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Education

ENHANCING EDUCATION USING BLOCKCHAIN TECHNOLOGY

Pooja Mohan Goswami Ganesh Dutta Sanatan Dharma College, Chandigarh

Vibhor Mohan Research Scholar, Panjab University, Chandigarh

ABSTRACT Blockchain technology means chaining the block of information together in the databases stored digitally or in the form of ledgers. With the advancement of computing, internet services along with IoT, the block chain technology has revolutionized every area of human life whether it is relating to financial transactions, electronic voting, and logistics management to education sector. The education sector is going to be completely digitalized after Covid-19 pandemic. The block chain technology can play an important role in designing a fully automated and secure evaluation and assessment module. The study focuses on the applications of blockchain to evaluate and assess the students located globally that too in fair manner with the need to design more secure evaluation systems.

KEYWORDS : Blockchain, Education, digital technology, distributed computing, challenges

1. Introduction

Blockchain Technology has its applications in various areas such as cryptocurrencies in finance including Bitcoin, Zcash and Ethereum etc. Bitcoin uses open-source peer-to-peer technology for secure transaction management by the network. Ethereum is an open-source distributed computing system based on proof-of stake consensus algorithm and Zcash is cryptocurrency just like bitcoin. Now it's most commonly used for decentralized applications for securing sensitive data such as in healthcare, supply chain, IoT and in the areas of higher education[1]. Blockchain in education focuses on monitoring the systems using IT infrastructures so as to prevent security and privacy breaches which is constantly increasing these days due to digitization. Blockchain allows safe storage of data for record keeping and also reduces the expenses of academic control of data [2].

Some organizations have developed distributed systems such as Uber Killer: A ride-sharing company integrated with Ethereum and identity reputation system, Ubitquity: property Management Company for secure recording of records. [3]. Blockchain applications covers version 1.0 for cryptocurrency system for cash payment, version 2.0 includes stocks, bonds, smart property and contacts etc. While version 3.0 compasses applications beyond currency and finance in the other areas such as health, science and culture etc. [4]

This paper will discuss the technical terminology of blockchain in section 2. Section 3 will cover the advantages of the blockchain technology. The application of blockchain for educational purpose will be discussed in the section 4. Section 5 proposes the conclusion followed by future directions.

2. Blockchain and distributed ledger technology

Blockchain technology is also known as distributed ledger technology which allows participants to send the secure transaction at a low cost [5]. In case of crypto currency transaction, user x initiating the transaction to user y uniquely through peer-to-peer network via cryptographic proof using public and private keys. The transaction is further broadcasted after reaching consensus through verification and validation. The new block is generated by mining, linking to original block through digital signatures by a suitable consensus algorithm [6]. Blocks in the transaction are linked by timestamp using specialized hardware with hash function to prevent tempering [7]. The stealing of even a bit of information will break the chain. So it's decentralized public ledger based on consensus algorithm by all the participants.

Security is an important aspect of blockchain transaction. Transactions can be secured by using data encryption which uses asymmetric algorithm using a pair of public and private key. Another aspect to secure the transaction is to prevent the modification of data. To prevent modification, all blocks are locked using hashing. The mathematical hash function takes data as input and generates hash value. Cryptographic hash function prevents the modification of even a single bit while in transit [8].

Similarly if someone wants to add new block to a blockchain, it requires to solve the "Proof of Work"(PoW) problem based on hash function. Out of all available miners in the network, only one who is able to solve the complex problem is selected to add new blocks in the blockchain.

The cryptocurrency combined with blockchain has its application of smart contracts in areas such as supply chain, voting system, Internet of Things (IoT), healthcare and higher education due to its trusted and decentralized contract environment [9]. This technology allows the learners to validate learning material and to specify with whom to share the relevant data. As there is no such requirement of trusted third party in its distributed ledger protocol, so it's advantageous to use it in the education sector[10].

3. Advantages of blockchain technology

The main benefit of this technology is its decentralized nature which does not require the need for third-party organization or administrator. As the system has its database, so it's important to protect it when dealing with outsiders. Blockchain provides authorization and security constraints that saves lot of time and money. Since the data of blockchain is available to all the users and nobody can change or delete the data, it also maintains the transparency, trust and the immutability [11].

The Blockchain technology can help to design a system which can be easily corrected in case of any problems thus maintaining traceability .Reliability is also maintained in case of blockchain transactions due to its decentralized nature.

Security of blockchain network is maintained by hash function which is a mathematical function that takes a variable-length input string and converts it into a fixed-length binary sequence. The output is independent of the input. The reverse is not possible as we cannot retrieve the input through a given output [12]. The addition of block in the network also follows the strict sequence of time.

Faster processing of transaction is also the one of the most important advantage. The technology helps to reduce the processing time thereby improving the speed of processing. As there is an automatic procedure for running the transactions in blockchain application, this not only reduces the labor cost but also improves the efficiency [13].

Trust is also an important factor as far as the sharing of data is done with outside parties. In block chain network trust also works but with decentralized ledger just opposite to centralized trust in case of central government such as commercial banks [14] .

4. Educational applications using blockchain technology

Nowadays, Most of the institutes have started using this technology into education to support academic degree management and evaluation process. It spans everything starting from learning process to students' achievements and further distribution of academic certificates.

The University of Nicosia uses blockchain technology to generate students' certificates received through MOOC platforms. Global assessment platform is created by Sony Global Education for storage

and management of degree information. Digital badge for online learning based on blockchain is designed by MIT where the blockchain network stores the certification acquired by the students [15].

The technology also allows learners to easily access to his learning records securely as he switches to some other institution. Some sort of editorial platform also eliminates the problems caused by copyright management, piracy or lack of transparency between publisher and author [16]. Decentralization also helps in facilitating secure exchange of grades between institutes in case of student mobility programs [17]. The trusted framework with privacy and authenticity facilitates communication between industry and students for employment by establishing a verifiable record of achievements [18].

This technology also automate the accreditation process and knowledge management in case of acquisition of knowledge through experimental methodologies in engineering discipline [19].

This technology also eliminates the frauds caused by degree which were too many in the past. Employing Blockchaining in granting and managing degree can reduce the frauds due to increased reliability and authority.

The study [20] presents the smart contract on Ethernum network, a protocol used for simulating a contract. This can initiates the negotiation, simplify terms, implement it and also verifies it. Smart contract ensures security and reliability and also reduces the third-party expenditure. Similarly contract can be initiated between student and teacher where students are motivated by giving them real-time rewards using digital currency stored in wallet. The contract can be terminated immediately if anyone breaks the rule in between.

Despite its utility, employers are resistant to adopt this completely due to its inaccuracy on the part of the students while describing skills and qualification in resume. The administration requires some form of transparency and advanced technology to fully automate the education system by handling all the challenges.

5. Conclusion

Blockchain, a data structure to create and share distributed ledger of transactions without the need of central authority. Blockchain include integrated infrastructure technologies that are based on Cryptography, consensus algorithm, combining peer-to-peer networks to solve distributed database synchronization problem. Although these technologies are serving many application areas in the field of education starting from learners' prospective to teachers'. “Learning is earning”, can fosters motivation for learning. This technology can store not only the trustworthy set of activities for both formal and informal learning but also record teaching behaviors that helps in their evaluation. At the same time, it brings challenges and opportunities to researchers and educators. Some drawbacks of this technology are its inability to assess evaluation of subjective essays and classroom presentations to measure learning outcomes. Pre-Programmed smart contract are unable to evaluate such activity without human-intervention. This technology works on Proof of Work consensus algorithm that wastes time and energy and has poor performance if implemented completely in education. There are some other technical barriers that are required to be addressed for its proper implementation in education sector. The future study will discuss how the evolution of education sector can be facilitated by integration of blockchain with some form of other innovative techniques. More work will be done to enhance learning motivation using some sort of digital currency property.

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