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BLOCKCHAIN BASED VERIFICATION OF EDUCATIONAL AND PROFESSIONAL CERTIFICATES

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Abstract: Educational Documents and Certificates are a proof of professional achievements for anyone. Without these documents, it is not possible to start your career and hence play a very important role in everyone's professional life. Till date, Colleges, Universities and various educational institutes issue paper based degrees and certificates which are prone to get damaged or may be lost. The other drawback is that this process of issuing of degrees and manual process of verification of those documents by third parties is a time taking and cumbersome process. The employers take a lot of time for verifying these paper based degrees and certificates before they give the job offer. Forgery of paper based documents is also easier and has led to many educational scams. This paper aims to give the solution to the problems mentioned above through Blockchain Implementation. Block chain technology is not only limited to crypto currencies but is also of great applications in various fields like health, supply chain management, finance, etc. It has disrupted the traditional education system. This paper highlights as to how the educational certificates can be verified using the Ethereum platform and smart contracts. The traditional paper certificates would be converted to digital certificates on student's request, their hash value would be calculated using cryptographic hash functions and stored on Blockchain. A unique certificate ID and transaction hash value would be generated which would then be used to verify the certificates through a common platform.

Index Terms **-** *Blockchain , Smart contracts , Ethereum , Document verification , Decentralized process , Hashing , IPFS.*

1. INTRODUCTION

The concept of Blockchain technology was described first time by the research scientists Stuart Haber and W.Scott Stornetta but it became popular in 2009 when Bitcoin was invented by Satoshi Nakamoto. The Blockchain technology is getting widespread in Educational sector for many use cases- Issuing and verification of documents(E-transcripts),cost-

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effective large storage of files, automated learning platforms, publishing and copyright protection, payment via Cryptocurrencies.[1] The traditional system of issuing paper degrees and certificates and subsequent manual verification of these documents involves a lot of paper work, emails, phone calls resulting in an overall slow and cumbersome process. This system is also susceptible to many problems, like loss or damage of certificates which results in re-issuing, which in turn again is a problematic issue. Other problems like forgery of paper documents leads to hiring of unskilled people which can make a company lose on an average 15,000 dollars [2].The degrees that are wrongly claimed are more than 30% [3]. In 2009,a case was filed against a court clerk who fabricated her documents in order to get the job [4]At MIT, Dean of Admissions, Marilee Jones , having been found guilty of having false degrees from some New York university for nearly 30 years was asked to quit her job.[5]This problem could have been avoided if her credentials would be digitally verifiable. Ezell and Bear have also reported about the billion-dollar industry which is behind these false practices [6].

The objective of this paper is to propose a solution to the challenges associated with traditional paper-based educational certificates by leveraging blockchain technology, specifically on the Ethereum platform. The aim is to enhance efficiency in the verification process, reduce the risk of document loss or damage, and mitigate forgery through the creation of secure and easily verifiable digital certificates.

Traditional paper-based educational certificates pose challenges such as susceptibility to damage or loss, time-consuming manual verification processes, and vulnerability to forgery, leading to educational scams. This paper addresses these issues by proposing a blockchain-based solution using Ethereum and smart contracts to transform certificates into secure digital formats, ensuring efficient verification and mitigating the risks associated with paper documents.

2. LITRATURE REVIEW

Educational imposters and fake degrees

We develop a sociological context for understanding the phenomenon of falsely claimed educational credentials and analyze national data that cast light on the incidence of false degrees. We find that about 6% of Bachelor's degrees and 35% of Associate's degrees are falsely claimed. Most individuals who falsely claim degrees have attended the college in question. Many have nearly completed the required credits, but claim a degree without having finished. The socio-demographic profile of persons falsely claiming credentials is consistent with Merton's theory of innovative deviance, but not with the theory of status inconsistency.

CredenceLedger: A Permissioned Blockchain for Verifiable Academic Credentials

Blockchain, the underlying technology that powers cryptocurrencies such as Bitcoin and Ethereum, is gaining so much attention from different industry stakeholders, governments and research communities. Its application is extending beyond cryptocurrencies and has been exploited in different domains such as finance, E-commerce, Internet of Things (IoT), healthcare, and governance. Some key attributes of the technology are decentralization, immutability, security and transparency. This paper aims to describe how permissioned Blockchain can be

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applied to a specific educational use case - decentralized verification of academic credentials. The proposed Blockchain-based solution, named `CredenceLedger', is a system that stores compact data proofs of digital academic credentials in Blockchain ledger that are easily verifiable for education stakeholders and interested third party organizations.

Using blockchain as a tool for tracking and verification of official degrees : business model

While the number of universities, tertiary education students and number of graduates per year constantly increase, the need to easily verify degree certificates generates new business opportunities. The irruption of blockchain, and its implementation based in the blockcerts software, provides a straightforward solution that demands to explore plausible business models. In this paper we project two financial models balancing where the price for the service is balanced between the graduate and the employer as the main stakeholders of that service. Students demand a proof-of-certification at low cost and easy to check, employers also demand quick and trustable verification of degrees when recruiting. Both models are projected for several geographic markets and shares to explore plausible ways to develop that business in the European Union.

SmartCertBlockChain Imperative for Educational Certificates

The electronic authentication system authenticates the documents electronically using the blockchain technology, which enables us to implement an integrated system of official documents of all kinds for Al-Zaytoonah University of Jordan. This technology allows us to build a robust database system that cannot be tampered with, modified, destroyed or altered. It further ensures the safety of documents issued within the University departments and those exported or deported outside the University system; such as, financial documents, official documents and academic certificates. Moreover, this system guarantees us a very high level of data and information security and confidentiality. Our system will be built using a database that provides 100% true information about the exports of that system. This technology will help users prevent the forgery of the data and official documents issued by the University of Al-Zaytoonah, both internally and externally, and also enables the departments within the University to issue documents to third parties while ensuring confirmed, undeniable delivery and sound content.

Blockchain and smart contract for digital certificate

According to the Taiwan Ministry of Education statistics, about one million graduates each year, some of them will go to countries, high schools or tertiary institutions to continue to attend, and some will be ready to enter the workplace employment. During the course of study, the students' all kinds of excellent performance certificates, score transcripts, diplomas, etc., will become an important reference for admitting new schools or new works. As schools make various awards or diplomas, only the names of the schools and the students are input. Due to the lack of effective anti-forge mechanism, events that cause the graduation certificate to be forged often get noticed. In order to solve the problem of counterfeiting certificates, the digital certificate system based on blockchain technology would be

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proposed. By the unmodifiable property of blockchain, the digital certificate with anti-counterfeit and verifiability could be made. The procedure of issuing the digital certificate in this system is as follows. First, generate the electronic file of a paper certificate accompanying other related data into the database, meanwhile calculate the electronic file for its hash value. Finally, store the hash value into the block in the chain system. The system will create a related QR-code and inquiry string code to affix to the paper certificate. It will provide the demand unit to verify the authenticity of the paper certificate through mobile phone scanning or website inquiries. Through the unmodifiable properties of the blockchain, the system not only enhances the credibility of various paper-based certificates, but also electronically reduces the loss risks of various types of certificates.

3. METHODOLOGY

The traditional method to issue and verify the Educational Certificates which is being used in several Universities and Colleges till date is a time taking and burdensome process involving a lot of manual work. The paper documents as a result of traditional method are prone to damage and also forgery resulting in scam. Hence a system is needed which can issue and verify the educational certificates and degrees digitally and hassle free in order to avoid forgery of documents.

Disadvantages:

1. traditional method are prone to damage and also forgery resulting in scam
2. time taking and burdensome process involving a lot of manual work

The proposed system uses BlockChain technology through the use of public Blockchain called Ethereum and smart contract along with a distributed peer to peer storage called IPFS to store the documents. Since the current traditional process of issuing as well as verifying certificates is being digitized through this system, it is resulting in greater efficiency and increased security.

Advantages:

1. The proposed system provides the features of immutability, decentralization and tamper-proof documents which can be verified directly without the need of a third party.
2. The Blockchain technology allows the generation of e-certificates with unique hash values which are then further used to verify the certificates

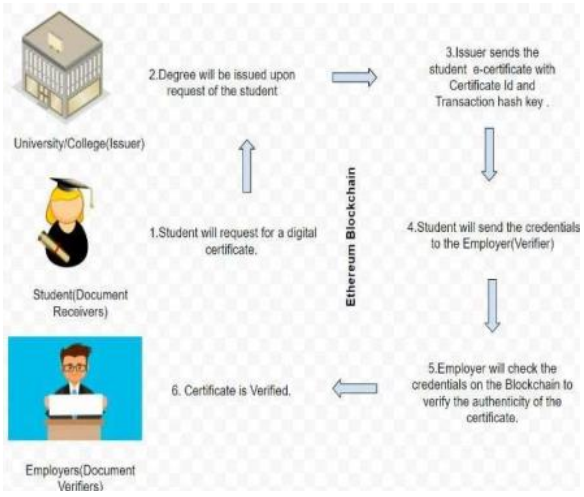

Fig 1 System Architecture

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4. IMPLEMENTATION

The blockchain that has been used here is a permissionless blockchain i.e., Ethereum. The public blockchain comes with a limitation of size, so the system will store the hash values of the data(certificates) on the blockchain within a transaction. The certificates will be stored on IPFS. The smart contract will be implemented using the language, Solidity. The University/college will login to a common platform and create a digital certificate corresponding to the details of the respective student for which the issuance request has been made. This system will generate a unique certificate ID/IPFS hash and a transaction hash value. The verifier can then verify the certificate through the transaction hash value or the Certificate ID. The following figure shows the overall design of our proposed system.

The proposed system takes three kinds of users-

1) Universities/Colleges acting as Issuers: The University/College will generate the digital certificate based on some details of the student. A unique Certificate Id and Transaction hash value would be generated and the e-certificate with these details would be given to the student.

2) Students acting as Document/Degree Receivers: The students will receive their e-certificate having the Certificate ID/IPFS hash and Transaction hash value.

3) Employers acting as Document Verifiers: The recruiter can verify the proof of existence and proof of authenticity of the certificates of the student either by Certificate Id or Transaction Hash in a matter of few minutes.

The first user i.e. the Document Issuer collects the information of the student such as Name, College ID,Course Name and registers the student by submitting the information received on a platform which enables the Issuer to create a user profile for the student(Document Receiver) as well as sign the certificate and store it on Document Management System (IPFS) while storing its hash value on the Blockchain. This profile will contain all the certificates of the students. Later on ,an E-certificate can be shared with the Document verifier who wants to verify the documents.

5. EXPERIMENTAL RESULTS

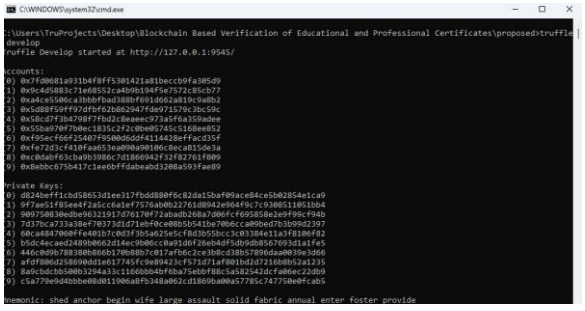

Fig 2 Hosting blockchain on the localhost

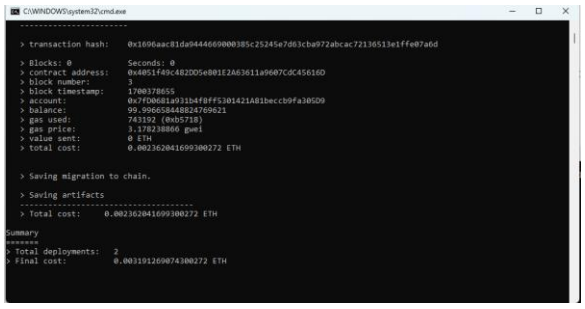

Fig 3 Compiling the smart contract file

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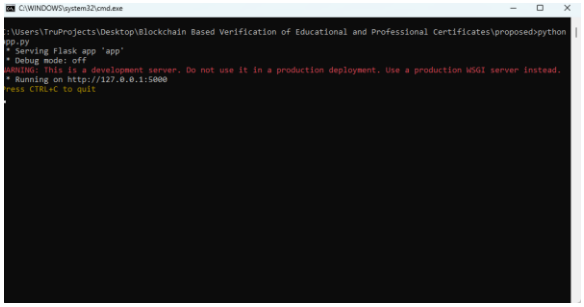

Fig 4 Hosting Flask Server

Fig 5 University will register

Fig 6 University registration task completed

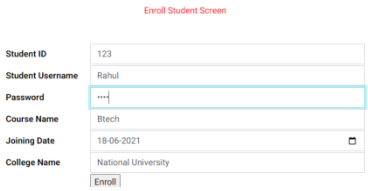

Fig 7 Student Will Register

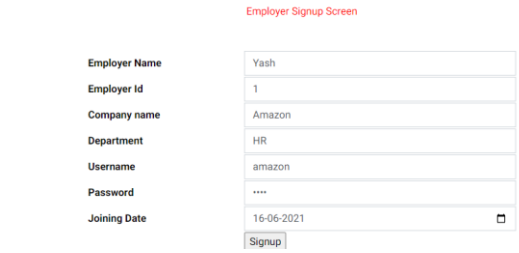

Fig 8 Employer will Register

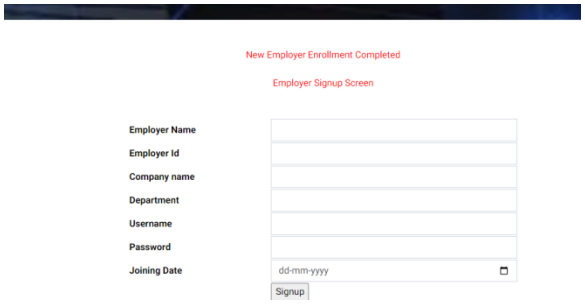

Fig 9 Employer enrollment completed

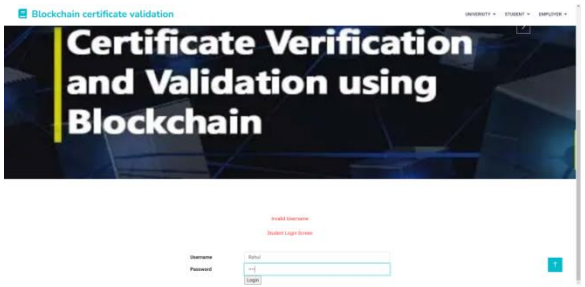

Fig 10 Student will login

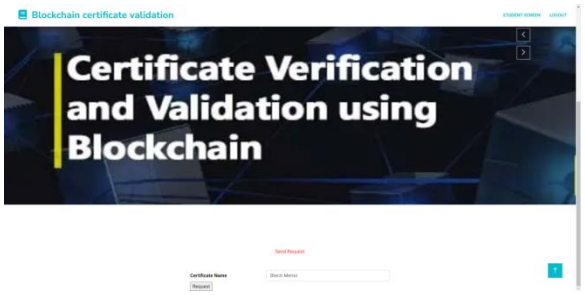

Fig 11 request screen

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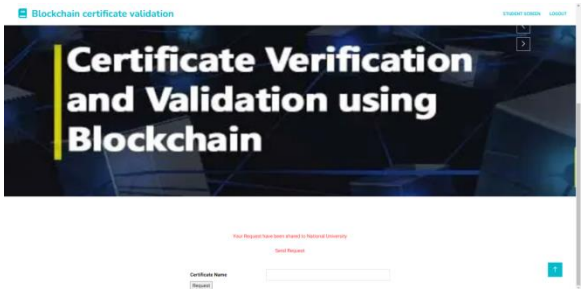

Fig 12 Student send the request certificate

Fig 13 University will login

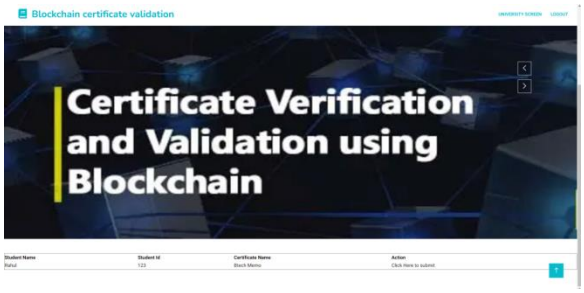

Fig 14 University send certificate

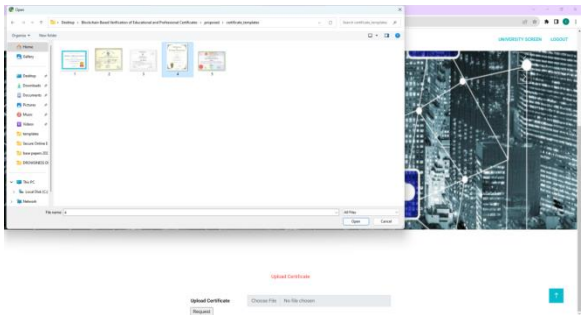

Fig 15 Upload certificate

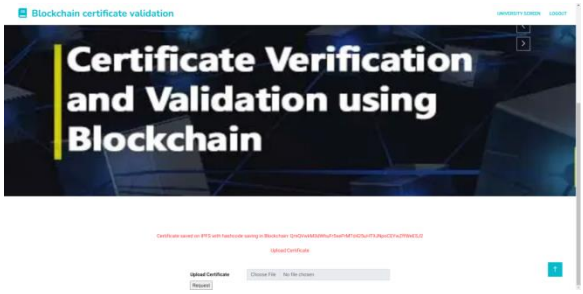

Fig 17 Certificate uploaded successfully

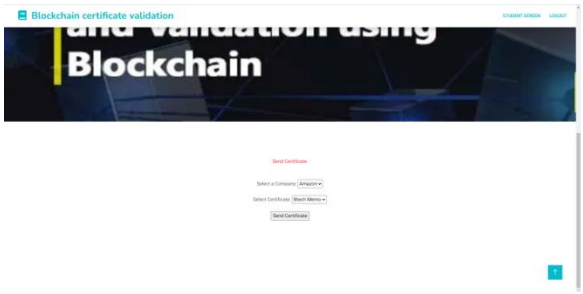

Fig 18 Student Can Login and send the certificate to employer

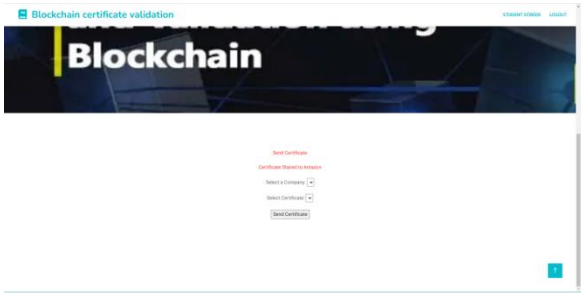

Fig 19 Certificate shared to employer

Fig 20 Employer will login

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Fig 21 Employer can see the certificate

6. CONCLUSION

This paper has solved two main shortcomings in the existing method of certificate issuance and verification by the concerned parties in the field of education. The proposed system provides the features of immutability, decentralization and tamper-proof documents which can be verified directly without the need of a third party. Firstly, the scam of fraud certificates since in Blockchain it is easy to trace back the transactions and secondly, this method is faster as compared to the existing method involving paper certificates. The Blockchain technology allows the generation of e-certificates with unique hash values which are then further used to verify the certificates. The unique hash values corresponding to each certificate makes this system more secure and forgery proof.

7. FUTURE WORK

The proposed system will provide an application which can generate and verify the certificates in very less time. A new functionality of QR code can also be added in place of Certificate ID and Transaction Hash in the future to enhance the experience.

REFERENCES

[1] “8 Use Cases Of Blockchain In Education - TruScholar.” https://www.truscholar.io/8-use-cases-of-blockchain-ineducation/ (accessed Jun. 25, 2022).

[2] “The Cost of a Bad Hire to Your Business.” https://resources.careerbuilder.com/recruiting-solutions/howmuch-is-that-bad-hire-costing-your-business (accessed Jun.25, 2022).

[3] P. Attewell and T. Domina, “Educational imposters and fake degrees,” Research in Social Stratification and Mobility, vol. 29, no. 1, 2011, doi: 10.1016/j.rssm.2010.12.004.

[4] “Dean at M.I.T. Resigns”, Accessed: Jun. 25, 2022. [Online]. Available: http://www.nytimes.com/2007/04/27/us/27mit.html

[5] “Judge Jenny Lind Aldecoa-Delorino v. Marilyn de Castro Remigio-Versoza. A.M. No. P-08-2433., Supreme Court of the Philippines, September 25, 2009, ”, [Online]. Available: http://sc.judiciary.gov.ph/jurisprudence/2009/september2009/ P-08-2433 .htm

[6] G. A. Phillips, “Degree Mills: The Billion-Dollar IndustryThat Has Sold Over a Million Fake Diplomas by Allen Ezell, John Bear (review),” The Review of Higher Education, vol. 37, no. 2, pp. 282–284, 2014, doi: 10.1353/RHE.2014.0002.

[7] “University of Nicosia Issues Block-Chain Verified Certificates.” https://www.coindesk.com/markets/2014/09/16/university-ofnicosia-issues-block-chain-verified-certificates/ (accessed Jun. 25, 2022).

[8] R. Arenas and P. Fernandez, “CredenceLedger: A Permissioned Blockchain for Verifiable Academic

ISSN 2347–3657

Volume 12, Issue 2, 2024

Credentials," 2018 IEEE International Conference on Engineering, Technology and Innovation, ICE/ITMC 2018 - Proceedings, Aug. 2018, doi: 10.1109/ICE.2018.8436324.

[9] M. Oliver, J. Moreno, G. Prieto, and D. Benítez, Using blockchain as a tool for tracking and verification of official degrees : business model. Trento: Trento : International Telecommunications Society, 2018.

[10] T. Kanan, A. T. Obaidat, and M. Al-Lahham, "SmartCertBlockChain Imperative for Educational Certificates," 2019 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology, JEEIT 2019 - Proceedings, pp. 629–633, May 2019, doi: 10.1109/JEEIT.2019.8717505.

[11] J. C. Cheng, N. Y. Lee, C. Chi, and Y. H. Chen, "Blockchain and smart contract for digital certificate," Proceedings of 4th IEEE International Conference on Applied System Innovation 2018, ICASI 2018, pp. 1046–1051, Jun. 2018, doi: 10.1109/ICASI.2018.8394455.

[12] A. El-Dorry, M. Reda, S. A. el Khalek, S. El-Din Mohamed, R. Mohamed, and A. Nabil, "Egyptian Universities Digital Certificate Verification Model Using Blockchain," ACM International Conference Proceeding Series, pp. 79–83, Nov. 2020, doi: 10.1145/3436829.3436864.