The Role of Blockchain Technology in Facing Revolution Education 4.0

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ABSTRAK

Meskipun beberapa konsep untuk menerapkan pendidikan menggunakan teknologi blockchain dilebih-lebihkan, perjanjian yang dialokasikan buku besar dengan hati-hati dan menyeluruh. Blockchain, tidak seperti database yang dikelola oleh otoritas terpusat yang menjamin integritas data melalui praktik dan kepercayaannya yang terbukti, Blockchain adalah sistem penyimpanan data digital yang berisi catatan yang terhubung melalui kriptografi. Teknologi Blockchain kini telah digunakan oleh berbagai sektor, salah satunya untuk transaksi di cryptocurrency seperti Bitcoin. Manfaat pendekatan teknologi blockchain dalam pendidikan adalah masyarakat yang tidak memiliki pengetahuan mengenai teknologi blockchain dapat merasakan manfaat dari teknologi *blockchain,* karena banyak data yang dihasilkan sektor ini bersifat berkesinambungan dari masa jenjang pendidikan. Blockchain, bisa diartikan sebagai, "mesin untuk menciptakan keamanan tingkat tinggi dan dapat diandalkan keamanannya", tingkat keamanan dan efisiensi yang tinggi dari blockchain sebagai tempat penyimpanan transaksi keuangan dan data telah membuka peluang inovasi di bidang pendidikan sebagai penyimpanan data pendidik dan peserta didik.

Kata Kunci : Aplikasi, Pelajar, Masyarakat

ABSTRACT

Although several concepts for implementing education exaggerated using blockchain technology, t agreements which are allocated ledgers carefully and thoroughly. Blockchain technology, unlike databases that are processed by certain forces that provide policies in correctness of data through real-time implementation, Blockchain is a digital data storage system containing records that are connected via cryptography. Blockchain technology has now been used by various sectors, one of which is for transactions in cryptocurrencies such as Bitcoin. The benefit of the blockchain technology approach in education is that people who do not have knowledge of blockchain technology can benefit from blockchain technology, because a lot of the data generated by this sector is continuous from education to Bachelor. Blockchain, can be used as, "a machine to create high-level security and reliable security", the high level of security and efficiency of blockchain as a storage place for financial transactions and data has opened up opportunities for innovation in education as a storage for educators and students' data.

Keywords : Applications, Students, Society

I. INTRODUCTION

1. Background

Blockchain is a reliable digital ledger, Most blockchains function as a distributed ledger (ledger) that records and protects digital data using the use of cryptograph (Alwiyah & Sayyida, 2020) (Berg et al., 2017). Blockchain technology, unlike databases that are processed by certain forces that provide policies in correctness of data through real-time implementation, blockchain is a transaction record that is replicated across multiple systems (or nodes) and is guaranteed cryptographically irreversible (Coyne & mcmickle, 2017). Bitcoin has been used in public blockchain technology, the prominent function of cryptography guarantees the determination and calculation of intelligent consensus algorithms that need something to solve the puzzle; In running it is necessary to verify block records and then they can be accepted by the blockchain, Figure 1 explains the blockchain steps in detail.
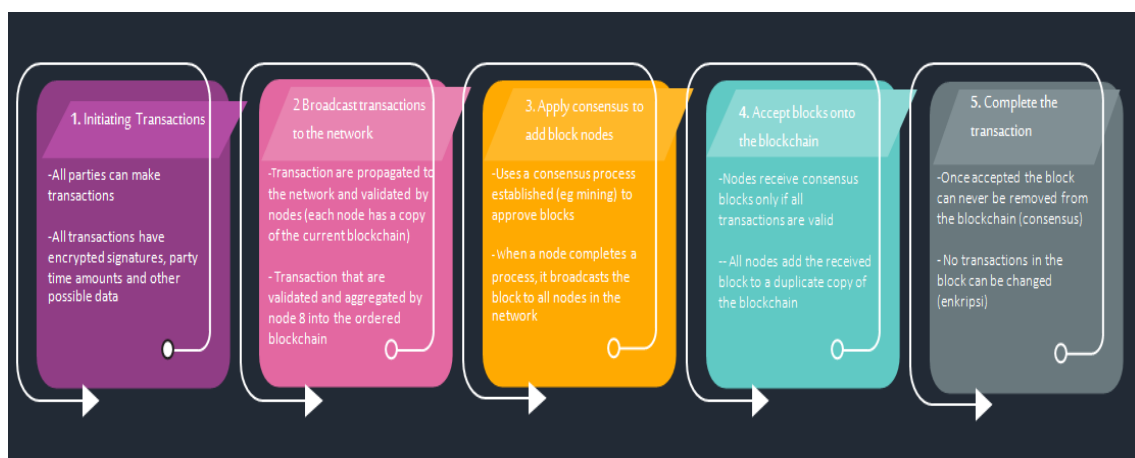

Figure 1.The beginning to the end process in the blockchain technology approach

2. Problem Source

The benefit of the blockchain technology approach in education is that people who do not have knowledge of blockchain technology can benefit from blockchain technology, because a lot of data is generated from sectors that are sustainable from education to Bachelor (Herawati et al., 2020)

3. Research Goal

To found the resolve about this research, Researchers have designed blockchain applications in a variety of fields, including security in data storage and being more effective and efficient 3.

4. Opportunity

Blockchain, in other words, is a "machine for creating trust" 2 that has the potential to eliminate middlemen across all types of exchanges.

II. RESEARCH METHODS

Blockchain technology is suitable for the education sector because a lot of data generated from this sector is continuous starting from all levels of education (rahardja et al., 2021). The blockchain is a distributed digital ledger that is constantly evolving. This book contains a collection of data records in blocks(rizky et al., 2021). This digital ledger is connected in

a chain of computer networks that are connected to each other after going through the cryptographic encryption process, which is the change of data into a code system(alwiyah & sayyida, 2020). To be able to read this data, the user must have a specific password. These connected networks can jointly run a mutually agreed protocol using mathematical algorithmic methods(amsyar et al., 2021).

Open program: step of development
By giving awards to students in the form of allowances and adequate support to improve student skills, it's not just a skill set that providers pack in a single course program. Future prospects, the awards given by different organizers can be related to the awards of several competencies which will be informed to school students(sunarya et al., 2020). With blockchain technology, stimulating learning resources in new markets will be much easier and very secure because blockchain has the following characteristics, it is immutable (cannot be changed) and only adds (can be added), distributed ledger, all data is copied to network participants (nodes). The data on the blockchain are connected to each other, if a hacker wants to change one data in one node, then he has to change the data on another computer which is not possible, thus, the existence of blockchain technology will increase producer confidence in realizing new programs(nazaré et al., 2016).

Collaboration of fuzzy methods and blockchain technology
In the above problems, the researcher uses fuzzy logic solution(dargi et al., 2014). For the selection of programs that will be created will use fuzzy, because this method is able to group data based on the input that has been selected and apply predetermined rules so that it can be efficient in collaboration with blockchain technology and it is easier to collect data on educators and students and others(alwiyah & sayyida, 2020). With the incorporation of this blockchain method and technology, all transactions are transparent and safe from corruption. In addition, transactions with blockchain are also safer because the possibility of interference is very small and the system is not easily broken into as processing fees increased, miners began to prioritize transactions that paid higher fees. (mcarthur, 2018).

Maximize blockchain technology in education
In this technology, a transaction consisting of an untimely miner on multiple nodes / computers - not just 1, after the transaction is approved, is encrypted and linked to the previous transaction via a hash. If using a centralized database such as SQL, if a hacker or employee has bad intentions, it remains only to bribe or bribe the database administrator to change the data. (Meiza et al., 2020)(Maupin, 2017). Hackers (or bribes) cannot hack or social engineering blockchain data, because. Blockchain database structure Add only - can add only, no edit command. Changes to one of the blockchain nodes / data will result in a mismatch of the existing hash on the data of other blockchain nodes so that this change will be rejected(Sharma et al., 2017). A centralized database cannot ensure the security of a database, to be able to ensure security, you must have a distributed consensus database structure(Downs & Hall-Wallace, 2003). Several types of industries have sensitive data so data protection is very important, such as financial, government and education services, blockchain has the potential to change the way data is stored to avoid fraud and hacker activity.

Permitted General Ledger Distribution
While the public blockchain is open to all, the allowed ledger creates rules and requirements to user members to grant different access rights to different classes of user members. The allowed ledger has many of the impressive features of a public blockchain. Their use of open

systems is aimed at getting unidentified participants to believe in it, avoiding need-centered influence, they have the characteristics of being strong, enterprising, and resistant to attacks. they can also handle the limitations of blockchain technology. In the licensing system, certificate issuers are checked by members to ensure that they meet the formal or informal community certification standards; it solves the blockchain problem of off-chain asset management with high quality. The allowed ledgers also deal with cost issues. When members of the official ledger trust each other, there is some need for practicality and high costs associated with the regulation of public blockchain exploitation.

All licensed ledger advocates advise that in other areas where public education and trust or external scrutiny are high, low-cost algorithms such as voting consensus may be sufficient to replace mining. With public blockchain technology, trust comes from infrastructure only; with allowed ledgers, this comes from the shared knowledge of the participants and consensus agreement.

Due to its convenience, some systems that originally used the Bitcoin blockchain will now be in the process of moving to the permitted platforms. Blockcert, the respected educational ledger certificate. However, the administrators admit that the first step is the current version, and Bitcoin services cannot provide the desired long-term needs. The version that Blockchart will do next will use the services of other references and will avoid an expensive activity. In addition, the early Blockcert program avoided the characteristic problem, so characteristics are a must. Hence, early issues of BlockChart namely basically a blockchain that is built on the public which is private. something like this would delete the transparent public blockchain, although things like that credit but need a high cost. An approach that is often used is usually to use a ledger service that has been given permission to get a large number of followers and will look for a cheaper one, even though it is still very reliable using the consensus protocol.

Table 1 Blockchain Research

NO	Blockchain research	Author
1.	Penerapan e-learning untuk meningkatkan inovasi creativepreneur mahasiswa	Alwiyah, A., & Sayyida, S
2.	Karakteristik blockchain teknologi dalam pengembangan edukasi	Kosasi, S
3.	Can blockchains serve an accounting purpose?	Coyne, J. G., & McMickle, P. L
4.	Blockchains and the economic institutions of capitalism. journal of institutional economics	Davidson, S., De Filippi, P., & Potts, J
5.	Blockchains industrialise trust	Berg, C., Davidson, S., & Potts, J

Triangular Fuzzy Numbers
Fuzzy numbers are real numbers that do not refer to a single value but refer to a set number (set) of possible values, where each value has a weight between 0 and 1, this weight is called a membership function.Triangular Fuzzy Number is a fuzzy number which is represented by three values, namely:

A = (a1, a2, a3)

$$\mu(a)(x) = \{0, \frac{x - a_1}{a_2 - a_2} \frac{a_3 - x}{a_3 - a_2} 0, \quad x < a_1, a_1 \le x \le a_2, a_2 \le x \le a_3, x < a_3$$
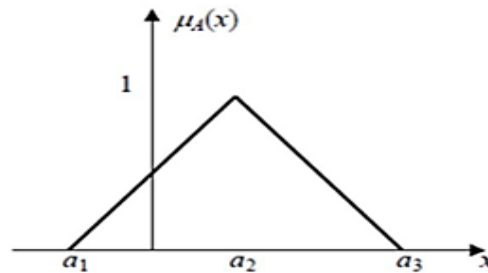
Basic arithmetic operations on fuzzy numbers are an extended concept of basic arithmetic operations in general, namely by including the degree of membership. Some of the important properties of the operation on the triangular fuzzy number are:

1. The result of adding or subtracting the triangular fuzzy number is also a triangular fuzzy number.
2. The result of multiplication or division is not in the form of a triangular fuzzy number.
3. The results of the multiplication and division operations can be used as triangular fuzzy numbers with approximate values. The max or min operation does not produce a triangular fuzzy number

III. RESULT AND DISCUSSION
How the Permitted Ledger Works.

For example, we will use a network of licensed ledgers for marking. We can start with the Core Block Chart service to create, publish, verify and share credentials, as can be seen in Figure 2. The publisher will have a series of badges which will be awarded based on clear evidence. Receiving students can store this badge in their digital wallet to make their choice; Other tools will allow third parties such as employees to verify badges.
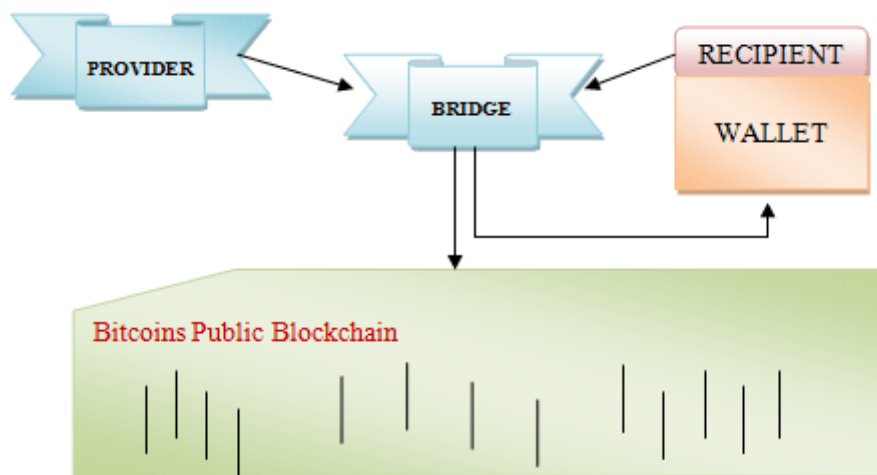

Figure 2 is an overview of each component of the license ledger for pinning education

The licensed ledger differs from the simple Block Cart system in terms of the components around it, some of which can be borrowed from Hyperledger or other newer blockchain platforms. The system will allow multiple members (not one publisher) (see Figure 3). Unlike open blockchains, the allowed ledger will establish the policies regarding membership and the permissions available to members. The badge provider will become a member of the center and have the right to create and apply badges and request the ledger. Other groups (such as auditors or researchers) may also participate, but they have limited access to ledger data.
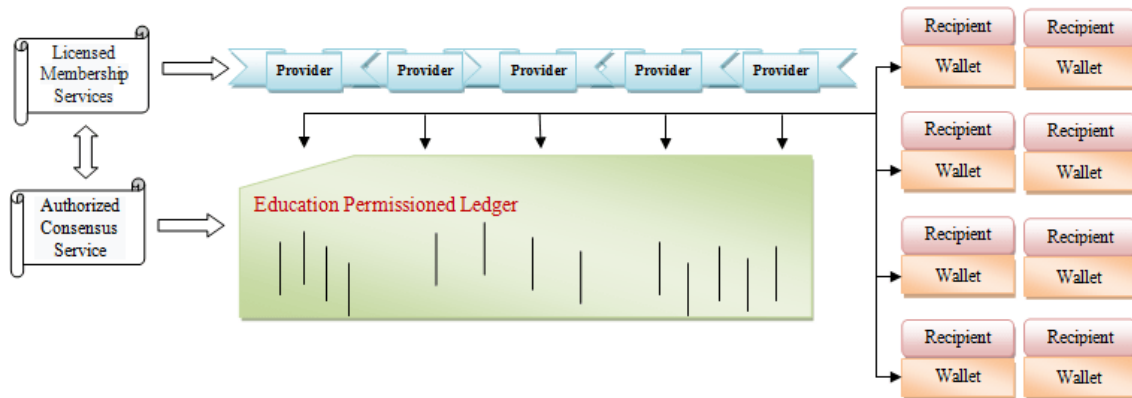

Figure 3 Licensed Protocol Service

Licensed ledgers will also use consensus protocols, not mining protocols, to guarantee Get immortality the cheaper way. The overall reputation of the ledger will depend on the technical strength of the consensus protocol chosen and the limitations of its membership policy. Any ledger that is permitted needs to coordinate these two decisions(Ucar, 2019).

The Openness Problem
Despite their promise to maintain educational records, the permitted distributed ledgers have their own limitations. Therefore, before being implemented in large forms some challenges must be overcome first. A well-designed permit ledger that can address the shortcomings of the characteristics and costs of a public blockchain, but they sacrifice openness and anonymity. For a currency blockchain such as Bitcoin, this issue may be important, but for organizations that utilize blockchain to manage off-chain substance. example: education certificate, this issue is less important. In addition, while ensuring the quality of the ledger, various options can be used to keep membership open. Certification. Government-supported certification bodies can Certification. Government-supported certification bodies can review all members and assigned members only to providers who have passed the exam; Certain badges can also be monitored to recommend. Professional associations: subject matter experts in their fields can organize content and standard awards by provider. When the subject field changes, the standard will be revised. Peer groups. Provider groups will appear dynamically, and social networking platforms can be used to define strategies and badges. As group distribution and content priority increase, policies tend to change rapidly. Fully open. Access from all providers will be accepted, and those received in the ledger are all badges received. Experiments conducted in the educational community are methods that can be tested and refined.

Diversity of a Blockchain Community
Using Hyperledger which is a new platform, very little time or money needed to compile and vary the ledger is in figure 3. The ease of adding candidates and the new consensus

protocol are plug-and-play. In terms of age, because the transparency of the ledger that starts in education is not guaranteed by all ledgers and is available to all distributors, with blockchain technology that allows communities to cheaply create their own distributed ledgers with multiple policies and consensus links. This will provide the student / learner with training, in a variety of educational options and badge providers. Furthermore, minor badge providers can be members of multiple ledgers, and will most likely issue a different badge. Students may look for specific provider badges wherever they are a member, for example, or they may protect licensed ledgers that have expanded to high quality distributors and badges in certain areas.

Standardization and benefits
Given the growth potential for ledgers, providers, badges, and other educational credentials, as well as records for individual ledgers, originating ledgers for education can create large networks of structured databases. This can make it difficult for students to find what they want, especially if the credentials are not a common language and fail to adhere to operable standards. The importance of a common language for credentials has long been recognized. For example, the Credentials Engine, which is built on work by Achievement Standards Network and the Credential Transparency Initiative, 12 make up the Credential Transparency Description Language (CTDL). The Open Badge initiative developed a similar standard term, with a major focus on larger learning resources and capabilities that have a large scale. this endeavor has provided many rich terms to describe abilities and badges, talents, publishers, how ability equals standardization in education. Meaningful blockchain work and certified ledger for education in two ways. First, it allows ledger developers and member providers to describe their credentials, badges and competencies in generic terms, reports are easier to find and compare to students, workers, and employers who may be looking for web-based learning resources. Blockchart certificates conform to the Open Badge standard. 13 Second, they provide the type of information that must be added to the credential register to articulate its quality and reliability. For example, records that conform to the Open Badge standard can provide extensive data on badge issuers, evidence of which is used to verify that students have this competency.

Blockchain In Education, Revolutionary Evolution
Public blockchain and ledger whose license can be applied successfully in many ways for education and learning. some of the advantages that are offered and compared to the (DDBMS) Distributed Database Management System which has been the backbone of the previous educational technology infrastructure. The most notable thing of the difference between distributed ledger and DDBMS is the inability of the allowed ledger records. by ensuring an aspect that all the abilities that the ledger claims students acquire from the publisher are actually assigned to it. This feature is important: This means that no middleman is required to verify the authenticity of credentials once be informed. The existence of a ledger and blockchain could transform education more globally and provide opportunities for small badge providers to easily expand their digital expertise and thereby compete with established educational institutions. Even these changes cannot revolutionize learning. On its own, the technology underlying a licensed blockchain cannot guarantee the advancement of a high quality educational content management system. Distributed ledgers need to have a common language in which to describe their records, more than just publishing and recording

IV. CONCLUSION

Blockchain is a digital data storage system that contains records linked via cryptography. Blockchain technology is now used by various sectors, one of which is for transactions in cryptocurrencies such as Bitcoin. The benefit of the blockchain technology approach in education is that people who do not have knowledge of blockchain technology can benefit from blockchain technology, because a lot of the data produced by this sector is continuous from the early childhood education to undergraduate. Blockchain can be interpreted as, "a machine to create a high level of security and reliable security", the high level of security and efficiency of blockchain as a storage place for financial transactions and data has opened up opportunities for innovation in education as a storage for educators and students' data. In the above problems, the researcher uses fuzzy logic solutions. For program selection that will be made will use fuzzy, because this method is able to group data based on input that has been selected and apply predetermined rules so that it can be efficient in collaboration with blockchain technology and easier to collect. data of educators and students and others.

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