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Adoption of Blockchain Technology in Education: Application & its Challenges

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Abstract: ***Blockchain Technology has other applications outside of Bitcoin. This technology has the potential to be used in a variety of industries, including education, finance, insurance, healthcare etc. This article not only provides a broad overview of Blockchain Technology, but also provides descriptions of how it could be used in educational institutions. School records management, such as validation and transfer of student transcripts, degrees, test scores and records, including those related to college admissions; educator credentialing/certification/re-certification; management and tracking of school assets, such as buses, library books; management of student privacy and parental permissions.***
Keywords: Blockchain Technology, Management, Education, Applications, Challenges.

I. INTRODUCTION

In 2008, someone using the pseudonym Satoshi Nakamoto proposed the ideas of blockchain while describing how cryptography and an open distributed system work. All blockchains have distributed and decentralized programs at their very core. Blockchains can be thought of as a decentralized, unchangeable database that keeps track of every transaction ever made and shares that information with all parties involved [1]. The Bitcoin protocol served as the foundation for the first blockchain implementation. An encrypted distributed ledger is used to record transactions and blocks. There are two types of transactions: those that have not yet been completed and those that have been completed but have not yet been added to the blocks of the main chain. To begin, a root block is created. Each block contains a collection of transactions that will be added to the distributed ledger with a proper time stamp. Through mining, which involves an intense competition and a lot of computer work, new transactions are validated and added to the main chain, thus forming new blocks [2]. here are three types of blocks in Bitcoin transactions: orphan blocks, blocks on the main chain carrying encrypted confirmed transactions, and blocks related to the main chain but excluding (not connected with blocks from the main chain).With the exception of the orphan blocks, the first two categories are represented in a directed rooted tree with ties to the root (via a prior pointer). The rooted tree eventually leads to the blockchain, which is a back-linked list of transactions constructed using hash pointers from a technical perspective [4]. Every block is identified by its unique cryptographic signature. The network participating in blockchain technology maintains a private/public key infrastructure.

There are many uses for blockchain technology across many industries, but in this paper, the focus will be on possible applications in the education sector. The development of a safe and open system for monitoring and confirming academic records will be aided by this technology. It contributes to better access to educational resources by establishing a decentralized system for exchanging study guides, classes, notes, etc. It will assist in developing a system with improved security for exchanging student data, thereby lowering the issue of data breaches. It can be used for creating and issuing digital credential that are verifiable, secure, and non-fragile. Additionally, this technology will aid in the development of a more effective system for scheduling, course registration. and allowing educators to easily manage their course offerings.

II. ECOSYSTEM OF BLOCKCHAIN



Fig. 1: Blockchain Ecosystem

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An ecosystem of Blockchain Technology in education sector might include the following:

1) Educational institutions: These could be schools, universities, or other organizations that offer educational programs and courses.
2) Students: Individuals who are enrolled in educational programmses and courses offered by educational institutions.
3) Teachers and educators: Individuals who are responsible for delivering educational content and providing guidance to students.
4) Learning management systems: These are digital platforms that facilitate the delivery of educational content and support communication and collaboration between students, teachers, and educators.
5) Educational content providers: These are organizations or individuals that create and distribute educational materials, such as textbooks, videos, and other resources.
6) Assessment and accreditation organizations: These are organizations that are responsible for evaluating the quality of educational programs and awarding accreditation to educational institutions that meet certain standards.
7) Employers: These are organizations that hire individuals who have completed educational programs and have the necessary skills and knowledge for a particular job or role.
8) Government agencies: These are organizations that regulate and oversee the education sector, such as the University Grant Commission, Ministry of Education.
9) Professional associations: These are organizations that represent and support professionals in a particular field, such as the Indian Medical Association, All India Council for Technical Education, etc.

III. POTENTIAL OF BLOCKCHAIN IN DIFFERENT FIELDS

Data security and data protection, even in the event of a compromised node, are two main advantages of using blockchain in education. During the epidemic, the education industry quickly reacted to digitalization [3]. Blockchain technology has the potential to revolutionize the education sector. Blockchain can, first and foremost, significantly alter how students and teachers collaborate and handle academic data [5]. Blockchain's distributed ledger technology has the potential to have a positive, major impact on the transparency and accountability of the education sector [3]. Let's investigate how blockchain can impact education. The education sector is ripe for disruption as the world becomes more and more technologically savvy. We have benefited from the EdTech sector over the years. The modernization of education has advanced due to this pattern. The time has come for blockchain technology to significantly accelerate the process. Blockchain distributed ledger technology, artificial intelligence (AI), and machine learning are increasingly replacing textbooks.

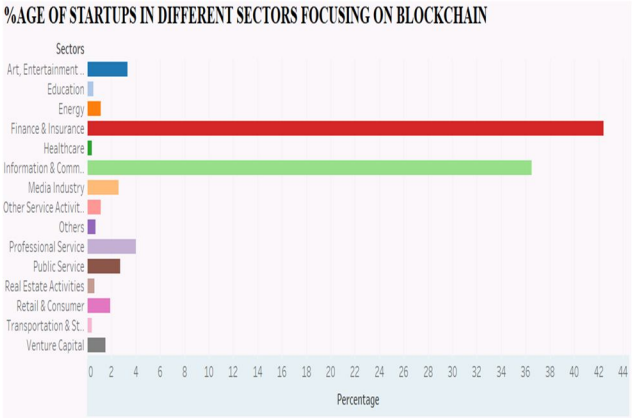


Fig.2: Percentage of start-ups in the different sector focusing on Blockchain

According to a 2019 report, Blockchain start-ups are becoming increasingly popular in a variety of industries, including finance, healthcare, supply chain management, agriculture, etc. Since blockchain technology was initially developed as the foundation for Bitcoin, a digital currency, the majority of start-ups are in the financial sector. For transaction verification and tracking, the financial sector needs a system that is more secure and transparent. The other reason is that only the financial industry has the necessary funding and resources to develop this technology. The remaining start-ups are spread across a variety of industries, such as energy, education, real estate, transportation, and healthcare.

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IV. IMPACT OF BLOCKCHAIN TECHNOLOGY IN THE EDUCATION SECTOR

There are numerous ways by which blockchain technology can revolutionize the education sector in different field:

A. Smart Contracts for Assignments and Courses

Blockchains frequently use smart contracts. This can help teachers create blockchain-based courses and classes. Once the prerequisite conditions are met, the course will begin automatically and can continue at its own pace [6]. Students and teachers can both sign a smart contract outlining the requirements of an assignment, as well as the due date and marking deadline.

B. Authenticity of Paperwork and Degrees

The immutable ledger technology of blockchain produces a timeline of recent events. This can be useful for providing a detailed report card, tracking attendance and informing students and stakeholders about their progress [4,5,6]. Students can submit their work using blockchain without having to worry about losing them and their work will remain unique. Additionally, students can now acquire their certificates and degrees digitally rather than on a fragile paper. The advantages of digital degrees and certificates include their convenience, organisation, quick and lack of burden.

C. Incentivization Of Education

One of the most significant use cases for blockchain is cryptocurrency and tokenization. In the near future, professors will be able to motivate students by offering them coin rewards if they perform well or complete a particular major [6]. Additionally, the teaching-learning process may be permanently altered by the gamification element of the tokenization teaching style [4]. Students who perform well in an exam or submit their work on time can be rewarded, which is a great motivator for them to score well and submit their work on time.

D. Grant Access

In addition to promoting lifelong learning, blockchain technology can enable access to publicly available, freely used, and distributable educational resources such as books, courses, and notes [5]. The resources can be shared publicly in an affordable and safe way. his technology aids in reaching out to students in remote parts of the world, allowing them to take courses and exams digitally. This technology also benefits teachers to grade their students directly on the blockchain.

E. Streamlining fees payment

The Tuition's fee payment for students is a difficult and drawn-out procedure. Blockchain, on the other hand, will be useful in streamlining this process, resulting in lower administrative costs and perhaps even reduced tuition rates as blockchain technology establish a decentralized ledger for payments [4]. This ledger can help reduce operational costs and bring two institutions closer together by speeding up the process of real-time transactions.

F. Identity and Student Records

Safe management of all information pertaining to a student who has registered for a study programme [4,5]. Discovering learning patterns, enhancing training, which in turn helps in creating new learning models, will be the main objectives of innovative schooling. A graph of learning exchanges as well as information on individual courses may be included in the ledger.

V. CHALLENGES OF ADOPTING BLOCKCHAIN TECHNOLOGY IN EDUCATION

There are various challenges encountered while using blockchain technology in education sector.

1) Scalability is affected by an increase in transaction volume, which causes an increase in block size, which increases transaction latency [7, 9].
2) The cost required to adopt the technology is very high. The expense of processing power, the cost of changing the current infrastructure, the cost of handling massive amounts of data etc. that come with using this technology [7,8,11].
3) The blockchain still has issues with poor usability, complex settings, and poor data management, which will make educational institutions hesitant to put their data on it. [10,11].
4) Mutability will be problematic because immutability may make it challenging for institutions to implement new information storage regulations.

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5) There is also an issue with latency and complexity as blockchain uses hashing which is very complex and requires a great deal of computational power to crack making it a very long and time-consuming process [10].
6) Adoption and awareness of blockchain technology are also significant barriers, because in order to adopt this technology, all current infrastructure must be changed, and even after switching to this technology, the majority of people will be unable to use it.
7) Due to a lack of regulation and stringent legislation, user security and privacy are a challenge, which could result in an uptick in criminal activity and a higher risk of scams due to the proliferation of fraudulent blockchain projects [7,10,11].

VI. LITERATURE REVIEW

There are numerous ways by which blockchain technology can revolutionize the education sector in different fields:

1) The paper [6] in which Pratima Sharma and Et al. gives an organised and overall overview of current smart contract applications. Describe the difficulties with blockchain-based smart contracts. Parameters: it provides an overview of smart contract enablement applications. Smart contracts are fast expanding, but a number of challenges have to be addressed such as Identifying and addressing these vulnerabilities is critical for smart contract development. This research will outline best practises for developing secure and dependable smart contract apps.
2) The paper [11] gives an In-depth discussion of the use of blockchain technology in network ideological and political education at universities is provided in this article, along with a practical discussion of how application scenarios should be constructed. Performance Parameters: This paper outlines that in order to create a fundamental foundation of the application scenario model that is to integrate the network conceptual practise in colleges and universities with the blockchain technology platform.
3) The paper [1] where Satoshi Nakamoto offers a complete overview of a peer-to-peer network as a solution to the double-spending issue. By hashing transactions into an ongoing chain of proof-of-work, transactions are timestamped. Nodes can leave and re-join the network at will, and messages are broadcast using their best efforts. Performance Parameters: A peer-to-peer network that records a public history of transactions using proof-of-work. The network's unstructured simplicity makes it robust and secure. Nodes are free to join and leave the network as they want, accepting the chain as evidence of what transpired while they were absent. The network itself needs very little structure.
4) The paper [10] where Wei Cai and Et al. provide an overview of creation of blockchain systems in order to demonstrate the significance of decentralised applications (dApps) and the future value of blockchain. the most recent dApps and discuss the future of blockchain development to meet the desired characteristics of dApps. Performance Parameters: Blockchain systems uses consensus models, P2P networking and cryptography technologies to create the foundations for decentralised applications. In this article, we've reviewed the development of blockchain technology and clarified its nomenclature.
5) The paper [3], where. Victoria L. Lemieux offers a description on Blockchain and distributed ledger technology guarantee trustworthy and immutable records in a broad range of records management use cases, including real estate and healthcare. Performance Parameters: It contributes to the development of a useful framework for evaluating blockchain-based record keeping systems that claim to provide trusted, immutable records. Understanding the flaws can lead to the development of improvements that address gaps in this innovative new suite of technologies.

VII. CASE STUDIES

There are few case studies where the blockchain technology is used:

1) Early adopters of blockchain technology in education include the Massachusetts Institute of Technology (MIT). In order to explore the potential uses of blockchain technology in education, such as developing safe and open systems for monitoring and confirming academic records, MIT launched the MIT Bitcoin Project in 2015.
2) A blockchain-based system for issuing and verifying digital credentials, such as degrees and certificates, has been implemented by the University of Melbourne. Additionally, the university has created a blockchain platform for exchanging and disseminating educational materials like lectures and articles.
3) At Peking University in China, a blockchain-based system has been implemented to manage and track academic records like transcripts and grades. The university also used blockchain technology to develop "red envelopes," a digital currency that is accessible to faculty and students in the university's community..

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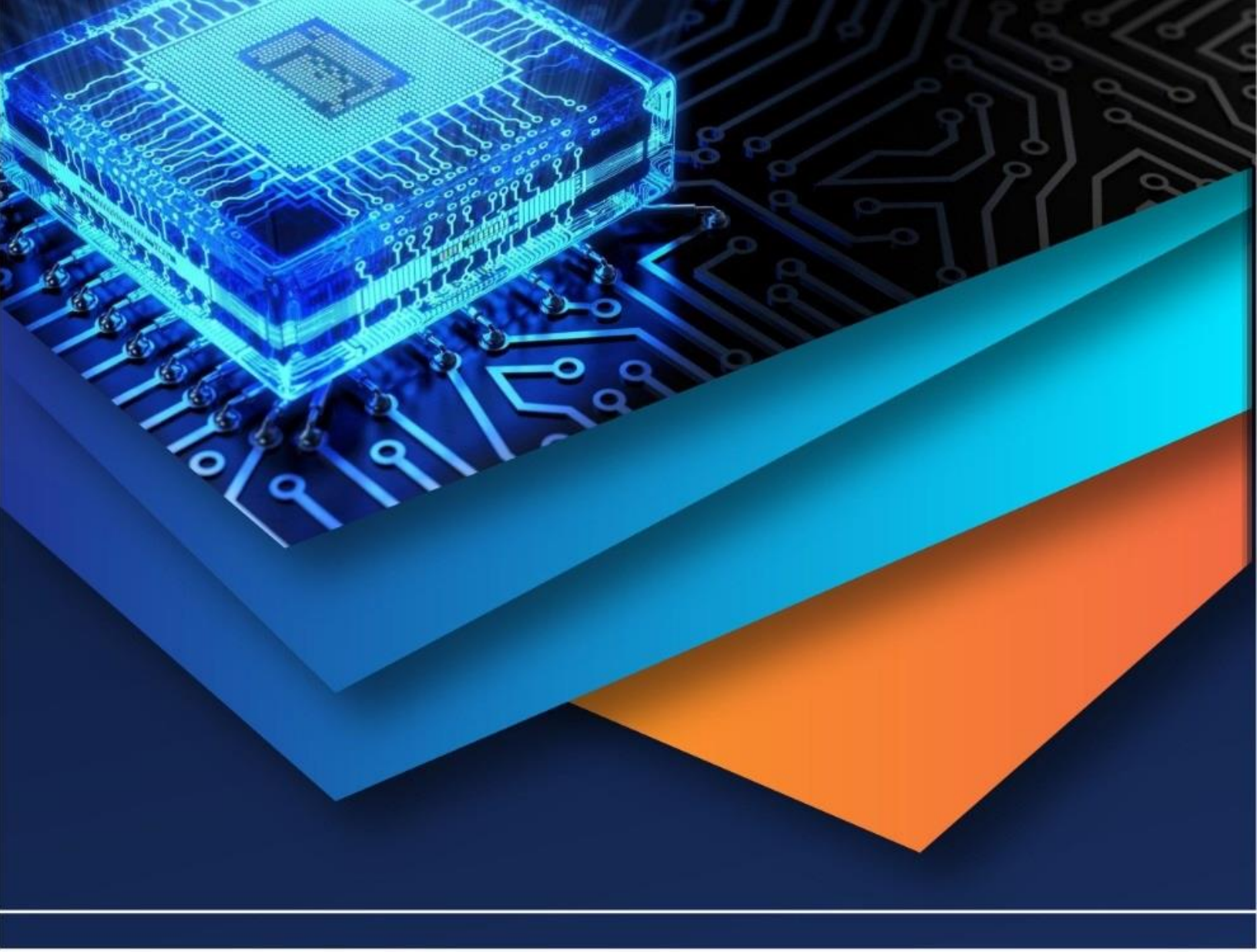
VIII.CONCLUSION

An overview of blockchain technology and information on using it in education were provided in this paper. The advantages of using this technology include the secure and open record-keeping system it offers, which helps to ensure the validity of the credentials. The student data is given greater privacy and security. The lack of understanding and knowledge about the blockchain, the high cost of implementing and using this technology, regulatory and legal concerns are challenges that come along with the benefits.

The development of a more user friendly and intuitive platform so that it gets more widely adopted and Integration with technologies such as Artificial Intelligence, Internet of Things, etc. are the potential areas for research. Future generations and the problems to be solved will be greatly benefited by the use of blockchain in the education sector.

REFERENCES

[1] https://bitcoin.org/bitcoin.pdf
[2] Exploring blockchain technology and its potential applications for education, Guang Chen, Bing Xu, Manli Lu & Nian-Shing Chen
[3] Blockchain and Distributed Ledgers as Trusted Recordkeeping Systems, Victoria L. Lemieux
[4] 5 Ways Blockchain Impacts The Education Industry In 2022 And Beyond,Amit Purohit
[5] A review of smart contract-based platforms, applications, and challenges, Pratima Sharma • Rajni Jindal • Malaya Dutta Borah
[6] Gabrielli, S.; Rizzi, S.; Mayora, O.; More, S.; Pérez Baun, J.C.; Vandevelde, W. Multidimensional study on users' evaluation of the KRAKEN personal data sharing platform. Appl. Sci. 2022, 12, 3270
[7] Raimundo, R.; Rosário, A. Blockchain system in the higher education. Eur. J. Investig. Health Psychol. Educ. 2021, 11, 276–293
[8] Park, J. Promises and challenges of Blockchain in education. Smart Learn. Environ. 2021, 8, 1–13
[9] Rahardja, U.; Hidayanto, A.N.; Hariguna, T.; Aini, Q. Design framework on tertiary education system in Indonesia using blockchain technology. In Proceedings of the 2019 7th International Conference on Cyber and IT Service Management (CITSM), Jakarta, Indonedia, 6–9 November 2019; Volume 7, pp. 1–4
[10] Decentralized Applications: The Blockchain-Empowered Software SystemWEI CAI, (Member, IEEE), ZEHUA WANG, (Member, IEEE), JASON B. ERNST3, (Member, IEEE), ZHEN HONG, (Student Member, IEEE), CHEN FENG4, (Member, IEEE), and VICTORC.M. LEUNG2, (Fellow, IEEE)
[11] J. Xie, Y. Qiao, X. Huyan, F. Yang and S. Qiao, "Application of Blockchain in College Network Ideological and Political Education," 2022 International Conference on Computer Network, Electronic and
Automation (ICCNEA), 2022, pp. 168-173, doi: 10.1109/ICCNEA57056.2022.00046.



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