Will Blockchain Technology Change How Well National Archives Preserve the Trustworthiness of Digital Records?: Preliminary Results of a Survey

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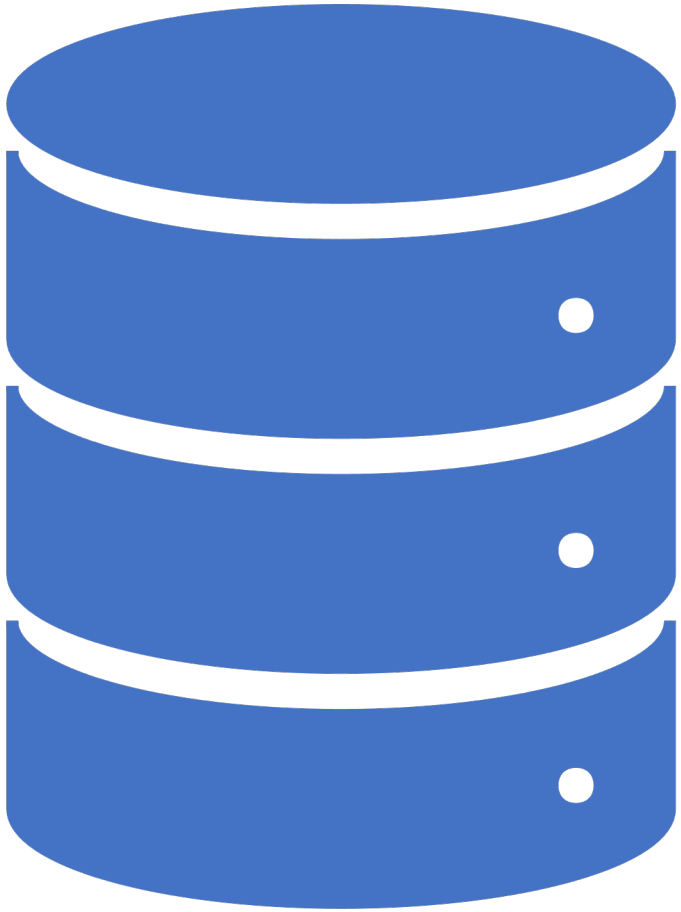
Introduction

- We examine the viewpoint of national archives on blockchain and distributed ledger technologies;
- discover their activities in relation to the application of these technologies;
- and analyse their thoughts on how these technologies can play a role in the preservation of records' trustworthiness.
- The survey was sent to the 194 national archives listed in the Directory of National Archives. We received 18 responses.



Blockchain Technology from Archival Science

- Blockchain represents a specific manifestation of distributed ledger technology (DLT). DLT facilitates the sharing of transactional records among multiple parties within a decentralised network. These transactions are sequentially recorded in ledgers with the mutual consent of the involved parties.

- There is no central authority governing the records, and all participants (nodes) possess identical copies of the records.

- In a blockchain system, records are stored in blocks that possess a specific data capacity. As these blocks reach their maximum and are completed, they are subsequently added in sequential order, akin to links in a chain, thereby forming blockchains.

- Each block contains timestamped information, including the date and time of its creation, facilitating the establishment of a chronological sequence, and recorded with a cryptographic signature.

Trustworthiness of Digital Records

- Trustworthiness encompasses preserving the attributes such as the medium, content, author, and context of records. To assess the trustworthiness authenticity, accuracy and reliability are crucial.

- Authenticity, defined as preserving the attributes of the record without any changes during its processing, filing, and archiving after production, is examined through identity and integrity.

- Identity pertains to the qualification of characteristic elements that distinguish the record from others and align with its specific type. Examples of these elements include persons involved in the record, date of creation and transmission, subject, archival bond, file code, and appendix.

- Another facet of authenticity is integrity, which ensures that the record remains intact and unaltered, encompassing all its components. The goal is to preserve the context, form features, and content of the record in its entirety.

Trustworthiness of Digital Records

- In addition to authenticity, accuracy is another essential element of trustworthiness. An accurate record strives to be precise, correct, consistent, and free from falsification.
- Reliability, another crucial element, is assessed based on the completeness of the record form through controls implemented in the record production procedures.
- These controls include the production and receipt of the record, its placement in the appropriate folder, and the authorization of the person in the record.
- The completeness of the record form ensures that all intellectual elements are present, rendering the record suitable for legal consequences.

Blockchain and Trustworthiness of Digital Records

- No single technology is capable of preserving the trustworthiness of records. To ensure that the adopted technologies have a positive impact on trustworthiness, they should be incorporated into institutional procedures from the perspective of archival science.

- Blockchain technology offers several advantages in effectively maintaining the authenticity, reliability, and accuracy of records. The authenticity of a record is demonstrated through the preservation of its integrity and identity information. Identification can be accomplished by characterizing the author of the record and establishing the archival bond.

- Integrity, on the other hand, can be defined as maintaining the completeness of the record even after it is created. In blockchains, once the author of the record signs with a private key, that signature cannot be denied.

- Current blockchain applications incorporate public key infrastructure. Another method for preserving trustworthiness is semantic tags.

Blockchain and Trustworthiness of Digital Records

- Semantic tags are used in blockchain applications to establish an archival bond. By employing semantic tagging, a relationship is established between records that pertain to the same transaction but are located in different blocks. In this way, the archival bond is preserved by linking the records to the respective transaction to which they belong.

- Preserving the integrity of records is regarded as a prominent advantage of blockchain technology. The real-time creation of blocks, verification of the transactions cryptographically, and the distributed architecture offer substantial benefits in maintaining unaltered records.

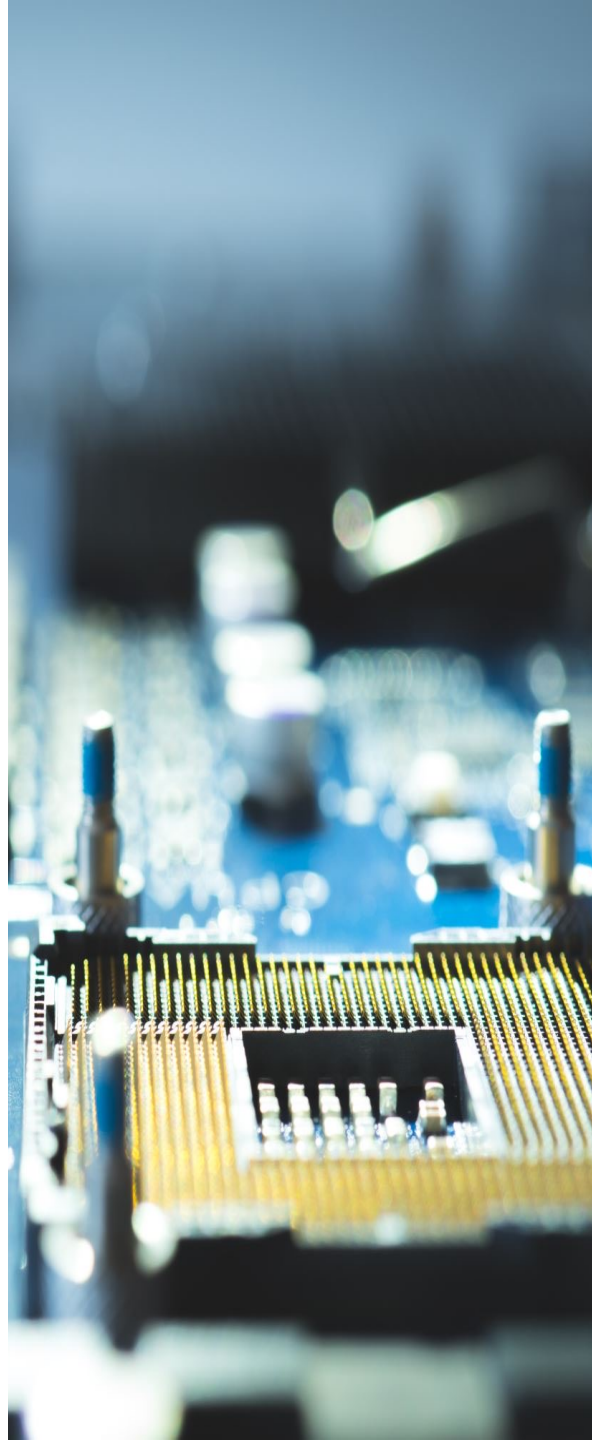
- Blockchain technology prevents unnecessary record duplication and eliminates the question of which record is authentic. Because all transactions within the system occurred on a single record.

Blockchain and Trustworthiness of Digital Records

- Blockchain applications also address accuracy and reliability, which are crucial components of trustworthiness by involving implementing technical and procedural controls over the data. System checks and audit logs can enhance the accuracy.

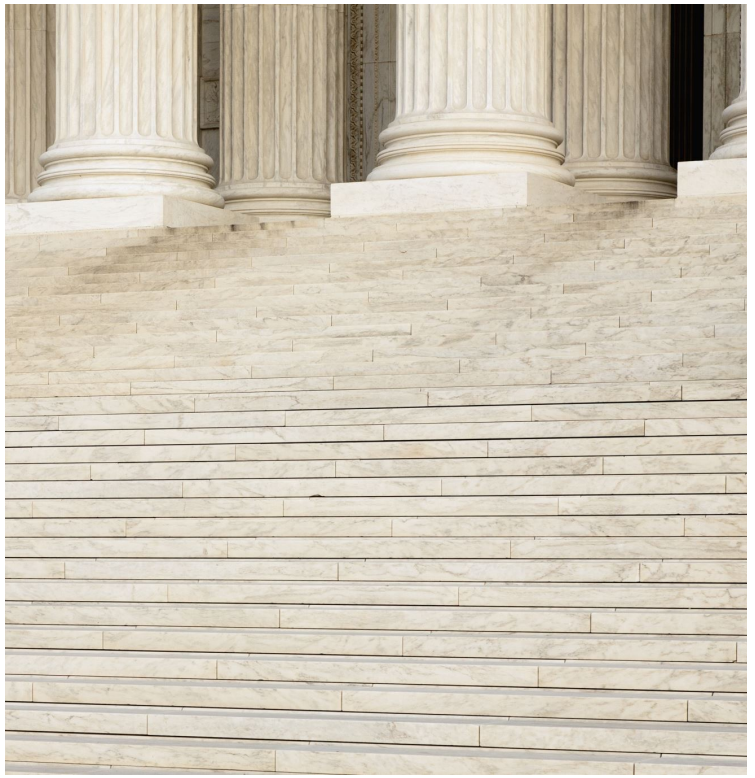
- It is foreseen that blockchain technology will enable more robust quality control measures. However, it is critical to note that without proper controls in place, as in any system, the outcome might lead to disorder of the records.

- If the components of an electronic message are not predetermined and there is no control of the production process, even if the message is sealed or has a timestamp, the chain of custody cannot be established, and the message cannot be reliable.



The Role of National Archives

- For many centuries archives have been recognized as repositories for keeping trustworthy evidence. National archives serve as the authoritative bodies responsible for the archival functions within their respective countries. They establish and enforce regulations that govern archival practices.
- They are entrusted with the task of offering guidance on the implementation of emerging technologies.
- While there is a lack of comprehensive initiatives in implementing blockchain technology, several national archives have emerged as pioneers. One such example is the British National Archives, which has introduced the ARCHANGEL project. This initiative is primarily dedicated to the storage of video recordings using blockchain technology.
- Similarly, the ARCHAIN project in the Republic of Tatarstan is currently conducting experiments involving how to register the records transferred to the archive in blockchains.
- The South Korean National Archives have also undertaken research on the utilization of blockchain for storing records. Moreover, the National Archives of China has been exploring the subject. Additionally, Estonia has implemented the storage of health data in blockchains.



Sample of the Survey

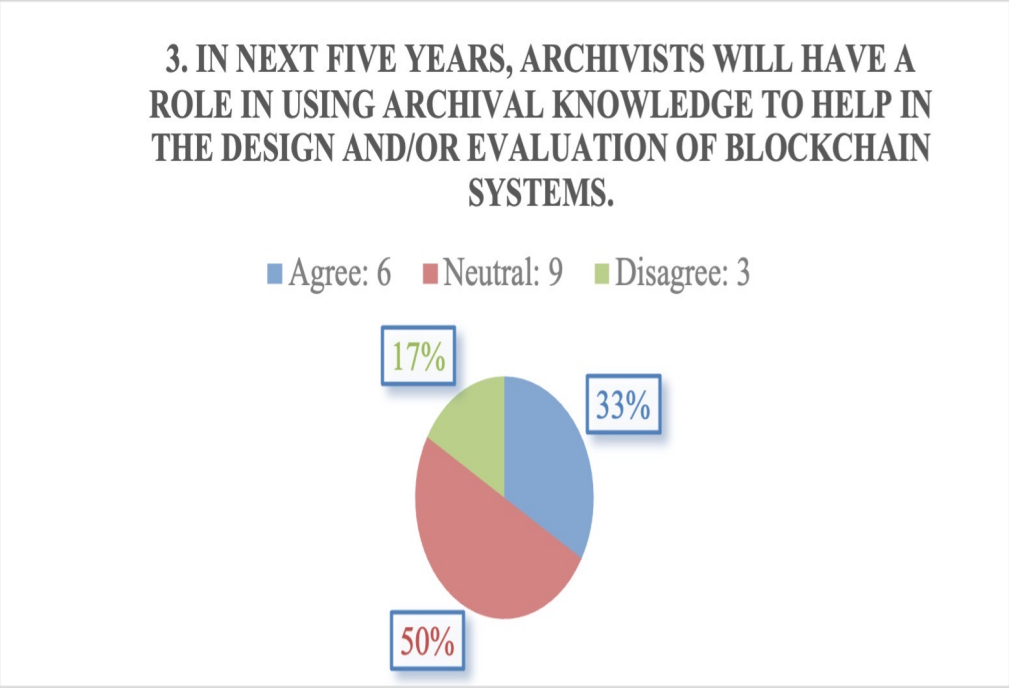
- The Directory of National Archives encompasses information gathered from a total of 194 national archives. Regrettably, 15 of these archives' email correspondences have not been incorporated into the directory, and an additional 60 entries contain erroneous information, leaving a total of 119 accurate archives to be contacted.

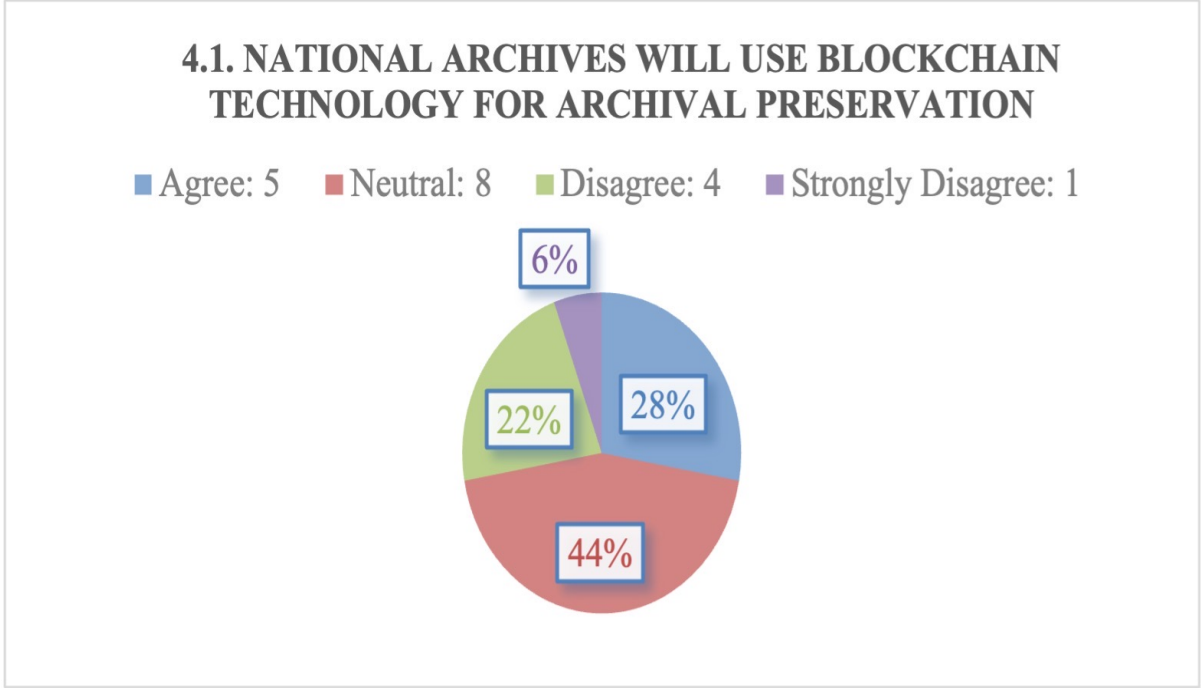
- The survey was distributed to the International Council of Archives (ICA), ARCAN, National Digital Stewardship Alliance (NDSA), NRA and Archival Education and Research Initiative (AERI) listservs. Additionally, ICA has circulated the survey to its members. Finally 18 of the 119 national archives (%15) participated in the survey.

- Geographically, the participating national archives were distributed as follows: Asia (4), Europe (12), Africa (1), and the Americas (1).

- Five of the national archives that responded to the survey indicated they have performed studies pertaining to blockchain technology. Three of them are from Europe and two are from Asia. However, only one of them stated to have published on the subject.

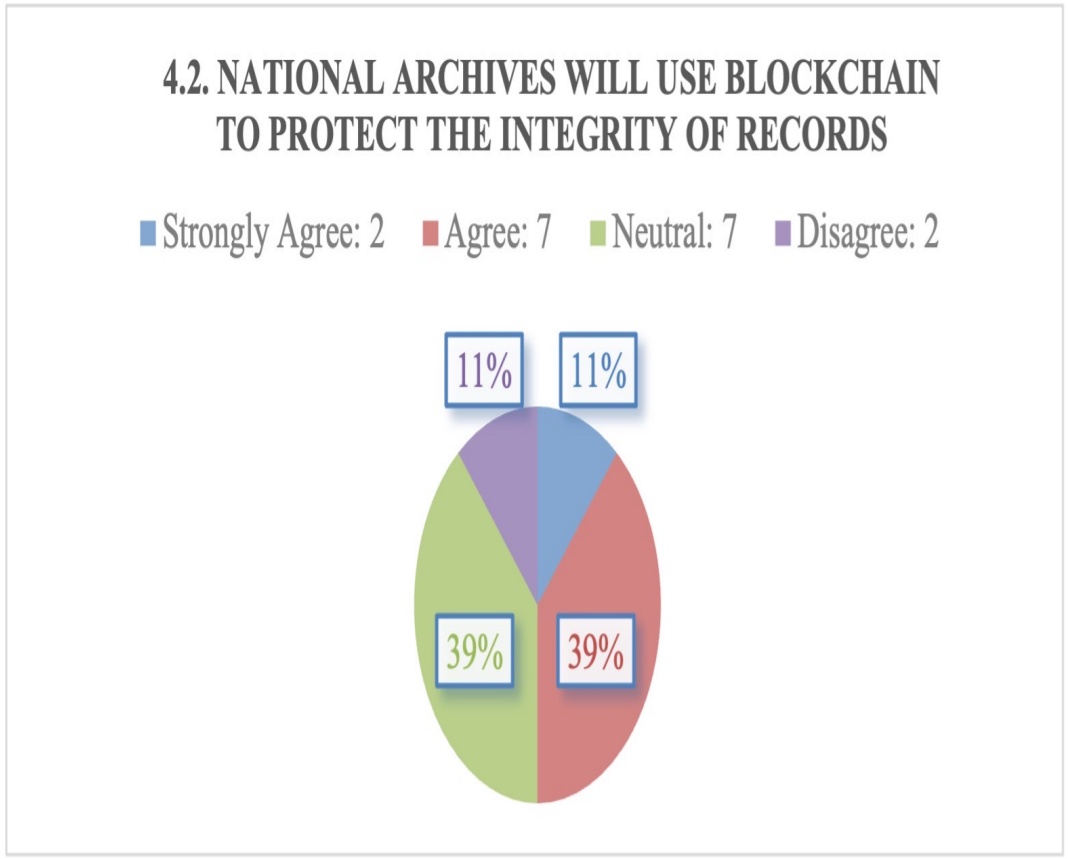
Findings of the Study

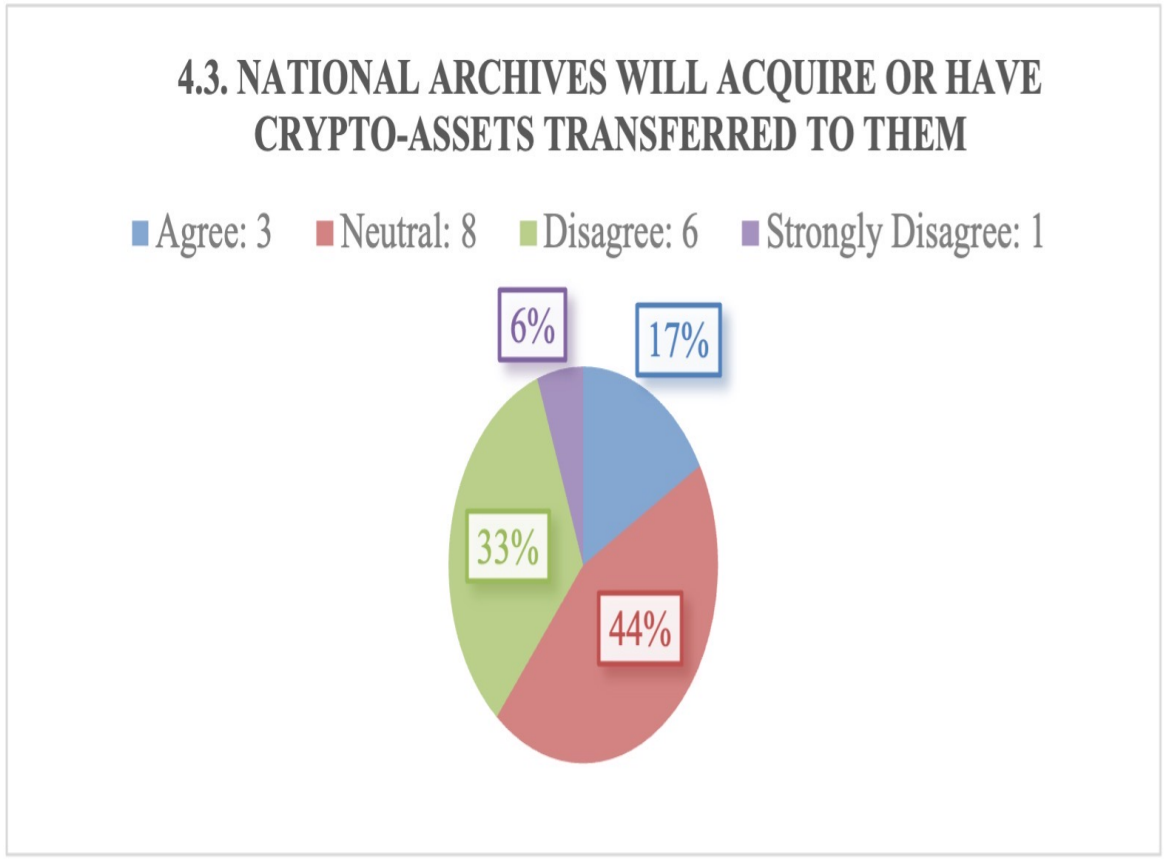




Blockchain technology will change archiving practices

Findings of the Study





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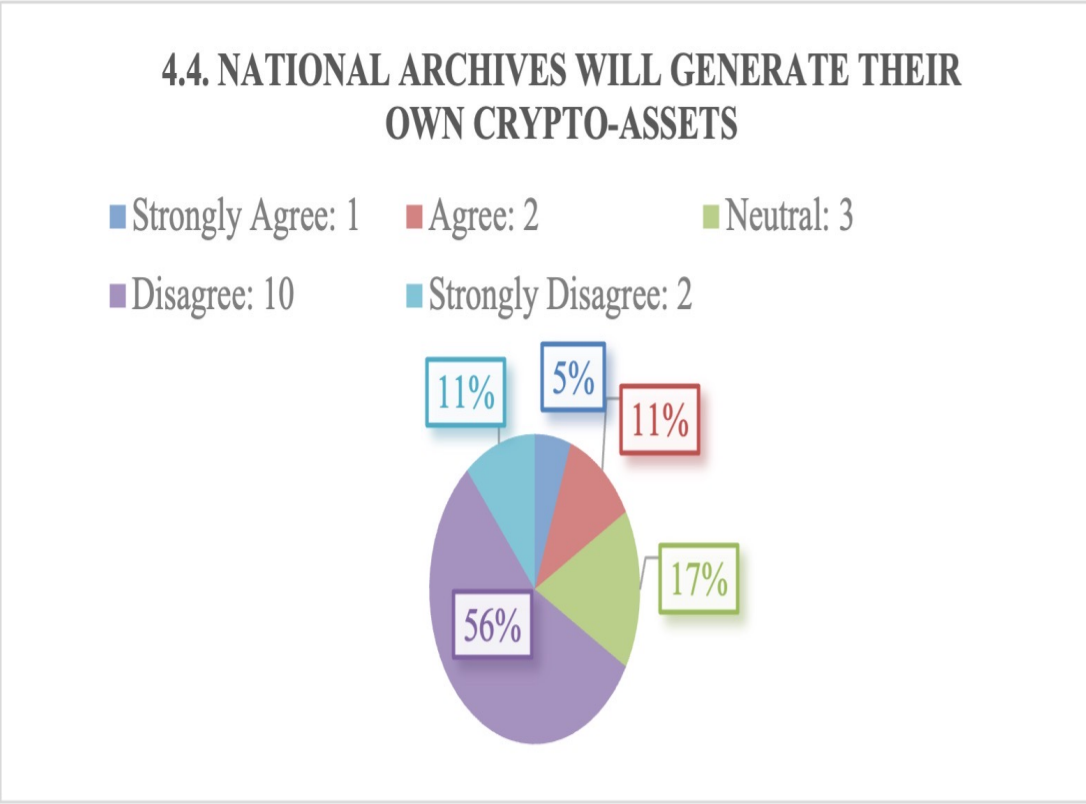

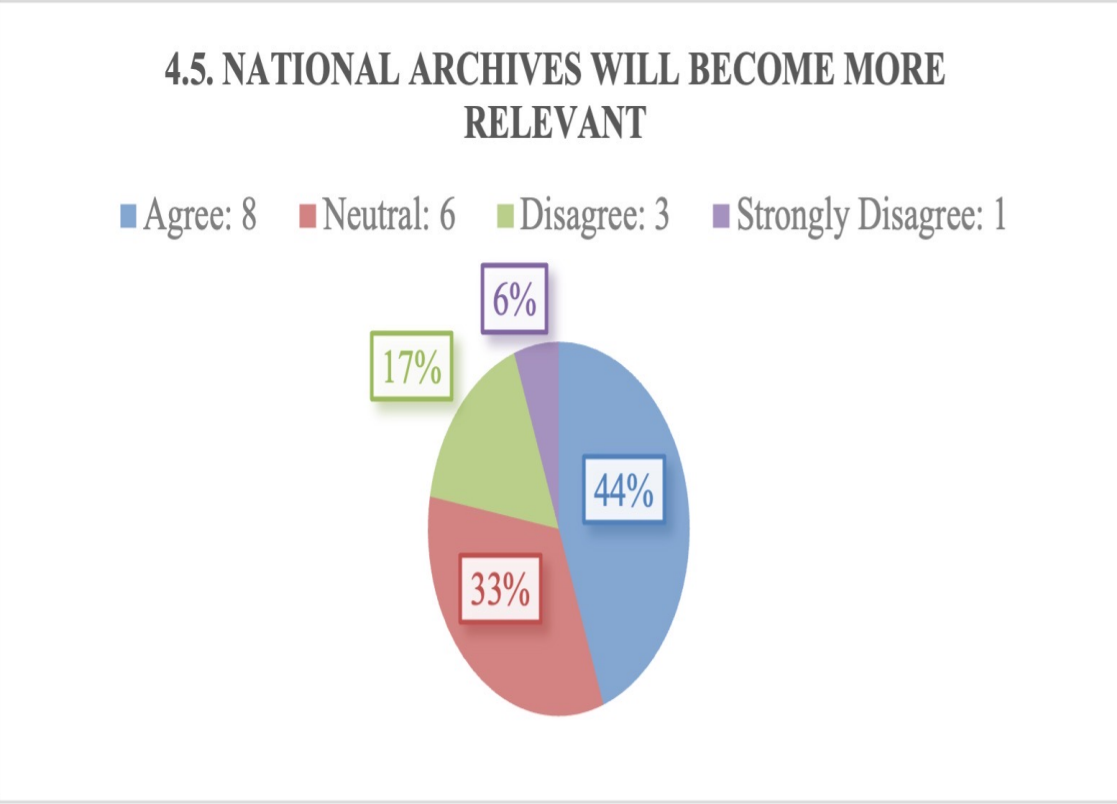

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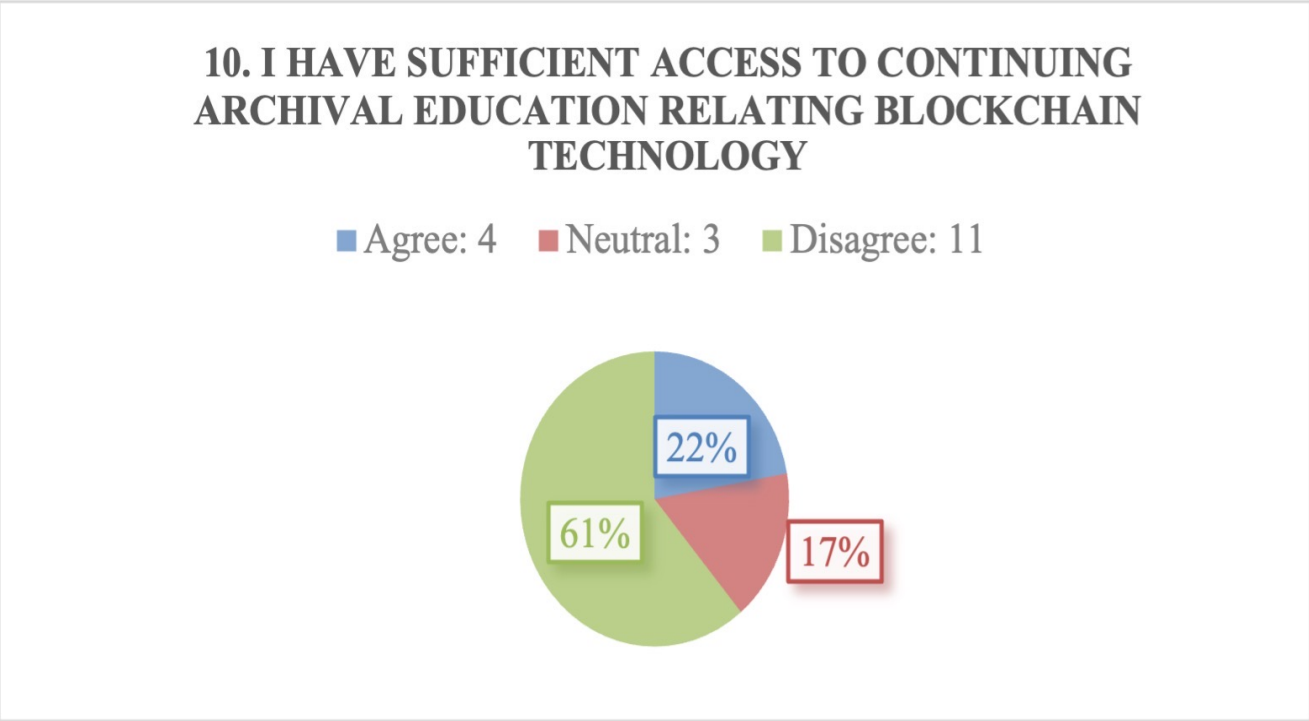
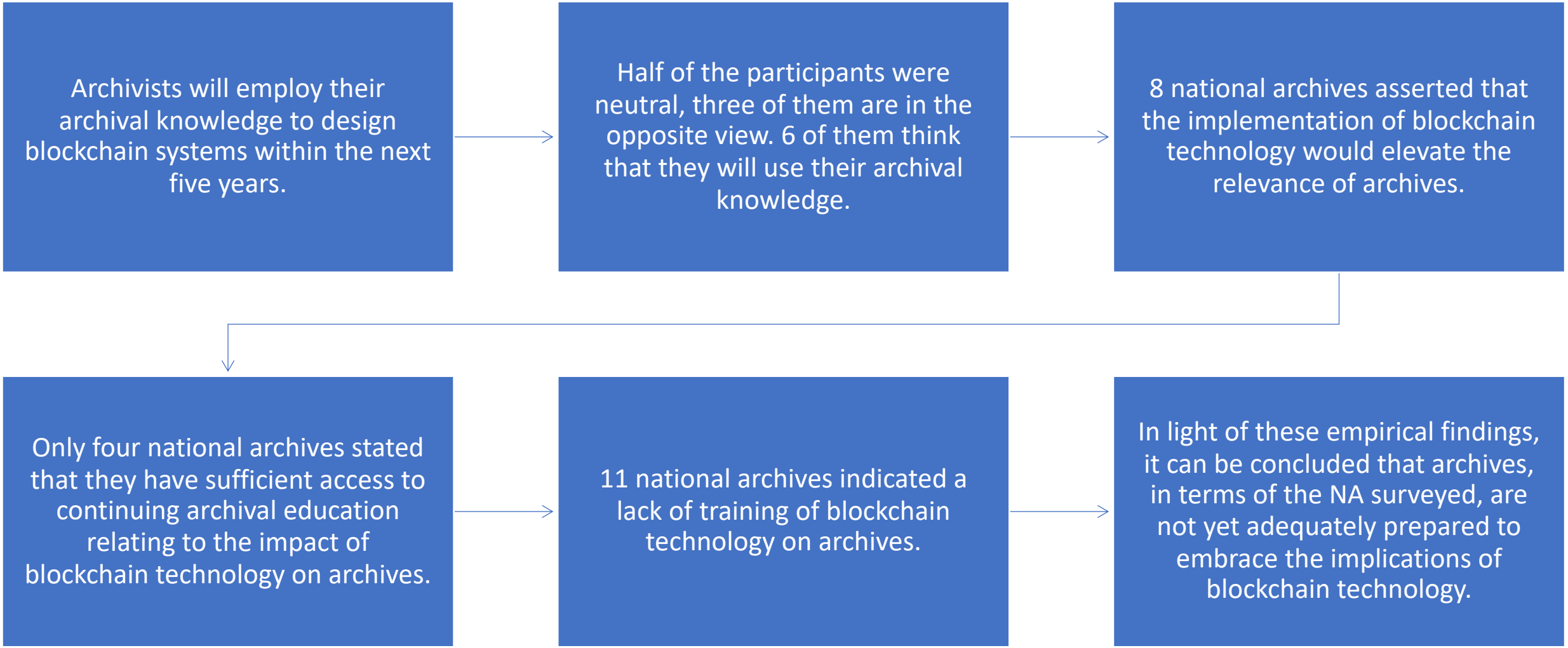


Blockchain technology will change archiving practices

Review of the Hypothesis 1



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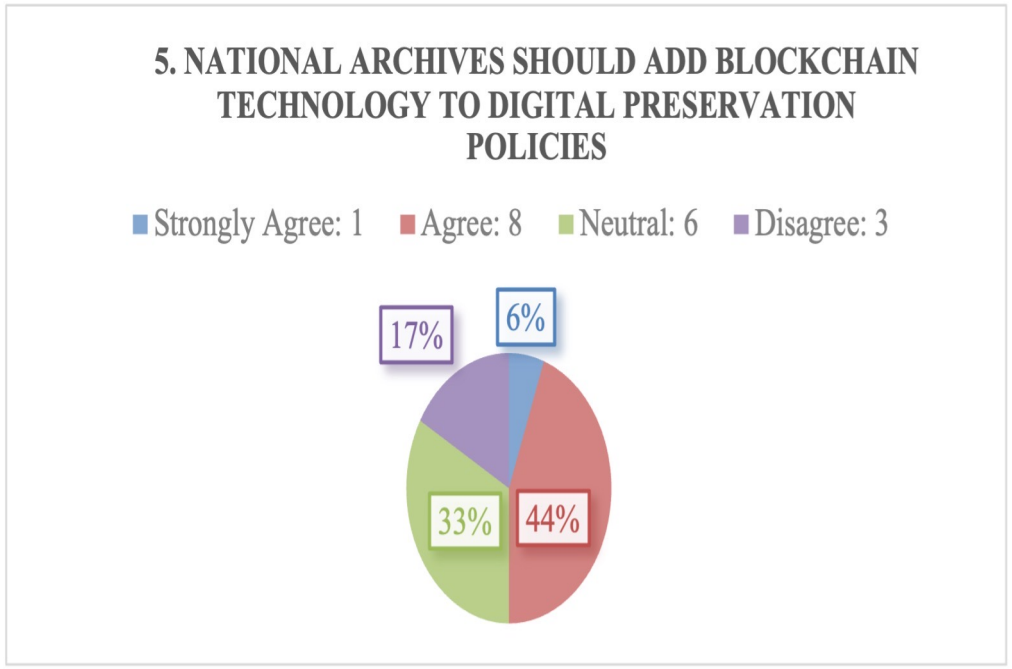
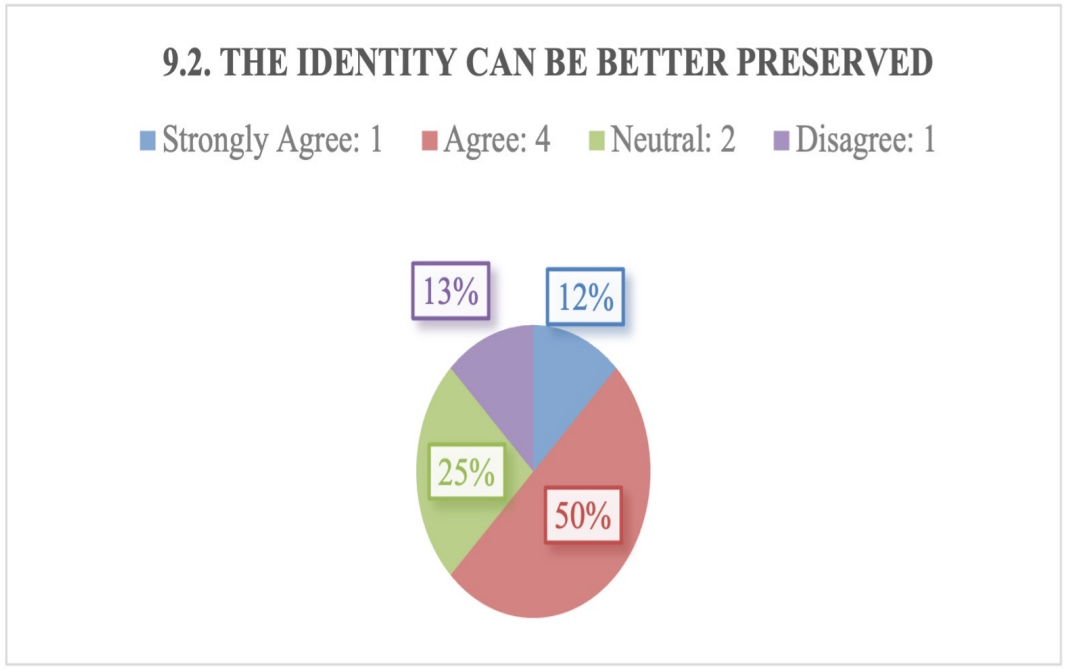
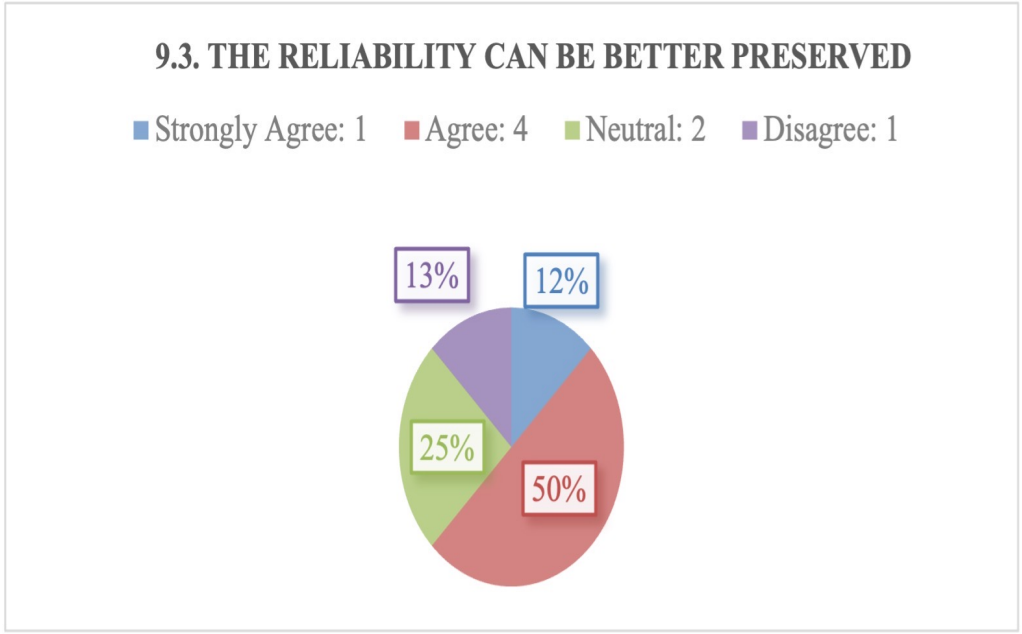
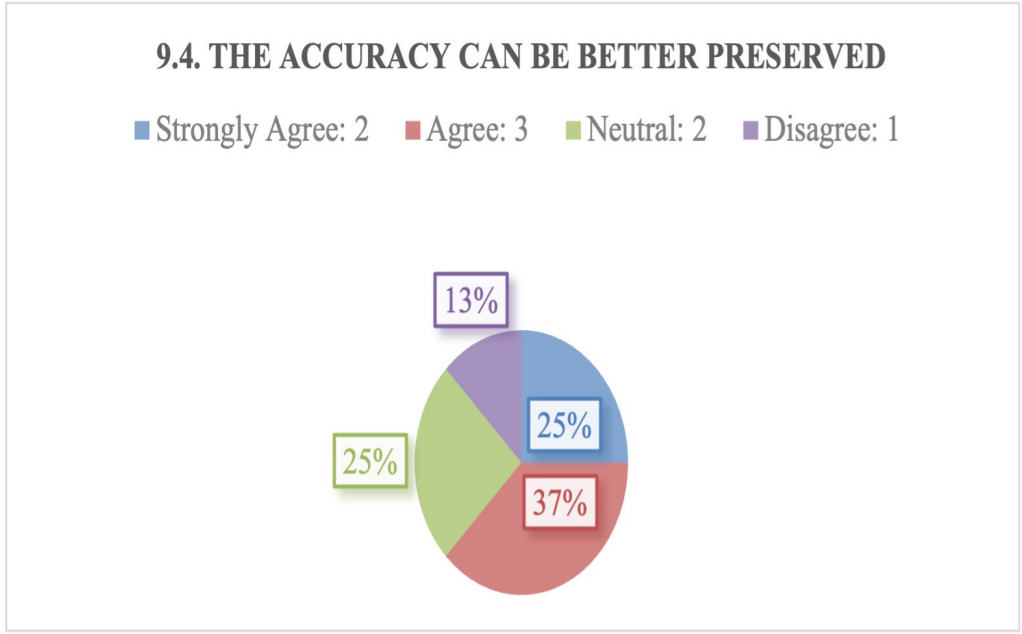




The trustworthiness of digital records can be preserved better with blockchain technology

Findings of the Study





The trustworthiness of digital records can be preserved better with blockchain technology

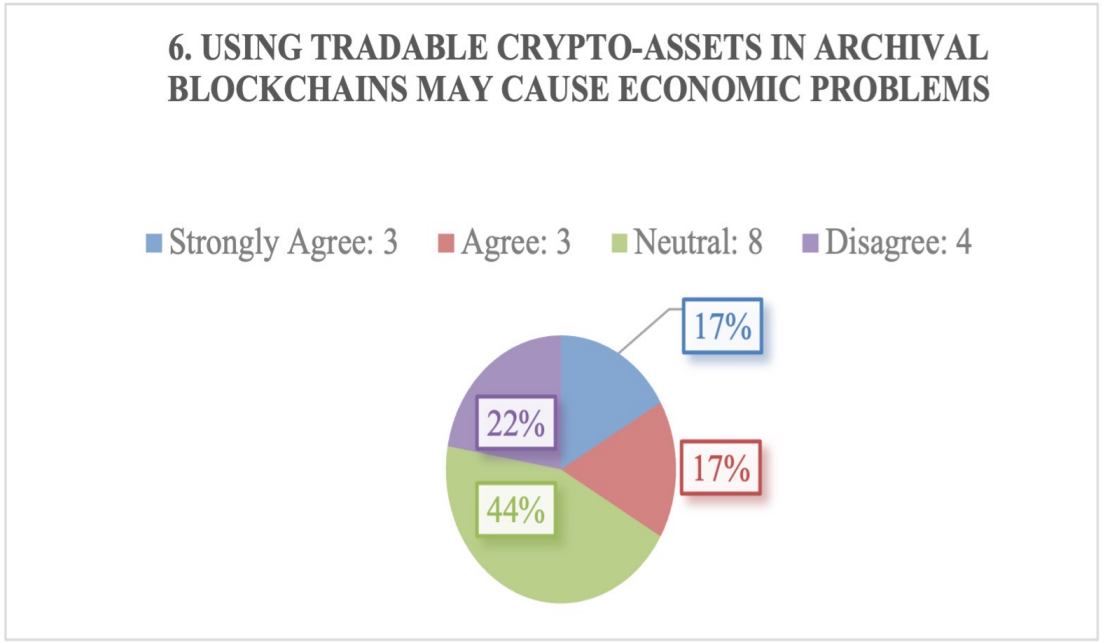
Review of the Hypothesis 2

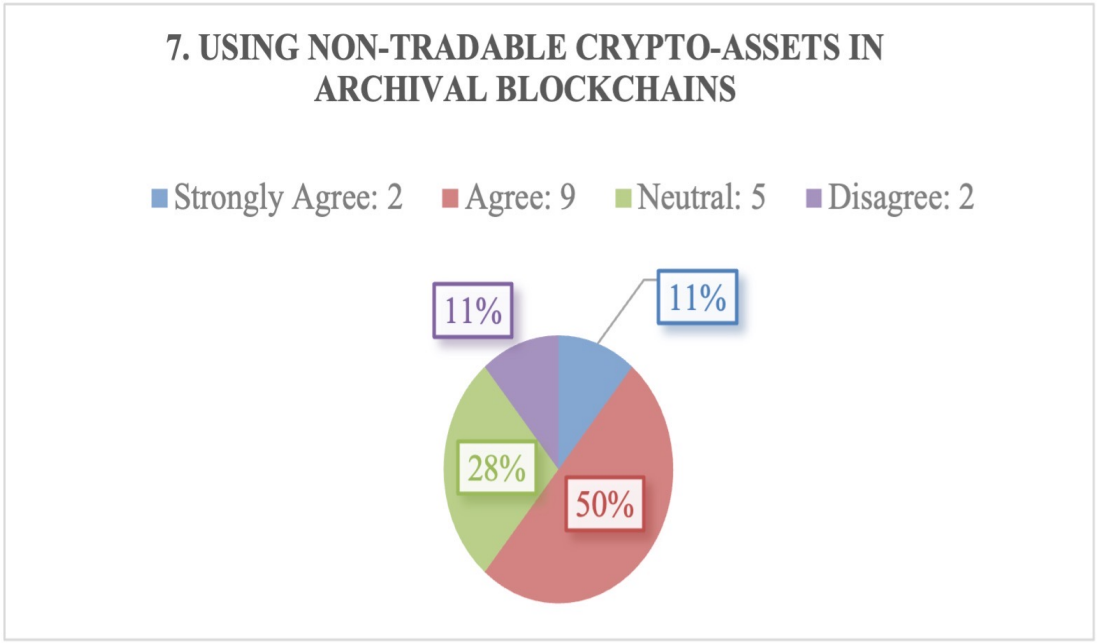
- Question 5 seeks input from national archives regarding the inclusion of blockchain technology in their digital preservation policies within the coming five years. The acceptance rate for this proposal stands at %50.

- Consequently, the adoption rate for propositions on preserving trustworthiness attributes, i.e. identity, reliability, stands at approximately %72. Thus, it can be posited that this hypothesis has been corroborated.

- Nevertheless, it is noteworthy that ten NA have expressed a contrary viewpoint, asserting that the trustworthiness of records cannot be successfully preserved through the utilization of blockchain technology.

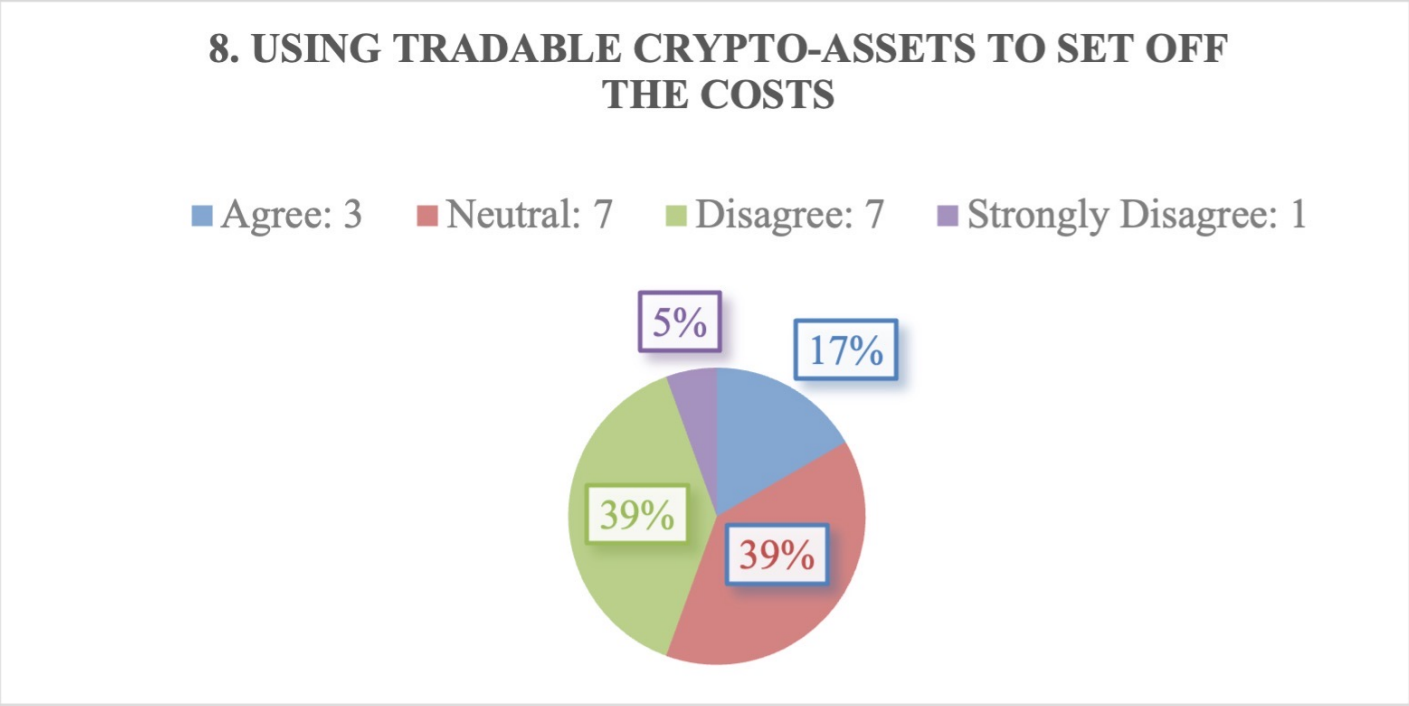
Findings of the Study





National archives are reluctant to implement blockchain networks that use tradable crypto-assets

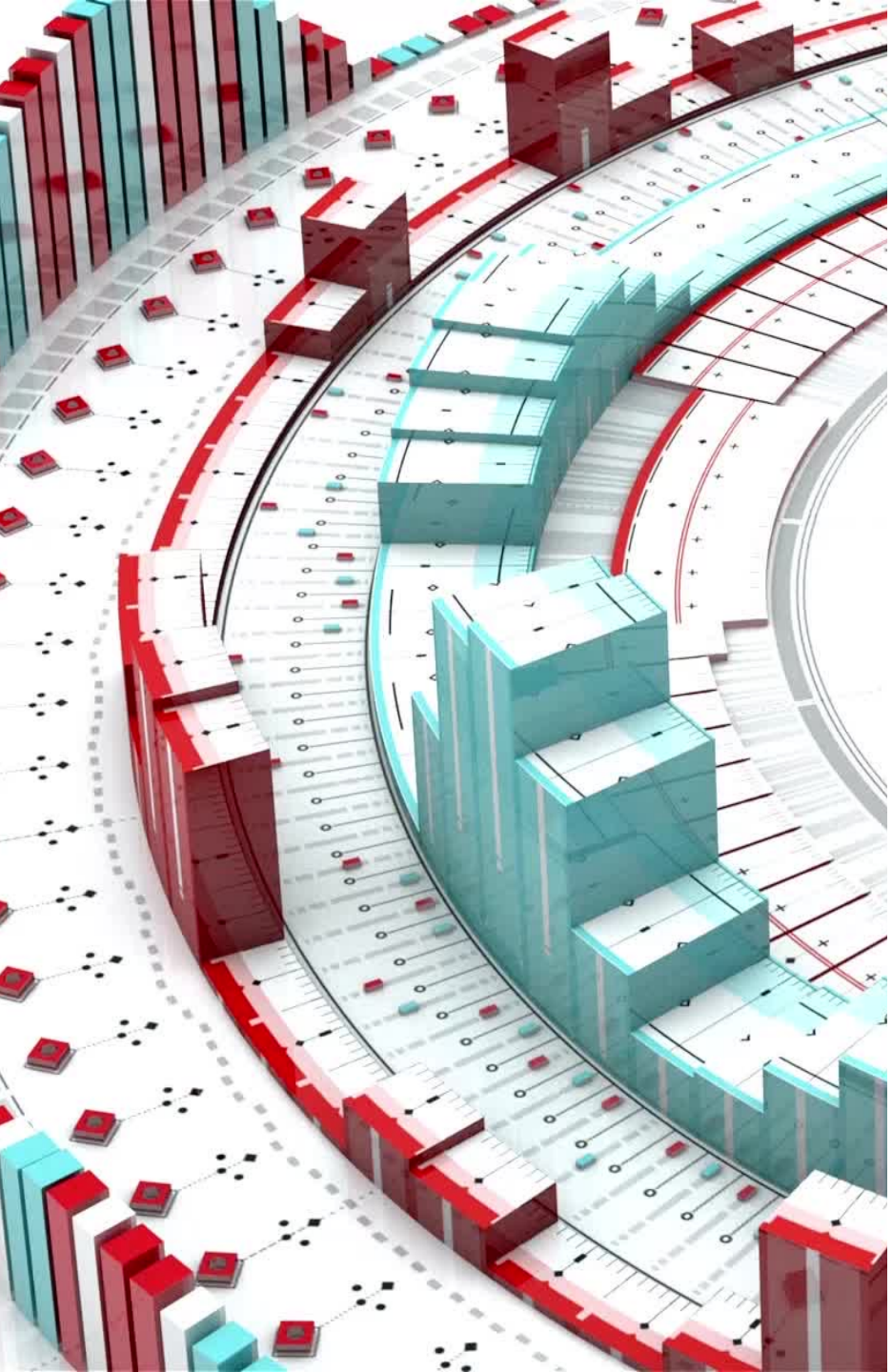
Findings of the Study



National archives are reluctant to implement blockchain networks that use tradable crypto-assets

Review of the Hypothesis 3

- In question 6 it is asked if using tradable crypto-assets in archival blockchains may cause economic problems due to the reasons such as price increases of assets and the unpredictability of costs. Among the respondents, six national archives expressed agreement, eight remained neutral, and four rejected this proposal.
- The other question aligned with this hypothesis pertains to using blockchain networks with protocols that can not be traded as crypto-assets. Eleven national archives expressed agreement, five adopted a neutral stance, and two rejected the proposal.
- The final question pertaining to this hypothesis explores the potential adoption of blockchain networks that employ tradable crypto-assets to offset expenses related to software, storage, and preservation. Among the respondents, three archives expressed agreement, seven adopted a neutral stance, and eight rejected this proposal.
- The pivotal inquiry in this context revolves around whether archives should refrain from utilizing non-tradable blockchain networks as crypto-assets. 61 percent of the participants responded affirmatively to this specific question. The third hypothesis are also true, though the reasons for national archives' reluctance to adopt these technologies could be more varied than originally hypothesized.



Conclusion

- The primary objective of the survey was to gauge the perspectives of national archives concerning the potential blockchain technology in bolstering the efficacy of preserving trustworthy records. While only one national archives had publication on this subject, five national have expressed their ongoing engagement in studies within this realm.

- The first tested hypothesis in the study “blockchain technology will change archiving practices” lacks support. Thus, it can be inferred that the national archives partaking in this study are not yet prepared to embrace blockchains.

- The second hypothesis of the study posits that “the trustworthiness of digital records can be preserved better with blockchain technology”. The verification of this hypothesis is supported by the belief of national archives, which anticipate achieving more favorable outcomes through its implementation.

- On the other hand, the last hypothesis suggesting that “national archives are reluctant to implement blockchain networks that use tradable crypto-assets” has been substantiated.

Further Studies

- This study is one of the first systemic analyses of the viewpoint and activities of national archives on blockchain and distributed technologies.
- While 18 archives responded to the survey, we need to reach out to more national archives to obtain a more complete picture of national archives' attitudes towards blockchain and distributed ledger technologies.
- This study reveals that some national archives are actively engaged in exploring blockchain technology.
- There is an opportunity to conduct qualitative research with these countries, aiming to understand the challenges they encounter, their objectives, and the obstacles that need to be addressed.
- If this study manages to inspire new perspectives for researchers interested in this subject, it can be deemed as having accomplished its intended purpose.

THANK YOU FOR LISTENING!

IF YOU HAVE FURTHER QUESTIONS
PLEASE MAIL ME

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Breakdown of the Answers

Question 1. Yes: Asia (2), Europe (3) **No**: Africa (1), America (3), Europe (9) (Carrying studies)

Question 2. Yes: Europe (1), **No**: Africa (1), America (1), Asia (4), Europe (11) (Publishing)

Question 3.

Agree: Africa (1), Asia (2), Europe (3)

Disagree: America (1), Europe (2)

Neutral: Asia (2), Europe (7)

Question 4.1.

Agree: Africa (1), Asia (2), Europe (2)

Disagree: Europe (4)

Strongly disagree: America (1)

Neutral: Asia (2), Europe (6)

Question 4.2.

Strongly agree: Africa (1), Europe (1)

Agree: Asia (2), Europe (5)

Disagree: Europe (2)

Neutral: America (1), Asia (2), Europe (4)

Breakdown of the Answers

Question 4.3.

Agree: Africa (1), Europe (2)

Disagree: America (1), Europe (5)

Strongly disagree: Europe (1)

Neutral: Asia (4), Europe (4)

Question 4.4.

Strongly agree: Asia (1)

Agree: Asia (1), Europe (1)

Disagree: America (1), Asia (1), Europe (8)

Strongly disagree: Europe (2)

Neutral: Africa (1), Asia (1), Europe (1)

Question 4.5.

Agree: Africa (1), Asia (4), Europe (3)

Disagree: Europe (3)

Strongly disagree: America (1)

Neutral: Europe (6)

Breakdown of the Answers

Question 5.

Strongly agree: Africa (1)

Agree: Asia (2), Europe (6)

Disagree: Europe (3)

Neutral: America (1), Asia (2), Europe (3)

Question 6.

Strongly agree: America (1), Asia (1), Europe (1)

Agree: Africa (1), Asia (1), Europe (1)

Disagree: Asia (1), Europe (3)

Neutral: Asia (1), Europe (7)

Question 7.

Strongly agree: Asia (1), Europe (1)

Agree: Asia (2), Europe (7)

Disagree: Asia (1), Europe (1)

Strongly disagree: Africa (1), America (1), Europe (3)

Breakdown of the Answers

Question 8.

Agree: Asia (1), Europe (2)

Disagree: Asia (1), Europe (6)

Strongly disagree: America (1)

Neutral: Africa (1), Asia (2), Europe (4)

Question 9. Yes: Africa (1), Asia (3), Europe (4) **No**: America (1), Asia (1), Europe (8)

Question 9.1

Strongly agree: Africa (1), Asia (2), Europe (1), **Agree**: Asia (1), Europe (3)

Question 9.2

Strongly agree: Asia (1)

Agree: Africa (1), Asia (1), Europe (2)

Disagree: Europe (1)

Neutral: Asia (1), Europe (1)

Breakdown of the Answers

Question 9.3.

Strongly agree: Africa (1)

Agree: Asia (2), Europe (2)

Disagree: Europe (1)

Neutral: Asia (1), Europe (1)

Question 9.4.

Strongly agree: Africa (1), Asia (1)

Agree: Asia (1), Europe (2)

Disagree: Asia (1)

Neutral: Europe (2)

Question 10.

Agree: Asia (2), Europe (2)

Disagree: Africa (1), America (1), Asia (1), Europe (7)

Strongly disagree: Europe (1)

Neutral: Asia (1), Europe (2)