BLOCKCHAIN TECHONOLGY

Abstract

Traditional storage systems in educational institutions often suffer from issues such as data security, data tampering risks, limited access, and inefficient scaling. These limitations hinder effective storage and management of academic records, leading to operational inefficiencies and potential data breaches. To overcome this problem, we are going to combine blockchain to create a secure, transparent, and scalable data management framework for educational institutions. Blockchain technology provides data immutability, traceability, and cryptographic protection, while blockchain offers flexibility, accessibility, and cost efficiency. Blockchain technology has the potential to transform data management in education. This overcomes the limitations of traditional storage systems and provides a secure, transparent, and efficient solution for storing and managing academic archives. As educational institutions look to modernize their data practices, this study provides valuable insights into the adoption of blockchain to create more secure education data ecosystem.

Keywords: Traditional storage, Blockchain, Working of Blockchain, Public Blockchain, Private Blockchain, Hybrid Blockchain, Consortium blockchain.

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I. INTRODUCTION

Satoshi Nakamoto presented blockchain as a dispersed blockchain with the concept of a "peer-to-peer electronic instalment system". It has made a more secure system and its system incorporates a bunch of computers associated to a break-even point with rights and commitments. to plan data, moreover known as p2p organize (peer-to-peer organize). When blockchain showed up, it got to be the spine of cryptography. With this advancement, you may be able to guarantee tall security of your data. Blockchain innovation gives numerous administrations to this tremendous computerized world. blockchain is vital in different sections such as cybersecurity, government, finance-banking, pharmaceutical, publicizing, etc[1]. The development motto of blockchain is to supply secure, basic and secret trades. The esteem of assets and approaching cars is considered trade. Mechanized exchange can take put utilizing strict contracts within the blockchain. It analyses the improvement of exchanges. It could be a changeless and constant organize. Exchanges shape a set of comparative assignments that are considered single activities overseen utilizing blockchain innovation. In later a long time, blockchain has pulled in consideration in numerous diverse businesses. The utilize of blockchain has extended past advanced monetary standards since it was presented as an innovation for Bitcoin. Exchanges on the computer arrange are followed by the blockchain, and these exchanges are gathered into pieces where each piece is connected to the last piece. The decentralized nature of blockchain moves forward the security and straightforwardness of exchanges in computer systems. Keen contracts diminish the require for middle people made conceivable by blockchain innovation. Blockchain innovation is continually advancing and its full extend of applications and impacts are continually being investigated [2]. Its capacity to supply security, straightforwardness, and decentralization can disturb conventional frameworks and forms, changing businesses and the way we transact and share data in the modern age advanced.

II. PROBLEM STATEMENT

In the education sector, there's continuously a require for a secure and productive framework. The essential issues in traditional storages are information security, security, judgment and credential confirmation etc. Organizations monitoring large amounts of sensitive information processed by traditional capacity systems can provide unauthorized access and pose a privacy threat and security. Instruction records and data are often distributed across different systems, creating a need for interoperability. A standardized and secure system is required to facilitate data sharing and collaboration while maintaining ownership and control of the data. Manually verifying certifications can be time-consuming, so automatic verification is important. The biggest constraint in education is financial management. Addressing these challenges by blockchain development will benefit the education sector by creating a secure, clear, useful, and organic framework for managing teacher data and certification. You can start a revolution. The system ensures persuasion, openness, and relevance while protecting privacy and judgment. Traditional capacity frameworks can be costly compared to blockchain. To solve these problems, blockchain finds a solution in command segments by providing computerized confirmations that reduce manual forms and improve security. Additionally, we recognize the potential for extortion. With the help of blockchain innovation, you will be able to manage your information and get highlights.

III. BLOCKCHAIN

Blockchain is a computer network-based method of recording transactions. While it was initially created to promote cryptocurrencies, like bitcoin its usage has expanded beyond finance. Blockchain, often referred to as a "blockchain" function as a trusted digital record book that goes beyond managing money. It is revolutionizing our perception of trust and record keeping in the realm.

The applications of technology extend beyond cryptocurrencies. It finds utility in supply chain management, healthcare, voting systems, identity verification and more. Its greatest value lies in situations where transparency, security and trusted paramount.

In contrast to centralized systems where a single entity such as a bank or government controls and maintains a ledger blockchain operates on a decentralized network of computers known as nodes [3]. These nodes collaborate to validate and record transactions while ensuring that no single party holds control, over the system.

IV. WORKING OF BLOCKCHAIN

Blockchain is storing of digital data in a secure manner. The decentralized ledger and peer-to-peer network improve the confidentiality of blockchain. On a blockchain network, two nodes can exchange data while the network itself verifies the data's legitimacy. A new block is created following several transactions and is then added to the blockchain network with the help of nodes. Proof-of-work is the procedure used to add a block. Verifying the block's computational strength is a component of proof of work. A node needs to have strong processing capability to complete the procedure. A node receives a hash value after successfully solving the mathematical challenge. The mathematical puzzle is permanently added to the network as more and more individuals crack it. The incentive for figuring out the mathematical conundrum was given to it in the form of cryptocurrency. The hashing process adds each new block to the one before it. Blockchain is more secure as a result of this procedure, which assigns a special number to each block.

To understand the working and operation of blockchain let us take of example of bitcoin that still works[7,12]. Below are the few steps to be followed for transaction in blockchain network

1. As an example, consider Ramesh and Suresh, two nodes in a blockchain network. Ramesh wants to securely give Suresh 10 bitcoins. Public and private key encryption techniques double-encrypt the data that will be shared. Public and private keys are given to Suresh and Ramesh.
2. After the network's nodes have all undergone encryption verification. Verifications such as whether they are both registered members, whether Ramesh has enough bitcoins, etc.
3. Numerous transactions are validated simultaneously. A mem pool stores these transactions and several mem pools combine to make a new block. One million transactions can fit in one block at most.
4. The network's security would be compromised by the addition of a freshly generated block. In order to add the freshly formed block to the blockchain network, a specific procedure must be followed. The proof-of-work procedure confirms the block's

authenticity, and the hash code is formed by resolving a system-made mathematical challenge. To add to the blockchain network, this particular hash is required. The goal value, which represents the server-set level of difficulty, is assigned to the node by the server. The hash value must satisfy the target value's requirements and be less than the target threshold. The previous block's hash value and the nonce integer, which is a number used only once, are needed to calculate a node's hash value. For a particular node, the desired hash value is obtained using a random integer number. To determine the proper hash value for a given node, the nonce value must be continuously changed. The SHA-256 hashing algorithm is used to create the right hash value for the particular node when the correct nonce value and preceding hash block are identified. The blockchain network accepts a block and adds it. When a node completes the proof-of-work procedure successfully, it is rewarded with bitcoins. There is no other way to create bitcoins.

5. A freshly constructed block is added to the network with other blocks when it receives its distinct hash value and is verified by proof-of-work. It only takes place when the deal is done. Ramesh will give Suresh 10 bitcoins.
6. After the transfer, the information is saved on the blockchain. Anyone in the blockchain network has access to the transaction data.

V. TYPES OF BLOCKCHAIN

1. Public Blockchain

The primary sort of blockchain technology is public blockchain(Figure-1). Usually, cryptocurrencies like Bitcoin began and made a difference in popularizing dispersed record innovation (DLT). Open blockchain addresses the issues related to centralization, such as decreased security and straightforwardness. DLT does not store data in a single area, but or maybe disseminate it over a peer-to-peer network. Its decentralized nature requires the implication of confirming data authenticity. Typically accomplished through an agreement calculation, where members within the blockchain concur on the current state of the record. Two common agreement strategies are confirmation of work (PoW) and verification of stake (PoS).

Figure 1: Public Blockchain

2. Private Blockchain

A private blockchain(Figure-2) may be a confined and permission-based blockchain that works inside a closed organization. It is commonly utilized inside organizations, where particular individuals are members of the blockchain. This sort of blockchain is perfect for ventures and businesses that need to use blockchain exclusively for internal purposes. The most significant distinction between open and private blockchains is that the former is profoundly open to the public, whereas the latter is restricted to a specific group of individuals. Also, a private blockchain is more centralized because it is kept up by a single specialist. Illustrations of private blockchains incorporate Corda, Hyperledger Texture, Hyperledger Sawtooth, and Corda.

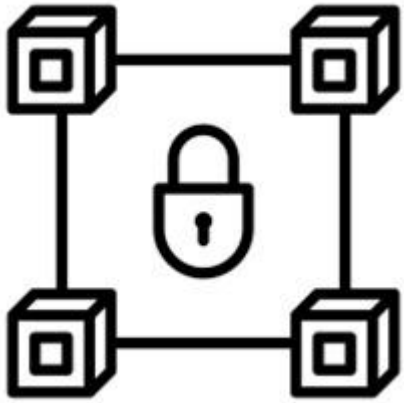

Figure 2: Private Blockchain

3. Hybrid Blockchain

Hybrid blockchain (Figure 3) is a unique type of blockchain that combines the functionality of public and private blockchains. Collaborate by combining public and private aspects. Blockchain is public, open, accessible and authenticated transaction data through a consensus mechanism. Once verified, the data will be stored on a private blockchain accessible only to authorized individuals. Figure 5 shows a hybrid blockchain

Figure 3: Hybrid Blockchain

4. Consortium Blockchain

The fourth sort of blockchain is called a consortium blockchain, also known as a unified blockchain. It offers similarities to a half-breed blockchain because it combines the highlights of both private and open blockchains. Be that as it may, it varies in that it includes numerous organizations collaborating on a decentralized arrangement. Essentially, a consortium blockchain may be a private blockchain with confined access to a particular group, which makes a difference in relieving the dangers related to a single substance controlling the arrangement in a private blockchain.

In a consortium blockchain (Figure 4), the agreement strategies are overseen by foreordained hubs. It incorporates a validator hub that initiates, gets, and approves exchanges. Part hubs have the capacity to get or start exchanges.

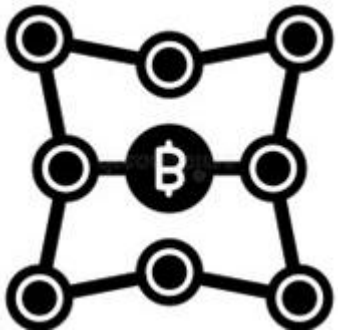

Figure 4: Consortium Blockchain

VI. ROLE OF BLOCKCHAIN IN THE EDUCATION SYSTEM

1. With blockchain, understudies may yield their assignments without stressing about losing them. Moreover, instead of accepting them on delicate paper, understudies can presently get their certificates and degrees carefully. The points of interest of advanced degrees and certificates incorporate their comfort, organization, and need of burden.[4]
2. Blockchain innovation has the control to convert this industry. The collaboration and administration of scholarly records between understudies and instructors can be considerably changed by blockchain, to begin with, and preeminent [5]. Blockchain's conveyed record innovation has the potential to have a positive, major effect on the straightforwardness and responsibility of the instruction segment.
3. Blockchain brings are decentralized capacity, the unchanging nature of put away data, traceability, and straightforwardness. The enhancements that blockchain innovation is making to instruction seem give openings for individuals from all foundations and countries.[6]
4. An assorted set of instructive archives, like recognitions, certificates, or qualifications, that directly require validators can be confirmed and kept on record consequently by blockchain. Once the predefined parameters are fulfilled, shrewd contracts fuelled by blockchain can handle all the work with moment, self-triggered endorsement of records.
5. It empowers understudies and learners to rapidly get to their records and safely share them with imminent bosses. Furthermore, it reduces the strain on managers because they now not have to be done difficult foundation checks to verify the applicant's

achievements. The great thing approximately it is that it remains intaglio in any case of outside issues.

6. Robotization has permitted teachers to free themselves from different regulatory obligations, secure workforce and understudy information from hacks with the assistance of blockchain cryptography, and cut regulatory costs by doing absent with go between.[11]
7. The technology's primary reason will be to safely store the information that has been recorded in a chain. Once it is put away, this information cannot be physically changed since it is ensured by cutting-edge encryption [10].
8. It is critical for teach to be additional cautious of the data and the way it is put away. Extra security measures like giving consents and more vigorous information encryption ought to be implemented for way better security.
9. Blockchain's permanent record innovation makes a chronological record of current occasions. This may work well for showing understudy transcripts, appearing a comprehensive report card, following participation, and informing understudies and partners of their advance. Students can turn in assignments utilizing blockchain without the fear of losing them. In expansion, understudies can get their degrees and recognitions carefully instead of on delicate paper. Advanced degrees and certificates are preferable because they are bother free, organized, and non-cumbersome.
10. Blockchain has the capacity and a monstrous undiscovered potential to alter the instructive environment by making unused, more open channels for learning and upending the current relationship between scholastic organizing and understudies. The up-and-coming eras will gigantically benefit from utilizing blockchain within the instruction sector.[9]
11. Understudy confirmation is getting to be a major concern at instruction premises, which are breached to form fake personalities and records. Thus, the more digitization of understudy data, the more concern to guarantee understudy protection.[8]
12. The confirmation prepare is constrained to the school or college level, and there are other employments. For illustration, protecting bosses against individuals who claim to have a degree but truly do not. Blockchain can be utilized as a solid weapon against fake capabilities and degrees at the workplace.

VII. ADVANTAGES OF USING BLOCKCHAIN IN EDUCATION SYSTEM

1. Blockchain gives a high level of security through cryptographic hashing and decentralized capacity. Educational records stored on a blockchain are safe from altering and extortion, ensuring the integrity of academic credentials.
2. Once data is recorded on a blockchain, it becomes permanent, meaning it cannot be changed or erased without agreement from the arrange. This kills the chance of unauthorized changes to scholastic records.[13]
3. Educational institutions and employers can effectively confirm the realness of scholarly accreditations by getting to the blockchain. This streamlines the confirmation handle and decreases the probability of credential extortion.
4. Blockchain empowers understudies to share particular data without uncovering their whole instructive history, improving information security and control.
5. Blockchain makes a difference in combating scholarly extortion, counting copyright, and cheating, by giving a secure and timestamped record of when assignments and exams are submitted.

6. Blockchain can make a long-lasting learning record for people, capturing their instructive accomplishments, certifications, and abilities obtained all through their lives. This encourages career headway and continuous learning.
7. In cases of grants, awards, or educational funding, blockchain can ensure transparent and productive distribution of funds, reducing the potential for misallocation or corruption.
8. Blockchain can help standardize academic records and certifications, making it easier for institutions and employers to obtain them and compare qualifications.
9. Blockchain systems are designed to be highly flexible and fault-tolerant, reducing the risk of information loss due to system errors or cyber-attacks.

VIII. DISADVANTAGES OF USING BLOCKCHAIN IN EDUCATION SYSTEM

1. As the volume of exchanges and information on the Blockchain increments, versatility gets to be challenging. The organize may moderate down, influencing preparing speed and effectiveness.
2. Joining blockchain innovation with existing instructive frameworks and stages can be challenging. Compatibility issues, information movement, and the require for preparing and bolster posture obstacles within the execution prepare [14, 15].
3. The far-reaching selection of blockchain innovation in instruction requires a social move and acknowledgment of modern forms and hones. Resistance to alter and a need of readiness to grasp unused innovations can obstruct the fruitful execution of Blockchain in instruction.
4. Adjusting straightforwardness with protection directions and guaranteeing information assurance can be complex. Administrative and legitimate contemplations Blockchain innovation in instruction may confront administrative and legitimate challenges, especially concerning information possession, mental property rights, and compliance with protection laws and controls.
5. In spite of the fact that it can spare cash in other ranges, embracing and actualizing unused innovation is costly. The fetched of computer control and the taken a toll of altering current foundation can rapidly heap up.

IX. CONCLUSION

Blockchain can give a decentralized and unchanging record to affirm and confirm the operations of your instructive institution this guarantees straightforwardness and diminishes the hazard of destructive capabilities making it less demanding to purport the group gets to be more able and flexible towards the bosses within the broken down environment blockchain advancement has numerous needs in instruction its utilize cases for data security testing and profound learning offer numerous benefits in spite of the fact that challenges such as adaptability integration must be taken under consideration and data security it is fundamental to carefully consider these challenges and work towards making practical and comprehensive blockchain courses of action that can really change instruction

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