APPLICATION OF BLOCKCHAIN IN HEIGHER EDUCATION: OPPORTUNITIES AND CHALLENGES

PERSPECTIVE OF SURGUJA DISTRICT

[1]Dr. Manisha Dewangan
Asst. Professor Dept. of computer Sciencee
Sant Gahira Guru VishwavidyalayaAmbikapur Surguja Chhattisgarh
[2] Mr. H.S.P. Tonde
HOD & Asst. Professor Dept. of computer Sciencee
Sant Gahira Guru VishwavidyalayaAmbikapur Surguja Chhattisgarh

Abstract: Block chain technology has a bigger application potential in the education sector with the modernization of the governance system and governance capabilities, although it is still at a low level. This will help to increase teaching effectiveness and education quality. Block chain technology has gained significant attention for its potential to revolutionize various industries, and higher education is no exception. This research paper explores the application of block chain in higher education, examining the opportunities it presents and the challenges that must be addressed for successful implementation in Surguja District. The paper investigates how block chain can enhance the transparency, security, and efficiency of academic processes, as well as its potential impact on credentialing, student data management, and collaboration among educational institutions of Surguja District.

Index Terms – **Block chain Technology, higher education, modernization of education**

1.INTRODUCTION

In this technical age, Block chain technology is drawing lot of attention from the research arena and academicians of the various universities worldwide. Block chain technology is a distributed ledger technology (DLT), or we can say that it's an open source distributed database, which is having the characteristics of immutable, transparent and integrity. Block chain technology concept was given by Satoshi Nakamato in 2008, pseudonymous person for removing the third party involvement in the transaction of currency [1]. It is a decentralization technique in which data is not residing in a single server system. it is distributed all over the network. It promotes consensus because it's a record-keeping platform. It's transparent because participants in the chain can download and validate individual ledgers. And it's permanent because those ledgers can't be altered [2]. The Gartner 2019 CIO Survey revealed that 2% of higher education respondents have already deployed block chain. Another 18% of respondents were planning to do so within the next 24 months. However, nearly half of respondents (47%) cited a lack of interest, and that number is up from just 37% in the 2018 survey [3].

2.DIFFERENCE BETWEEN CLIENT SERVER AND PEER TO PEER NETWORK

2.1. Architecture:

Client-Server: In a client-server architecture, the network is divided into two components: clients and servers. Clients are end-user devices (such as computers, smartphones, or tablets) that request services, and servers are dedicated machines that provide services or resources to clients.

2..2 Centralization:

Client-Server: Centralization is a key feature of client-server networks. Servers hold the primary role in managing resources, providing services, and controlling access. They act as centralized points of authority.

Peer-to-Peer: Peer-to-peer networks operate in a decentralized manner. There is no central server; instead, each peer has equal status and can communicate and share resources directly with other peers.

2.3. Resource Management:

Client-Server: Servers are responsible for resource management. They host and control resources such as files, databases, or applications. Clients request these resources from servers.

Peer-to-Peer: Resource management is distributed across all peers. Each peer can both request and provide resources, and there is no dedicated server for centralized control.

2.4. Performance:

Client-Server: Performance can be highly optimized in client-server networks, as servers are often powerful machines designed for handling multiple client requests simultaneously. This architecture is well-suited for scalable and efficient resource distribution.

Peer-to-Peer: Performance may be more variable as it depends on the capabilities of individual peers. However, peer-to-peer networks can be more resilient to failures since there is no single point of failure.

2.5. Scalability:

Client-Server: Scalability may require upgrading server hardware to handle an increasing number of client requests. The addition of clients does not necessarily improve the overall network's ability to handle more load.

Peer-to-Peer: Peer-to-peer networks can be more scalable as each peer contributes to the network's capacity. Adding more peers often leads to improved performance and scalability.

2.6. Security:

Client-Server: Security can be more easily enforced in client-server networks since access control and authentication mechanisms are centralized on servers.

Peer-to-Peer: Security can be more challenging to manage in peer-to-peer networks, as it relies on the security measures implemented on individual devices. However, the lack of a central point of control may make it more resilient against certain types of attacks.

Understanding these differences can help in selecting the appropriate network architecture based on the specific requirements and characteristics of a given system or application.
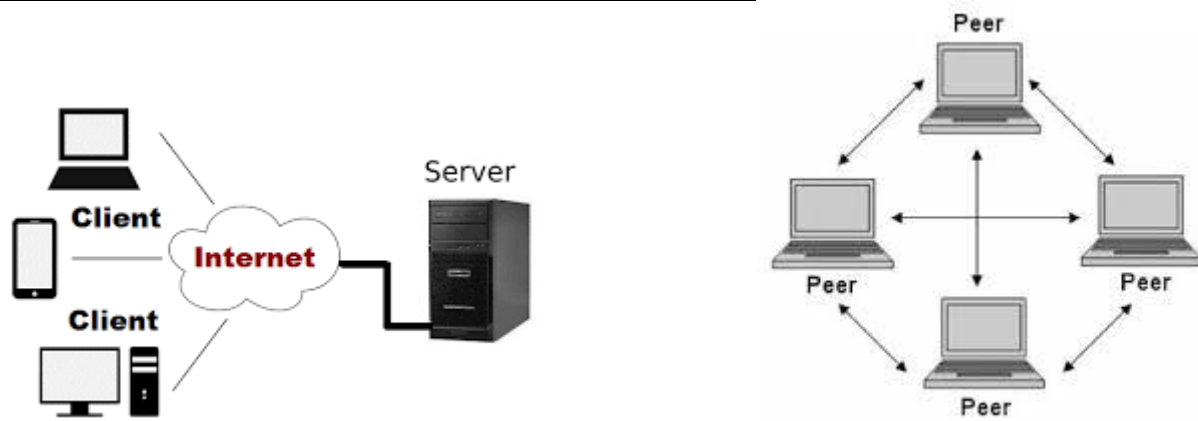
Figure:1 Different Between Client Server Architecture And peer to peer Architecture

As the above figure is showing the difference between the difference between traditional database system and this peer to peer network is that in the peer to peer network data is decentralized rather than in traditional database like its residing in the main server

3.ARCHITETURE OF BLOCK CHAIN WITH DATA STRUCTURE

A list of blocks containing transactions in a specific sequence serves as a representation of the structure of block chain technology. These lists can be kept in the form of a straightforward database or as a flat file (.txt) format.

A block chain system is often made up of several nodes, each of which holds a local copy of a ledger. The nodes in most systems are affiliated with distinct organizations. The nodes coordinate and validate transactions without the need for a central authority by speaking with one another to come to an agreement on the ledger's contents. Two vital data structures used in block chain include:

Pointers - variables that keep information about the location of another variable. Specifically, this is pointing to the position of another variable.

Linked lists - a sequence of blocks where each block has specific data and links to the following block with the help of a pointer [4].

Cryptographic Digital Signature: The public-key cryptography is used in block chain to generate a signature for Block chain transactions. Users carry out transactions by creating a digital signature using their private keys. Recipients in the block chain network verify the transaction using the public key of the sender to ensure that the transaction is indeed signed by the sender.

Distributed Ledger: Block chain use a distributed storage to record the transactions. In essence, all the platforms in the network store either all the transactions or a subset of transactions. All the nodes in the network come to a consensus (using a consensus algorithm) before entering the transactions into the ledger. This feature makes block chain effectively immutable.

Consensus algorithm: Block chain does not rely on a centralized server for verification and validation of transactions. Instead, block chain uses a peer-to-peer model, and all the decisions within the network are made by the participating members through a consensus protocol.[5].

4.BLOCK CHAIN TECHNOLOGY APPLICABILITY ITS OPPORTUNITIES IN THE HIGHER EDUCATIONAL

INSTITUTIONS IN SURGUJA

Blockchain technology has the potential to bring about significant positive changes in higher education institutions, offering various opportunities for improvement in processes, transparency, and security. Here are some key areas where blockchain technology can be applied in higher education:

Credential Verification and Management:

Opportunity: Blockchain can streamline the verification of academic credentials, degrees, and certifications. By storing educational achievements on a tamper-resistant ledger, employers and other institutions can easily verify the authenticity of an individual's qualifications.

Benefits: Reduces the risk of credential fraud, speeds up the hiring process, and enhances the overall credibility of academic qualifications.

Secure and Transparent Academic Records:

Opportunity: Blockchain can be used to maintain a secure and transparent ledger of academic records. Each student's achievements, including grades, coursework, and extracurricular activities, can be recorded in an immutable and easily verifiable way.

Benefits: Enhances data integrity, reduces the likelihood of data tampering, and provides students with greater control over their academic records.

Smart Contracts for Administrative Processes:

Opportunity: Smart contracts, self-executing contracts with predefined conditions, can be utilized for various administrative processes in higher education. This includes automated enrollment, fee payments, and contract execution between educational institutions and students.

Benefits: Increases efficiency, reduces administrative overhead, and minimizes the potential for errors in manual processes.

Global Collaboration and Credit Transfer:

Opportunity: Blockchain facilitates secure and efficient collaboration between educational institutions worldwide. It can also simplify the process of transferring credits between institutions by providing a transparent and traceable record of a student's academic history.

Benefits: Expands opportunities for international collaboration, encourages knowledge sharing, and streamlines credit transfer processes.

Decentralized Learning Platforms:

Opportunity: Blockchain can support the development of decentralized learning platforms where educational content, certificates, and achievements are stored securely. This can empower students to have more control over their learning journey.

Benefits: Promotes learner autonomy, reduces reliance on centralized platforms, and ensures the integrity of educational content.

Research and Intellectual Property Management:

Opportunity: Blockchain can be used to manage research data, publications, and intellectual property rights. This ensures the transparent and secure tracking of contributions, collaborations, and ownership in academic research.

Benefits: Mitigates issues related to plagiarism, provides a transparent record of research contributions, and streamlines intellectual property management.

Secure Payment Systems:

Opportunity: Blockchain can enhance the security and efficiency of payment systems within higher education institutions. This includes managing tuition fees, scholarships, and other financial transactions.

Benefits: Reduces the risk of fraud, ensures transparent financial transactions, and provides a secure environment for managing financial data.

Lifelong Learning Records:

Opportunity: Blockchain can support the creation of lifelong learning records, allowing individuals to maintain a comprehensive and verifiable record of their educational achievements throughout their careers.

Benefits: Encourages continuous learning, facilitates career development, and provides a holistic view of an individual's educational journey.

While there are numerous opportunities for applying blockchain technology in higher education, it's important to consider the challenges, including technical, regulatory, and institutional adoption hurdles. Additionally, the successful implementation of blockchain solutions requires collaboration among stakeholders and a commitment to overcoming potential barriers.

5. CHALLENGES

While blockchain technology presents several opportunities for improvement in higher education, it also comes with its set of challenges that need to be addressed for successful implementation in Surguja District. Here are some key challenges associated with integrating blockchain technology in higher educational institutions of Surga District:

Technical Challenges:

Scalability: The scalability of blockchain networks can be a concern, especially when dealing with a large number of transactions, users, and academic records. Ensuring that the blockchain infrastructure can handle the scale of a higher education system is a significant technical challenge.

Interoperability: Integration with existing systems and technologies within educational institutions can be challenging. Achieving interoperability between blockchain solutions and legacy systems is crucial for a seamless transition.

Regulatory and Legal Challenges:

Data Privacy and Protection: Educational records often contain sensitive and personally identifiable information. Adhering to data protection regulations and ensuring the privacy of student information are paramount. Institutions need to navigate legal frameworks such as GDPR, HIPAA, or FERPA, which can pose challenges.

Compliance with Existing Educational Standards: Blockchain solutions must align with established educational standards and regulations. Achieving compliance with accreditation bodies and educational authorities can be complex.

Institutional Adoption Challenges:

Resistance to Change: Educational institutions, with their established processes and systems, may face resistance to adopting new technologies. Faculty, staff, and administrators may be reluctant to embrace block chain due to unfamiliarity or concerns about disruptions.

Initial Implementation Costs: Implementing blockchain technology requires a financial investment in infrastructure, training, and development. Convincing institutions to allocate resources for these upfront costs can be a hurdle.

User Experience and Accessibility:

Usability: Blockchain systems should be user-friendly for both administrators and students. Complicated interfaces and processes can hinder adoption and create a barrier for users unfamiliar with blockchain technology.

Accessibility: Ensuring that all users, including those with disabilities, can access and benefit from blockchain-based applications is essential. Accessibility standards must be considered during the design and development phases.

Lack of Standards:

Standardization: The lack of standardized protocols and frameworks for implementing blockchain in education can lead to fragmentation. Developing industry-wide standards can facilitate interoperability and create a more cohesive ecosystem.

Security Concerns:

Smart Contract Vulnerabilities: Smart contracts, while powerful, can be vulnerable to security exploits if not developed and audited properly. Ensuring the security of smart contracts is critical to prevent unauthorized access or manipulation of academic records.

51% Attacks (for Proof-of-Work Blockchains): In the case of proof-of-work blockchains, the potential for a 51% attack, where a single entity controls the majority of the network's mining power, poses a security risk.

Educational Divide:

Access and Inclusivity: Blockchain technology relies on internet connectivity and technological infrastructure. Ensuring equal access to blockchain-based educational services across different regions and socio-economic backgrounds is a challenge.
Educational Ecosystem Integration:

Industry Collaboration:

Achieving widespread adoption may require collaboration with industries, governments, and other stakeholders. Ensuring that the blockchain solutions align with broader educational ecosystems and meet the needs of various stakeholders is crucial.

Addressing these challenges involves a multi-faceted approach, including technological advancements, regulatory frameworks, educational initiatives, and stakeholder collaboration. Successful implementation of blockchain technology in higher education requires careful consideration of these challenges to create solutions that are effective, secure, and widely accepted.

6. CONCLUSION:

We conclude that the application of block chain technology in the higher educational field in Surguja District is in the very complicated . It's very difficult to say something about it future.howeever it is very much secure ,safe unchangeable and easy for the user but there is no regulation or lack of regulatory makes it little risky for the inexperienced users. But if implemented with high infrastructure we may have the brightest results in the near future and can solve the main problem of third party involvement in the higher educational field for academics certification verification, offering online course etc.

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