the initial research framework using the meta-synthesis method. According to the results of the analysis, Blockchain-based business strategy, culture, and Blockchain-based product traceability showed a medium level of readiness.

Balasubramanian et al (2021) identified challenges confronting blockchain adoption as a lack of clarity on blockchain regulations and laws, and issues about privacy and trust are found to affect the readiness of all stakeholders. Deloitte (2016) added that the principal challenge associated with blockchain is a lack of awareness of the technology, especially in sectors other than banking, and a widespread lack of understanding of how it works. Rana et al. (2022) also reported a lack of standards and lack of validation which form the foundation of the hierarchical structure of blockchain adoption as the bottom level of challenges of blockchain adoption.

For archivists and records managers, Bhatia and Hernandez (2019) offered a quick review of blockchain or distributed ledger technology. The findings revealed that blockchain for archival management is currently at the infant stage, although it has already been used in creating and managing records. As a result, archivists and records managers must learn the fundamentals of blockchain technology, as well as its benefits and drawbacks, to make educated decisions about the adoption of blockchain systems and/or their usage in managing record authenticity. Woodal and Ringel (2019) looked into the subsequent mediation between blockchain businesses and the new professional communities to whom they cater. The authors examined how this process is carried out through the discursive building of trust, which is leveraged rhetorically in academic, trade, and news publications to extend an application for financial transactions to cultural organizations, using thematic analysis. The study demonstrates how trust is used not only to mediate the introduction of an application that prioritizes decentralization and cryptography but also to stake a claim as the trustworthy manager of digital records through the usage of blockchain by traditional institutions. The archival imaginary, a picture of what archives and blockchain should be and signify based on projected needs and technological capabilities based on existing information ecology, institutional control, and expert systems, is one way to elucidate this process.

It is noted from the above that most of the studies focused on the use and adoption of blockchain in the corporate industries and not the libraries. Similarly, none of the studies seems to focus on archivists and records managers. This implies studies that focus on the use or adoption of blockchain technology among Nigerian archivists are rather limited or not available.

## METHODOLOGY

The research was conducted entirely qualitatively. All archivists working at the Nigerian Archives are included in the population. The research used a completely qualitative approach. The qualitative method relies on an open-ended questionnaire to collect data. Qualitative approaches typically allow for more in-depth probing and questioning of respondents based on their responses, in which the respondents and/or researcher attempt to understand their motivations and feelings. Understanding how the study's respondents (librarians) viewed big data, the potential it presents, and the obstacles it poses in public libraries will aid in the study's conclusion. The qualitative technique was chosen because it is expected to disclose librarians' perceptions and awareness of the study's subject matter, which focuses on the benefits and limitations of big data applications in libraries. Similarly, the method was chosen because the results are usually more descriptive, allowing the researcher to draw inferences from the data collected from the respondents. Furthermore, the qualitative method is cost-effective, particularly when self-administered.

**Design:** The study adopted a survey. Through the use of a survey, the researcher was able to survey all the respondents available at the time of the study in the six different archives located across the Nigerian six geopolitical zones.

### Population and Sample:

Through total enumeration, 15 archivists available at the time of the study in the six different archives located in Nigeria's six geopolitical zones represent the study's sample.

**Instrument:** Data for the study was collected through an open-ended survey that was mailed to respondents. This was with the view to avoiding physical contact and maintaining social distance from COVID-19 protocols. An open-ended survey that featured pre-informed questions relating to the four objectives of the study was developed. The survey featured instructions on how to respond to it and defined the concept of blockchain for the respondents to have a good understanding of what it is. The items in the open-ended survey are those that are relevant in capturing data on the four variables focused on the objectives of the study. The researcher was able to collect relevant data on blockchain awareness and perception in the management of libraries and archives in Nigeria by using an open-ended questionnaire in this study. Even though there are many other types of qualitative procedures (Creswell & Poth, 2018), the open-ended questionnaire was chosen since it is one of the most prevalent qualitative research methods and because it is the most practical method during this epidemic moment of social separation.

**The Procedure of Administration:** The researcher was supposed to conduct the interviews first. This was not possible due to the COVID-19 lockdown, which prevented the researcher from visiting each of the participating libraries to conduct the interview. Instead, a different arrangement was established with each of the participants in each of the archives, which resulted in the creation of an open-ended questionnaire (survey) that was emailed to the appropriate responders. Respondents were instructed to complete the survey and return it to the researcher as soon as feasible. The fifteen copies of the survey that were mailed to the respondents were all filled out and ready for analysis.

**Ethical Considerations:** Informed consent of the respondents was sought and each of them delightedly expressed their intention and willingness to take part in the study. Similarly, they were allowed to withdraw their participation provided they thought their involvement might prove otherwise.

## RESULTS AND DISCUSSION

## **Perception of Nigerian archivists on the use of Blockchain for archival management**

The objective was to examine the perception of Nigerian archivists on the use of Blockchain for archival management. To achieve this objective, respondents were asked to express their perception of the use of blockchain for archival management.

The majority of the respondents 11 out of 15 representing 73.3% shared a similar view by explaining that blockchain is a sophisticated technology very good and useful for the management of archives and records. Their explanation reflects the fact that the technology does not require trust, and it has strong anti-calculation modification which uses a variety of computer technologies such as cryptography, probability theory, consensus mechanisms, and distributed networks. Specifically, four of the respondents put up their unique explanation which goes thus:

*"Blockchain gives options for archival practice that are similar to those for records management." In the field of provenance tracking, blockchain provides a way to verify material ownership over time by recording and timestamped each transfer."*

Another respondent in his explanation has this to say:

*"Blockchain technology is thought to help archives store information in a dispersed fashion by acquiring, maintaining, and distributing authoritative information, as well as helping archivists in producing a unique verifiable record that can be accessed by everyone in the archives."*

Another respondent with a unique response explained that:

*"A blockchain could be a viable option in archives for storing, protecting, and preserving data about tangible heritage throughout time, especially minor tangible heritage, such as aesthetically relevant artworks that aren't as well-known as masterpieces." An excellent example is in the event of a disaster, whether natural or caused by humans because blockchain is a replicated registry, it may be used to retrieve information that would otherwise be lost forever in other scenarios."*

Similarly, another respondent added:

*"Archives keep records that may need to be updated in the future." The ability to update records' metadata is a requirement of archival preservation, not only to ensure authenticity after digital preservation actions but also to ensure that relationships to other records, which may be created after an original record has entered the archive (and been registered in a blockchain), can be maintained."*

Arising from the various responses, it can be summarised that respondents perceived Blockchain to be a formidable technology, capable of provenance tracking, and assisting in gathering, preserving, and sharing authoritative information. Also, the technology supports the creation of unique verifiable records which anyone can access, and it protects and preserves data about tangible heritage. This finding is in agreement with the previous findings from the literature. Stancic and Brali'c (2021) reported the potential of blockchain to include the ability to update records' metadata as a requirement of archival preservation, which is not just to ensure authenticity after digital preservation actions but also to ensure that relationships to other records, which may be created after an original record has entered the archive where it can be maintained.

## **Awareness of Nigerian archivists on the use of Blockchain for archival management**

The objective was to determine the awareness of Nigerian archivists on the use of Blockchain for archival management. To achieve the objective, respondents were asked to indicate whether they are aware that Blockchain is now being used for archival management.

Generally, the results from the respondents indicate that they are aware because they have read, heard and seen on YouTube and documentaries about how Blockchain is now being applied to manage archives and

archival materials. All the fifteen respondents except one were of the view that they are aware of the technology. There are some specific responses to support this general finding. For instance, here are some direct comments from the respondents:

*"Yes, I've heard about it, so it's not something new to me." I've read about it in the literature, and libraries in advanced countries throughout the world are utilizing technology to promote record management in particular. And since it can manage records, I don't see much else it can't manage in terms of archive activities."*

*"Several essays have been written on the subject. There are examples of how technology is being used to maintain archives in the literature, papers, and videos. So, as far as I'm concerned, I'm simply waiting for the day when my archive decides to embrace it."*

*"In our day, nothing is hidden." I've been keeping track of the current developments, particularly the disruptive technologies that emerged with 4IR and how they've made their way into libraries. One of them is blockchain. It's just as important in the library for organizing information as it is in archives and museums. As a result, I am aware of its capabilities in terms of managing archival materials."*

*"I am partially aware, but the truth is that I have not seen how it functions." Knowing about technology and being aware of its existence is one thing; seeing it in action and understanding how it works is quite another."*

*"I have heard about it many times and I think If our archives can subscribe to it, it will change our mode of operations".*

The responses above in part buttress the general finding on the awareness that the majority of the respondents are aware of the technology and its potential in the management of archives. The results of this study have shown that blockchain is formidable technology relevant to promoting records and archives management. Not that the majority of archivists in this study are aware of its use and its potential. However, the finding in this study on awareness contradicts the findings reported by Ku-Mahamud et al. (2019) whose results demonstrated that the awareness level of blockchain technology is at the intermediate level. The variation might not be surprising because the context of the two studies differs. The current study was conducted in Nigeria among the archivists while the Ku-Mahamud et al were conducted among the blockchain communities in Malaysia. The variation in the respondents of the study, archivist cum blockchain communities might be another reason for the differences in the results of the two studies.

### **Readiness of Nigerian archivists on the use of Blockchain for archival management**

The objective was to determine the readiness of Nigerian archives and archivists for the use of Blockchain for archival management. To achieve this objective, respondents were asked to indicate their readiness and the readiness of their archives to use deploy Blockchain for archival management.

Generally, the results reveal that majority of the respondents were of the view that their archives are not ready because the deployment of the technology requires that there must have been some technology already available which will make the uptake and deployment of Blockchain a hitch-free one in archives.

Some of the specific responses that provide details about the general results and views of the respondents above are provided as follows:

*"In terms of readiness, allow me to state that there is limited infrastructure available to drive the adoption and deployment of Blockchain in Nigerian archives." If a technology is to be used and deployed for managing archival activities, it must be available and accessible. Unfortunately, the technology isn't available right*

*now. Although it is true technology, no archives or other information-related organizations in Nigeria, including libraries, have ever employed it."*

*"I don't think any archives in Nigeria will be ready to embrace Blockchain in the next five years." This is because there are now no signs of it. No associated technology has been implemented, our network is unstable, and our bandwidth is slow, all of which are necessary for the effective completion of the project.*

*"Let me say that the situation is 50/50 in terms of archivists' willingness to use technology. This means that half of the population is prepared, while the other half is not. This indicates that the outcome is mixed. Their unpreparedness stems from the fact that they possess the necessary skills and expertise to operate the Blockchain if it is eventually implemented in our archives."*

*"Let me also react from the point of view of an archivist. We are still not ready. The infrastructure required to make it work is temporarily unavailable. And we (archivists), who will be the first users when it is deployed, are mostly unaware of the technology and lack the necessary abilities."*

The findings suggest that none of Nigeria's archives or archivists is prepared to use Blockchain technology for archival administration. This is due to the lack of facilities to facilitate the adoption of technology in archives, as well as the fact that only a small percentage of archivists can utilize it. Currently, 50% of archivists have the skills to use the technology, while 50% do not. The studies also found that Nigerian archivists had varied emotions about blockchain technology's suitability to be integrated into archival administration. While some archivists feel that implementing blockchain technology in archival management can advance the archives by decreasing human errors caused by repetitive archival chores, others worry that if prudence is not exercised, blockchain will result in the loss of some archivists' jobs. The finding here is in consonant with the reports from earlier studies. For instance, Balasubramanian et al (2021) reported a readiness assessment framework for Blockchain adoption in a healthcare case study. The study reported the multifaceted significance of government readiness in driving blockchain initiatives. The finding also lends support to Lustenberg, Malesevic and Spychiger (2021) who reported that readiness is the most important factor for the adoption of blockchain. However,

The results of the analysis on blockchain-based business strategy, culture, and blockchain-based product traceability by Mamaghani et al. (2022) which showed a medium level of readiness contradict the current finding in this study where archivists demonstrate their 50 per cent readiness to use and optimise blockchain technology for archival practices

### **Challenges envisaged by Nigerian archivists on the use of Blockchain for archival management**

The objective was to identify the challenges envisaged by Nigerian archivists in the use of Blockchain for archival management. To achieve the objective, respondents were asked to identify the challenges they think might hinder the use of Blockchain for archival management in Nigerian archives.

According to the respondents' perspectives, there are numerous challenges. In general, poor finance, insufficient specialists and training staff who will be in charge of system maintenance, inconsistent power supply, and a limited budget from which the technology may be obtained are among the problems that Nigerian archivists may face in adopting blockchain technology. These issues arose as a result of the interviewees' unique responses to the questions. The following are a few of them:

*"While blockchain technology has many advantages, it nevertheless has issues such as inefficient access and excessive economic costs. Although blockchain cannot replace existing database technology, it is frequently utilized as a technical complement in conjunction with other technologies. In summary, current intangible*

*cultural heritage management systems suffer from issues such as insufficient protection, easy calculation modifications, and destruction."*

*"I see our archives and archivists as posing a significant challenge." Nigerian archives aren't ready since the infrastructure to support their use and acceptance isn't in place. Because they lack the necessary skills and knowledge to run the technology if it is ever deployed, archivists are not also assisting matters. These are the two key issues that are unique to us."*

*"There are numerous challenges...but I'll stick to the one I'm familiar with." In Nigeria, technology adoption and utilization cannot occur without the presence of power. However, this electricity is unavailable, and I am unable to access the Nigerian archives to make enough provisions for alternative power-generating equipment due to a lack of funds. The Internet, or network, is necessary for the operation of the chain; yet, the internet and network are part of our difficulties. The bandwidth isn't great, and some archivists have a bad attitude that needs to be addressed."*

*"There's no denying that the technology is cutting-edge. However, we must not be blind to issues such as funding. The annual budget for archives is so little that funding the adoption of Blockchain technology from it may not be possible"*

From the above, it is clear that there are challenges associated with the use of Blockchain for archival management. The ones identified are the lack of readiness of archives and archivists because they lack the requisite skills and knowledge, inadequate power supply and funding, poor internet and slow bandwidth, insufficient experts and training personnel as well low budget allocation to archives. The challenges reported in this study are similar to those reported earlier in the literature. For instance, a lack of clarity on blockchain regulations and laws, and issues about privacy and trust are found to affect the readiness of all stakeholders reported by (Balasubramanian et al (2021), and a lack of awareness of the technology, especially in sectors other than banking, and a widespread lack of understanding of how it works reported by (Deloitte, 2016) and also a lack of standards and lack of validation which form the foundation of the hierarchical structure of blockchain adoption as the bottom level of challenges of blockchain adoption reported by (Rana et al., 2022) all lends credence to the current finding on challenges in this study.

## **CONCLUSION**

Blockchain was viewed as a formidable technology capable of provenance monitoring, gathering, conserving, and distributing authoritative information; enabling the construction of a unique verifiable record that everyone can access; and safeguarding data concerning tangible heritage. The vast majority of respondents are aware of the technology and its applications in archive management. Neither the Nigerian archives nor the archivists are prepared to use Blockchain technology for archival administration. This is due to the lack of facilities to facilitate the adoption of technology in archives, as well as the fact that only a small percentage of archivists can utilize it. Currently, 50% of archivists have the skills to use the technology, while 50% do not. This indicates that the outcome is mixed. Lack of preparation of archives and archivists due to a lack of required skills, and expertise, insufficient power and money, bad internet and slow bandwidth, and limited budget allocation to archives are the challenges noted with the use of Blockchain for archival management.

## **RECOMMENDATIONS**

Adequate funding should be provided for Nigerian archives to procure and optimise the opportunities provided by blockchain technology. It also recommends that infrastructure that will support the optimal use of blockchain technology for archival management must be provided, as well as the recruitment of ICT staff with relevant requisite skills to handle the technology.

Archivists and records managers must understand blockchain because it will almost certainly be used in the future. Official records are already required to be kept on it by government agencies. Businesses and educational institutions are starting to catch up. Learning about the technology and how it is now being

utilized can help one prepare for the eventual addition of content linked to or keep on the blockchain, as well as the possible addition of a whole blockchain system.

## LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

There can never be a perfect study because flaws and restrictions will always be present. This research is not an exception. The use of self-reported instruments for data collection and the small sample size are two notable shortcomings. Therefore, rather than the small number of archivists (15) included in the current study, future researchers should think about expanding the scope of the study to include more archivists from other archives across Nigeria. In similar future investigations, data collection methods like questionnaires and document analysis may also be taken into consideration.

## RESEARCH IMPLICATIONS

This study is one of the few that have focused on blockchain and its use and efforts to optimise it by archivists to facilitate archival management in Nigeria and Africa as a whole. As a result, the methodology for assessing archivists' optimization of blockchain technology in Nigerian archives is a valuable addition to the body of knowledge in this field. Similar to this, there are few studies focused on the aim of Nigeria and all of Africa to adopt blockchain for records and archival management. Consequently, information on the use of blockchain technology from the study's sample of archivists in archives in Nigeria is now available.

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