

Feasibility of Blockchain Based Document Verification in Cambodian Academic Institutions

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Abstract

This study investigates how academic institutions in Cambodia could improve their document verification procedures by utilizing blockchain technology. With a safe way to verify authenticity, the suggested solution aims to stop the spread of falsified academic credentials. The study highlights important problems and research topics, and it indicates that putting in place a blockchain-based system might greatly enhance public confidence and academic integrity. The paper presents the potential of blockchain technology to transform the verification process through a thorough investigation, providing a dependable solution that tackles the present issues while preserving the integrity of academic documents.

Keywords: blockchain, verification, academia.

1 Introduction

In the Cambodian educational system, the problem of fake academic credentials has long been a significant issue, raising concerns about the validity and integrity of academic accomplishments. Blockchain technology has the potential to offer a trustworthy and reliable approach to validating academic credentials, ensuring the accuracy and legitimacy of students' academic achievements. Additionally, by simplifying verification procedures, blockchain technology can help academic institutions operate more effectively and at a lower cost. In a study, the Joint Research Centre of the European Commission [1] found that blockchain technology has the potential to increase the effectiveness and transparency of educational systems. According to the paper, blockchain technology can be utilized to develop secure systems for academic records and certifications, gaining trust from employers and academic institutions. The report suggests that blockchain technology can make verification processes quicker and more affordable, benefiting both students and educational institutions. This study aims to determine the potential of blockchain-based document verification systems in academic institutions in Cambodia. It will examine the advantages, challenges, and impacts of implementing a blockchain-based system for document verification to shed light on the viability and efficiency of such systems. By leveraging blockchain technology, this project intends to enhance academic integrity in Cambodian academia, promoting transparency and confidence among stakeholders.

2 Literature Reviews

The issue of fraudulent academic credentials has presented serious challenges for the Cambodian educational system, raising concerns about the validity and integrity of academic accomplishments. Researchers have suggested using blockchain technology to develop a secure document verification system for Cambodian academic institutions as a solution to this problem. Past research has investigated how blockchain technology might improve the reliability and security of academic degrees. For instance, Androulaki et al. [2] explored the application of blockchain technology in academic credentialing and found that it can offer a tamper-proof and decentralized system for storing and confirming academic credentials. Similarly, Böhme et al. [3] indicated that blockchain technology can provide a transparent and reliable system for certifying academic achievements, which can help reduce fraud and boost confidence in the education system. Their findings demonstrate the potential of blockchain technology to enhance the management and verification of academic qualifications, suggesting that further study in this field is necessary. The current document verification process in Cambodian academic institutions faces several issues and challenges. One major issue is the absence of a centralized system for document verification, which can lead to discrepancies and errors. Manual verification techniques that require paper documents and stamps can also be cumbersome and inefficient. Additionally, the prevalence of fraudulent documents poses a significant challenge, as these can be difficult to detect without proper expertise and tools. These difficulties may prolong the verification process and jeopardize the reputation of academic institutions. To address these problems, there is a need for a more streamlined, technologically driven system of document verification that can deliver quicker and more reliable results. Blockchain technology has the potential to alleviate many of these challenges and limitations by providing a secure mechanism for document verification. Academic



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institutions can create a decentralized system for storing and verifying academic credentials using blockchain technology, which can improve transparency and reduce fraud. Moreover, blockchain technology can facilitate quicker and more cost-effective verification processes, benefiting both educational institutions and students. However, the adoption of blockchain-based document verification systems in Cambodian academic institutions is not without its challenges. Technical issues, such as the requirement for specialized knowledge and skills, can hinder the use of blockchain technology. Additionally, there may be concerns regarding the privacy and security of student data, as well as the scalability and sustainability of blockchain-based systems. This study aims to explore the potential of blockchain-based document verification systems in Cambodian academic institutions by identifying the advantages, challenges, and implications of implementing such systems. By drawing on insights from previous studies and reviewing the current state of document verification in Cambodia, this research seeks to provide a comprehensive understanding of the potential of blockchain technology to enhance the reliability and integrity of academic credentials in Cambodian academia.

2.1 Limitation of Traditional Systems

Traditional document verification systems face several significant limitations that affect their reliability and efficiency. One major issue is their vulnerability to forgery. These methods often rely on visual inspection and comparison of physical documents, making them susceptible to fabrication. Forged or altered documents can be challenging to detect, especially if the forger is skilled. Additionally, traditional verification techniques are time-consuming, particularly when a large volume of documents needs to be verified. This can lead to delays and bottlenecks in processes such as onboarding or background checks. Another limitation is the limited accuracy of traditional verification procedures. They are not always reliable, especially when dealing with old or damaged documents. In some cases, the verification process may fail to confirm a document's authenticity, resulting in false positives or negatives. Furthermore, traditional methods generally lack automation, relying heavily on human inspection and verification. This approach is not only time-consuming and prone to errors but also limits scalability, making it difficult to verify large numbers of documents quickly. High costs also pose a significant challenge for traditional document verification systems. These methods can be expensive, particularly if they require specialized equipment or trained personnel. As a result, smaller organizations or individuals may find it difficult to access reliable document verification services. This combination of high costs, limited accuracy, vulnerability to forgery, and the lack of automation underscores the need for more advanced and efficient verification solutions.

2.2 Key Technologies in Blockchain

Blockchain technology has completely changed how data is distributed and stored, providing a safe means to confirm the authenticity of papers. The main technologies and their uses in blockchain-based document verification systems are covered in this section. Distributed Ledger Technology (DLT), which makes it possible to create a decentralized database that is run by a network of computers, is the cornerstone of blockchain technology. Every node in a DLT system maintains a copy of the ledger, and any changes are confirmed by the network's consensus, according to Narayanan et al. [4] This procedure guarantees data integrity and stops unauthorized changes in document verification systems by making it nearly impossible to change or hack the information kept in the ledger. Self-executing contracts, often known as smart contracts, are written to take action in response to predetermined conditions. Smart contracts can automate the verification process in a blockchain-based document verification system [5]. For instance, a smart contract can be configured to verify the legitimacy of a document by looking at its digital signature and other important information. The entire process can be streamlined by having the smart contract instantly update the ledger with the verified data after verification is finished. Encryption is necessary to safeguard communication from outside interference. The information held in the ledger of blockchain-based document verification systems is protected by encryption. To protect data, methods like digital signatures and encryption are used [6]. Digital signatures offer another degree of security by confirming that the data has not been altered, while encryption makes sure that it cannot be read without the decryption key. Hash functions are mathematical techniques that provide each document a distinct fingerprint by converting any input data into a fixed-size output. Hashing functions are employed in a blockchain-based system to confirm the legitimacy of documents. A changed hash indicates tampering and guarantees the integrity of the document whenever there is a modification [4]. To sum everything up, distributed ledger technology, smart contracts, cryptography, and hash functions are all used by blockchain-based document verification systems to offer a safe and secure way to confirm the authenticity of documents. These technologies, which are being embraced by more and more industries, have the power to revolutionize the way we exchange and keep data.

2.3 Blockchain Technology's Potential

One area where blockchain technology has the potential to have significant impacts is document verification systems. This paper examines the possible uses of blockchain technology in document verification systems,

outlining its benefits and offering instances of effective use. Blockchain technology is a compelling substitute for document verification methods due to its advantages. Its ability to guarantee the authenticity of the document through a tamper-proof mechanism is a major benefit. A document that is added to the blockchain is included in an unchangeable record that cannot be removed or changed without being noticed [6]. This feature ensures the integrity of the document and prevents fraud by making it nearly impossible to tamper with. The fact that blockchain technology functions as a decentralized system and does not require a central authority is another important benefit. Several people can take part in the verification process using a blockchain-based system, and each person can independently confirm the document's legitimacy. Decentralization lessens reliance on a central authority, which is frequently costly, time-consuming, and error-prone [7]. Blockchain-based document verification solutions have already been deployed by many enterprises with good results. To track all land ownership changes on the blockchain, for example, the Republic of Georgia has set up a land register system based on blockchain technology. This system has successfully decreased fraud and improved transparency in land ownership transactions since it was put into place in 2017 [7]. In a similar vein, the University of Melbourne has created an academic qualification verification system based on blockchain technology. Through the use of this technology, students can safely provide their academic records to prospective employers, who can then confirm the documents' legitimacy without having to get in touch with the university [5]. This invention has eased the hiring procedure and lessened the university's administrative workload. To sum up, blockchain technology offers a tamper-proof, decentralized mechanism for validating and ensuring the integrity of documents, which has the potential to completely transform document verification techniques. The aforementioned instances highlight how blockchain technology has already been successfully implemented in practical settings, highlighting its advantages. We may anticipate even more cutting-edge uses of blockchain technology in other fields, such as document verification, as it develops further.

2.4 Proposed Document Verification Systems

To build the proposed system, it is essential to understand the types of blockchain technologies. Blockchain technologies are categorized into three types. The first type is the public blockchain, which features a ledger visible to everyone on the internet and allows anyone to check and add blocks of transactions [8]. However, identity verification is not required on a public blockchain, making it unsuitable for educational institutions, students, and third parties due to the costs associated with storing data or making transactions [9]. The second type is the private blockchain, a distributed yet centralized network that permits only a few individuals within an organization to check and add blocks of transactions, while all users on the internet can view the ledger [10]. The third type is the consortium blockchain, a hybrid of public and private blockchains. In a consortium blockchain, multiple organizations participate in transactions, but only privileged participants are allowed to perform transactions on the blockchain [11]. This combination allows for a balance of accessibility and control, making it a potential option for more secure and efficient systems. In our proposed system, we choose a consortium blockchain for its decentralized structure and self-regulating networks, where participants' nodes must agree on the current state of the ledger. For building this consortium blockchain network, we opt for Hyperledger Fabric. Hyperledger Fabric [12], an open-source collaborative effort under the Linux Foundation, aims to advance cross-industry blockchain technologies. This platform is particularly suitable for our use case due to its inherent privacy features and role-based access mechanisms for accessing documents. To ensure security, we use the SHA-256 secure hashing algorithm to hash the documents. A hash is a short code of fixed length that serves as a unique identifier for the document. When a document is hashed, it produces a hash output with a certain number of digits. This hash output remains consistent for the same document but changes completely with even the slightest modification, such as altering a single letter of text [13]. This mechanism ensures the integrity and authenticity of the documents within our system. For digitally signed documents, we use public and private key cryptographic methods to create a digital signature mechanism that verifies the document's authenticity. The digital signature is created by encrypting the hash value of the file with the sender's private key [14]. The REST API system, which facilitates interaction with the blockchain network, will be built using JavaScript (Node.js). For educational institutions, third-party, and student portals, we will use HTML, CSS, and JavaScript. The working process of the proposed system design involves several steps. First, educational institutions issue an academic document and enter students' data into the system. Next, the system generates a hash of the document using the secure hashing algorithm SHA-256. The system then signs the hash of the document using public and private key cryptography and adds the hash value to the blockchain network. When a student applies for a job, a third party can verify the document by uploading the digitally signed document and inputting the public key of the educational institution. If the hash value matches, the document is authenticated; if not, the document may be a forgery.

3 Discussion

With the help of blockchain technology, our proposed system is scalable and can serve as a unified platform for Cambodian academic institutions to issue digitally signed academic documents and for third parties to verify these documents efficiently. The proposed solution offers several advantages over the existing process, which is

often costly and time-consuming. One significant benefit is cost reduction. In our proposed solution, third parties will pay a significantly lower fee to verify each document. This low-cost verification process will help small and medium-sized enterprises verify applicants' backgrounds during the hiring process, enabling companies to select the best candidates more effectively. Time-saving is another critical advantage. The proposed solution is much less time-consuming than the current verification process. Third parties can instantly verify the authenticity of documents submitted by applicants, without needing to contact academic institutions or agencies. This immediate verification process prevents delays in hiring and ensures that third parties do not waste resources by hiring unqualified candidates. Efficiency is also greatly improved with our proposed solution. It is nearly impossible to manipulate documents without altering the hash value, and the hash value stored on the blockchain is immutable. This feature ensures a highly reliable verification process, in contrast to the existing manual verification methods, which are prone to errors and manipulations. Finally, our solution is highly scalable. It can easily accommodate any Cambodian academic institution and third party wishing to participate. Once the system is established, scaling it on Hyperledger Fabric [12] is straightforward. As the ecosystem around our solution grows, it can function as a single system for verifying documents provided by applicants, streamlining the entire process.

4 Conclusions

The purpose of this study was to determine whether using blockchain technology for document verification in academic institutions in Cambodia was feasible. According to the research, blockchain-based solutions significantly increase the effectiveness, security, and dependability of document verification procedures, which is advantageous for both educational institutions and students. Blockchain ensures that academic records are easily accessible to authorized users and tamper-proof through the use of smart contracts and decentralized storage. By reducing problems like false document submissions and credential fabrication, this strategy improves academic credentials' transparency and reliability. The report emphasizes how important it is for Cambodia's academic community to continue investigating and utilizing blockchain technology. It draws attention to how blockchain technology has the power to completely transform document verification procedures while improving transparency and accountability among academics. As such, by creating a strong framework for safe and trustworthy academic credential verification, integrating blockchain technology could be crucial to the advancement of Cambodia's education industry. The study presented in this paper points to a number of potential possibilities that academic institutions in Cambodia should pursue in the future when integrating blockchain technology into document verification processes. First off, since educational institutions handle an increasing number of students and academic records, it is essential to look into how scalable blockchain solutions are in large academic contexts. Implementing blockchain in a sustainable way will require an understanding of how it can handle massive amounts of data. Furthermore, investigating the interoperability of various blockchain systems utilized by Cambodian educational institutions may make it easier for students to obtain their academic credentials from any institution. For students, this would simplify the verification and transfer procedures. Finally, to develop uniform frameworks, future research could concentrate on using blockchain technology to recognize academic credentials internationally while working with international academic and governmental organizations. Through these initiatives, academic credentials from Cambodia may become more respectable and transferable to other countries. All things considered, these paths offer attractive prospects for promoting blockchain-based document verification in Cambodia, possibly placing the nation at the forefront of educational technology innovation and encouraging improvements to the country's educational system.

5 Declarations

5.1 Study Limitations

Like any new system implementation, the suggested blockchain-based solution for academic document verification in Cambodian institutions may run into a number of obstacles and restrictions. First, a big barrier to adoption might be academic institutions' and their employees' ignorance of and lack of comprehension of blockchain technology. To remedy this, it is recommended that extensive training and educational programs on blockchain technology be made available in order to guarantee staff members' readiness and proficiency. Another potential obstacle is the initial expenses related to setting up the blockchain network and providing personnel training. Even though they are more cost-effective in the long run, these up-front costs might be reduced if funding was obtained through public or private grants or investments. Furthermore, even though the blockchain network is inherently resistant to cyberattacks, questions about its dependability and security may surface. To effectively reduce these dangers, strong security mechanisms like multi-factor authentication and encryption must be put in place. Last but not least, resistance to change or a lack of funding in some academic institutions may prevent widespread implementation. Overcoming this obstacle would depend on providing the resources and assistance required to make acceptance and implementation possible across all institutions. In conclusion, proactive steps including finance, education, security improvements, and institutional support can successfully overcome the problems associated with deploying blockchain-based document verification in Cambodian academic institutions.

With these safeguards in place, all academic institutions in Cambodia stand to gain significantly from the successful adoption of the new system.

5.2 Competing Interests

The authors declare that they have no conflicts of interest regarding the publication of this paper.

5.3 Publisher's Note

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