Blockchain Concept in Educational Movement: A Study Case from Gerakan Sekolah Menyenangkan (GSM)

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Keywords: 4th industrial revolution, gerakan sosial, sekolah menyenangkan, blockchain, cryptocurrency, bitcoin

Abstract: In the era of 4.0th industrial revolution, there were many aspects of life that were changed by this revolution, including education. In this study, social movements that lead to education are the core of this research. The purpose of this study is to discuss the social movements that can use the concept or contract that is used in the field of information technology to become a platform to support the work of social movements. The researcher looked at some references related to the use of information technology in the field of social movements. In this study using the blockchain as a concept that is a reference for social movements namely Gerakan Fun School which supports world education there are currently many uses of the blockchain concept in various fields, apart from finance, there are also health and energy fields that have used the blockchain concept as well as growth community that uses the blockchain concept that is very fast and easy to spread, like bitcoin. The Fun School Movement (GSM) is a reference to be a case study in this study because the growth of the movement is quite fast and this movement makes it easy for the government to make schools fun for students who go to school. This social movement has several agreements with the blockchain from aspects of their approval or freedom to make social changes. This movement does not depend on the government to make social changes, this social movement relies on the trust and support of this social movement to adopt broadly.

1 INTRODUCTION

The lack of reference from the use of the concept of information technology to be applied to social change encourages researchers to conduct research that addresses this issue. The purpose of this study is to prove that concepts in the field of information technology can be used as a framework for social movements that focus on the education sector to make social change. In this study the researchers also discussed cross-disciplinary learning, in which in this study it can be seen that there are two disciplinary fields that are used as the main ingredients, namely social and information technology.

Cross-disciplinary learning refers to learning activities related to subjects outside the scope of discipline without integration from other disciplines (Dinov, 2008). Interdisciplinary or interdisciplinary collaboration aims to produce broad insights, major impacts, and the best results from work. Like the two founders of the social movement, both of them have their respective expertise in different fields, namely the fields of psychology and information technology. These two founders want to practice cross-disciplinary learning in this social movement, where researchers see this in the work system of this social movement.

From several studies that discuss cross-disciplinary learning above, researchers want the results of this study to be a reference for higher education systems in the 4.0th industrial revolution that require more capabilities than technical abilities, such as the ability to complete, leadership, and other non-technical abilities. The essence of this 4.0th industrial revolution is the creation of knowledge and new values based on connections to various types of information (Yoon, 2017). This type of information that makes cross-disciplinary learning can be one way to deal with this industrial revolution. It is not only learning concepts that must be changed to be able to face this industrial revolution, but also need teachers who are able to create learning ecosystems that make students happy and can explore the potential of critical strength and creativity to be ready to face this industrial revolution. This is the vision and mission of this social movement. To change teachers so they can prepare their students to be ready to face this revolution.

In one of the reports written by Bernarr Marr published in Forbes magazine. There are 8 ways to deal with this industrial revolution. One of these methods is very focused on developing human potential, which becomes the focus of being one way to deal with this industrial revolution. The following is an excerpt from the report:

"Although machines master many tasks normally performed by humans, humans are still more proficient in creative endeavors, imagination, critical thinking, social interaction, and physical agility. Future education systems need to develop these inherent capabilities so that they are equipped to partner with machines in the future rather than compete with them. "- Bernarr Marr

n the quote above it is said that when the industrial era 4.0 was running, the machine would master a number of tasks previously carried out by humans and at that time would be replaced by many machines. The development of the potential of each individual is urgently needed so that in the future humans will play the role of controlling the engine rather than acting as the engine where it is found in education in Indonesia today. The report also writes that it is possible for students to hone their curiosity about new things, problem solving skills, curiosity and repetition of new knowledge, schools need to provide a positive, comfortable and pleasant learning environment that allows students to hone skills In this day and age school is no longer just a place for students to learn scientific or knowledge matters, but also school must be a place for students to develop themselves and their personalities into individuals who have skills beyond the technical ability to compete in the era this industry 4.0 In this interconnected digital world, future employees need to have a global mindset. Schools and educators must adapt learning to take this into account for their students.

In this study the author tries to find the concept of technology that developed rapidly in the era of industrial revolution 4.0. One of the technological concepts that is felt to be in line with the efforts to be able to face this era is to use the concept of blockchain technology, the reason for which blockchain is one of the rapidly developing technologies. With its ability not to depend on stakeholders, this concept of technology is very fast and in demand, not only in the financial sector, but also in terms of development, health, manufacturing, security, and others. According to a report from Neer Varshney written on thenweb.com (Varshney, 2019), the blockchain has the ability to manage and manage public ledgers that are distributed and decentralized, so that performance in their organizations and transparency is a very high problem. upheld in the

concept of this technology.

The blockchain technology was first outlined in 1991 by Stuart Haber and W. Scott Stornetta, two researchers who wanted to implement a system in which the document timestamps could not be damaged. But only two decades later, with the launch of Bitcoin in January 2009, Blockchain had its first real-world application (Fortney, 2019). The Bitcoin protocol was built on the Blockchain. In a research paper that introduced digital currency, the creator of the Bitcoin pseudonym, Satoshi Nakamoto called it a "new peer-to-peer electronic money system, without third parties." According to Luke Fortney, Blockchain is literally just a block chain, but not in the traditional sense of words: When we say the words "Block" / "block" and "Chain" / "chain" in this context, we are actually talking about information digital ("blocks") stored in public databases ("chains" (Fortney, 2019), which in this social movement are public databases are teachers who join the Fun School Movement itself. According to other researchers, Ameer Rosic mentions that the blockchain is a list a developing record, called a block, which is connected using cryptography, each block contains cryptographic hashes from the previous time block, and transaction data (generally represented as a Merkle tree) (Rosic, 2019).

Examples of the use of the Blockchain concept are not only from the field of cryptocurrency as done by Satoshi Nakamoto, but also there are several studies that have discussed Blockchain use outside the financial sector, research conducted by Alexander Grech and Anthony F. Camilleri in 2017, conducting research on the use of concepts blockchain for the world of education. In 2018, Sandi Rahmadika and Kyung-Hyune Rhee conducted research on the use of the blockchain concept to provide a decentralized personal health information architecture model. In 2018, Vishal Patel conducted a study of a framework for sharing safe and decentralized medical imaging data through a consensus process using the blockchain concept.

Nowadays humans have been facilitated by various types of technology that exist to help carry out activities in their daily lives. With the advancement of technology the effect not only affects things that are done by humans, but also on human thought. Nowadays many people want things that are more practical and efficient in the process of doing something. The desire to do things that are more practical, free, and efficient, many people want to do something without being associated with an institution and institution, because by dealing with institutions or institutions according to some people will hinder the performance of their work processes. This is also done

by the blockchain to cut through the bureaucratic processes that do not require a little time. The lack of interference from the government or this institution that makes the concept of blockchain technology can be an appropriate reference for social movements to make social changes.

In a conventional centralized transaction system, each transaction must be validated through a trusted central institution (for example, a central bank), which can cause cost and performance bottlenecks on the central server. Unlike the centralized mode, third parties are no longer needed on the Blockchain (Zheng et al., 2017). The non-centralized nature of Blockchain is what makes it interesting and is also currently being developed by many people to be used as a work system of a system or movement made to make it more effective than existing systems or movements. made in accordance with the vision and mission of a system or movement made.

Blockchain is a tool for achieving integrity in distributed software systems. Therefore, it can be seen as a tool to achieve the nonfunctional aspects of the implementation layer (Drescher, 2017). Although bitcoin is one of the most popular applications for the blockchain, Blockchain can be applied to a variety of applications that go far beyond Cryptocurrency (Zheng et al., 2018). Some fields have tried to use the blockchain concept as a framework for the system that has been created. Many of them choose to use the blockchain as their framework for several reasons.

Fun School Movement (GSM) is a social movement with teachers to create a learning culture that is critical, creative, independent and enjoyable in school. The Fun School Movement (GSM) was created with the same philosophy as the blockchain. The movement promotes and builds the awareness of teachers, principals and educational policy makers to build schools as a fun place to learn science and provide life skills so that children become successful learners. GSM aims to transform Indonesian schools through a grassroots development approach involving teachers, principals, and the government to build a culture of learning that is critical, creative, independent and enjoyable (Menyenangkan, 2018).

2 LITERATURE REVIEW

2.1 Gerakan Sekolah Menyenangkan

The movement promotes and builds the awareness of teachers, principals and educational policy makers to build schools as a fun place to learn science and provide life skills so that children become successful

learners. The Fun School Movement aims to transform Indonesian schools through a grassroots development approach involving teachers, principals, and the government to build a culture of learning that is critical, creative, independent and enjoyable (Menyenangkan, 2018).

Encouraged to make the revolutionary paradigm for education in Indonesia to see and feel the direct effects of the pattern of education in Australia by the founders made them want to make changes to the paradigm. The revolution carried out by this movement was a revolution to pursue critical thinking skills and narrow the education gap with other countries through the Joyful School Movement.

The experience felt by the founder of the Fun School Movement was felt when he picked up the child to come home from school when his son was still studying abroad, there was something extraordinary and customary in Indonesia where after school a child felt happy. (Drescher, 2017) they are to find out and find out what actually makes children feel comfortable and happy when their children are in school.

Reflect on the experience experienced by the founders of the Movement Fun School. The founder of the Fun School Movement did not want Indonesian children to become memorizing robots without adequate design skills and critical thinking to deal with changing times [8]. In addition, children today live in an era that disrupts technology and requires not only academic ability, but also they need creativity and critical thinking to be able to face life in this very modern and advanced era. That is what underlies the struggle of the founders to promise when they returned to Indonesia, they go straight to school, invite teachers at the grassroots level to change the environment, culture and teaching methods that present education that humanizes humans, frees reason and fulfills the nature and mind of students to ready to face challenges in the future of a world that changes very quickly and erratically (the era of disruption) (Menyenangkan, 2018).

The reason why this movement does not really depend on any institutional governance and they actually run this movement independently is the founder of this delightful school movement that seeks to spread their enthusiasm and enthusiasm through suburban schools, where schools The school is currently due to lack of learning facilities, they are trying to trigger the school to become more creative and have critical thinking so that schools in the suburbs can have the same competitiveness as schools in big cities. What they did in this movement was to promote and build awareness of teachers, principals and educational policy makers to build schools as a pleasant

place to equip students with knowledge and life skills so that children become successful learners (Menyenangkan, 2018).

This fun school movement wants schools and education in Indonesia to humanize students. Currently education in Indonesia, they only focus on learning material and not behavior change. according to one of the founders of a pleasant school movement in this era of disruption, the main goal of education is character. Although there is already a character strengthening program, the assessment is still cognitive based. In fact, if the character is good, the academic will follow.

2.2 Blockchain

Blockchain is a technology that connects all members in a network or group with the aim of recording and sharing data without the role of centralized authority (Zheng et al., 2018). In a simple theory, a blockchain is a group of blocks that are connected to each other in a network (chain), where block content is a list of data transactions carried out by each member contained in a network where all network members have transaction data and there is evidence stamp of work on every transaction made by each member on the network, where the stamp is obtained from the algorithm obtained from the machine to get a stamp that matches what the group wants, which machine process makes bitcoin one of the applications of the blockchain due to difficulty getting stamp and requires complex algorithms to get the stamp.

2.2.1 Blockchain Structure

The main component that makes the blockchain is a block, the block stores a collection of legitimate transaction instructions that have been hashed and encoded in Merkle. The blocks that are connected then form a chain. This iteration process confirms the integrity of the previous block, all the way back to the original genesis block. The blockchain structure is in fig. 1

Figure 1: Structure of Block

- Data
  In this data section, this contains data from transactions that have occurred and are happening.

- Hash
  Hash is a block marker. The usefulness of this hash is to mark the block so that it matches the

sequence of transactions that occur in the data header. This hash will be used for every transaction that occurs on the blockchain, each new block will use the hash in the previous block.

- Hash from Previous Block
  The hash of the previous block is a block marker on the blockchain used to indicate from the previous block series. The purpose of this Hash is to make a connection from the previous block so that the blocks on the blockchain are arranged sequentially

The following is Fig. 2, this image explains how blocks in the blockchain work when a transaction occurs.
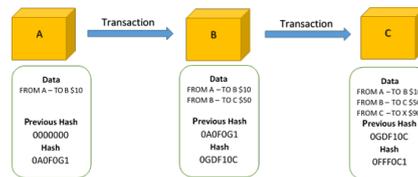

Figure 2: Process of Recording Data in Blockchain

The hash process for each transaction that occurs using this block is done with the help of a machine algorithm, where this machine is used by many people to mine cryptocurrency. Because the process of requiring hash provides a very complicated process that requires more resources to create hashes to mark transactions that occur on the blockchain.

In the example drawn, there is an initialization block, where the block is the first block that records transactions contained in the blockchain, so that it can be seen in the Hash of the previous block empty (000000), because there were no previous transactions.

2.2.2 Blockchain Type

There are many types of blockchain, this can make it easier for application or system developers to implement the blockchain into the system or business process that is being developed. This is the basis that the blockchain is very flexible and there is a possibility that there will be another model or type of blockchain in the future. Here are a number of models or types of blockchain that are currently developing and also using blockchain.

Figure 3 below is a table of comparisons between the three types of blockchain, namely the Public, Consortium, and Personal:

BLOCKCHAIN TYPE	PUBLIC	CONSORTIUM	PRIVATE
DETERMINATION OF CONSENSUS	Member of this type of blockchain can be followed by everyone.	Member of this type of blockchain are set / chosen by the founder of the organization	Member of this type of blockchain are more focused on one organization
PERMISSION	Public	Can be public or restricted	Can be public or restricted
PROVISION RULES	It's almost impossible to change	May be changed	May be changed
EFFECTIVENESS	Low	High	High
CENTERALIZED	No	Partially	Yes
CONSENSUS PROCESS	Without permission	With permission	With permission

Figure 3: BLOCKCHAIN TYPE (Zheng et al., 2018).

Determination of consensus. On all three types of blockchain there are some differences in the roles that members perform on the blockchain. On the public blockchain, each node can take part in the consensus process. And only one set of selected nodes is responsible for validating blocks in the blockchain consortium. In a closed (private) blockchain, it is fully controlled by an organization that can determine the final consensus (Zheng et al., 2018).

Granting permission. In the process of granting permission on each type of blockchain has its own characteristics. Transactions that occur on public blockchain types can be seen by the public, while granting permission on the blockchain is closed (private) or the blockchain consortium can decide whether the stored information is public or restricted (Zheng et al., 2018).

Rules of Provisions. On all three blockchain models there are differences between the rules set by each blockchain model. On the public blockchain, transactions that occur on the blockchain are stored on various nodes on a distributed network, so it is almost impossible to change the rules set on the public blockchain. Unlike what happens to the blockchain consortium and is closed (private), if on both types of blockchain, the majority of consortium members or dominant organizations want to change the rules that are on the blockchain, on the blockchain consortium and can change (Zheng et al., 2018).

Efficiency. The efficiency of the three types of blockchain is different on each type of blockchain. On the public blockchain, it takes a lot of time to spread transactions contained in blocks because there are many nodes on the public blockchain network. Taking into account network security, restrictions on public blockchain will be much tougher. As a result,

the transaction results on the public blockchain are more limited and have high latency. Unlike the consortium and personal, with fewer validators, consortia and individuals can be more efficient and have lower latency (Zheng et al., 2018).

Centralized. Centering traits of the 3 types of blockchain have differences between each other. The main difference between the three types of blockchain is that the public is decentralized, the consortium has a partially centralized and personal nature that is fully centralized because it is controlled by one group (Zheng et al., 2018).

Consensus process. On the three types of blockchain they have their own characteristics in conducting a consensus process. On the public blockchain, everyone in the world can join the consensus process on the public blockchain. Unlike the case of the public blockchain type, the blockchain is a consortium type and is closed (private). One node needs to be certified to be able to join the consensus process in the blockchain consortium or private (private) (Zheng et al., 2018).

2.2.3 Charateristic of Blockchain

There is no definite agreement about the characteristics of the blockchain. However, it can be seen from several studies conducted by several researchers such as (Tapscott and Tapscott, 2017), (Puthal et al., 2018), (Sultan et al., 2018), (Viriyasitavat and Hoonsopon, 2019). There are at least 10 core characteristics of the blockchain which can be described as follows:

- Network Integrity: When people on the network make transactions with other people, they act with integrity and expect others to act accordingly. If someone does not follow the rules, the system will automatically remove it from the network.

- Distributed Strength: Strength is distributed between members and allows each member to access and copy information. Because decentralization minimizes dependence on third parties, if members in the network are disconnected by authority, the system can still run as usual.

- Value as Incentive: This system allows each member who contributes to the system to get a prize as an incentive and those who do nothing will not be punished but also cannot get any prizes. This prize is needed not only as an incentive but also as a reflection of the reputation of members.

- Resilience: Because there are many people who keep transaction records, the system has less risk of data loss and manipulation.

- Privacy: Each member has the control to share their own data with others and be responsible for it.

- Transparent: All members can access and audit previous transactions.

- Encouraged by Consensus: Verification is carried out independently by each member and validated based on consensus on the results of member verification.

- Guarded rights: Because of transparency, everyone knows the owner of the data and his ownership rights are protected.

- Openness: Anyone can join the network as long as he follows the rules set by the consortium.

- Inclusion: Even though it has a standard system, it works for everyone with different conditions.

3 DISCUSSION

3.1 Blockchain for Education

Blockchain is considered the second generation of the Internet for some researchers. The first generation focuses on communication and collaboration, but "it is built to move and store information rather than value" (Menyenangkan, 2018). Like what has been published Don Tapscott and Alex Tapscott through the results of reports from research that has been done. Having a ledger that can contain values from information such as transcripts, certificates, or banking accounts made with technological support can help promote higher education and provide alternative models to provide lifelong learning.

The use of the blockchain concept for education is currently still being discussed by several researchers. By adopting the new technology it will have an impact on the educational process that is happening now. Like this blockchain technology, using this technology, there will definitely be a big change that is felt by adopting this blockchain technology for progress or changes in the education system. One study conducted revealed that using blockchain technology can provide infrastructure for students to create their own learning pathways and allow students to access learning or higher education content and these students can be involved in collaborative development experiences. By adopting this technology, it is clearly stated that the blockchain's role can help many students who are in school or teachers from school.

The advantage of using this blockchain technology can be used as a place for teachers to collaborate to improve the quality of education in their schools. This is the focus of the Plesant School Movement to improve the quality of education, the purpose of which is to improve the quality of education from schools in rural areas, where teachers are currently being triggered to think critically to be able to improve quality. from their school with the concept of this movement, where the results of the movement are expected to trigger critical thinking also from students who attend school.

"Blockchain is a technology that has applications in the world of learning at the level of individuals, protection, national and international groups. This is relevant in all types of contexts: schools, colleges, universities, MOOC, CPD, companies, internships, and knowledge bases. Instead of old hierarchical structures, technology is the focus, with the freedom to migrate to technology, not coordination. This is really disintermediation technology. "- Donald Clark

The flexibility that the blockchain has is that makes the consideration of several system developers and also organizations that choose to use the blockchain as their framework. Using the blockchain, the trust created by this movement, and to maintain that trust, of course with social movements that focus on education like this will not use public blockchain. With social movements that focus on this education, they must use a consortium or private blockchain.

Of course, it will be regulated accordingly to provide checks or certifications for everything shared by members of this movement. In terms of certification, the blockchain can store a list of publishers and recipients of each certificate, along with the document signature (hashes) in a public database (blockchain) that is stored identically for all members of this movement [13]. With this, it is possible for the blockchain to store a lot of stored data, it will be an advantage of this movement, because with all the stored data it will make it easier for new members of this social movement to quickly grasp what previously members have done to make the school more fun for students attending in schools that adopt the curriculum from the Fun School Movement.

3.2 Consortium Blockchain for Education

The concept of the blockchain consortium is one of the blockchain concepts that still has independence like the blockchain, but at the same time it can still be controlled as for stakeholders in this system or organization. if there are system developers or stakeholders who are willing to use and apply the blockchain concept in the educational environment. The reason why

researchers propose a consensus blockchain in the educational environment as a concept:

A. Because part of the blockchain consortium is centralized, stakeholders still have the ability to monitor how the organization or system works.

B. Stakeholders can provide who can participate in their organization or who doesn't.

C. Stakeholders can still improve their rules in the future.

D. The Blockchain consortium has more reliability than other types because it can change rules and is easier to adapt to new environments or technologies.

But that is not only for stakeholders. by using the blockchain consortium it still allows members of this type of blockchain to have the same transparency and freedom to create equality in their educational environment by using data that is in this data store, because it is transparent and everyone in the system can see at that time, not only one member has that data but all members have the same data as everyone in this system, so it will be difficult to manipulate data because other members have the same data.

In this study, we found that if some organizations use the blockchain concept, it must have the same characteristics as the blockchain. With this study, we found a measuring component to find out whether the concept of blockchain exists in this organization in this case the Fun School Movement (GSM), but it can be used by other researchers to measure different cases.

The measurement component consists of several variables that indicate the use of the blockchain concept in this organization. Supporting these measurement components are initialization, workflow, distribution, effectiveness, and efficiency. With this measurement component, it does not only measure that organizations use the concept of blockchain or not but also measure and determine what type of blockchain the organization is currently using.

Initialization. This measurement component is more to capture the first initialization of the organization. By capturing the initialization we can identify how the organization chooses their members and how they provide the first initialization of this organization, in this case the social movement that focuses on education.

Referring to the concept of the blockchain, the first initialization process is the key to determining the type of blockchain used by the organization. If an organization uses a public type then members of this organization are liberal, everyone can join the or-

ganization as long as they have the same vision and perspective as the organization.

If the organization uses a type of consortium, members of this organization are chosen by organizational stakeholders, stakeholders always review their new members if they want to join the organization. If the organization uses a personal type then the members of this organization are closed only focus on one organization. The difference between a consortium and a person is the style in which stakeholders work. In the personal type, the organization centered on the other side of the consortium still uses a partial model, so that it is mixed between centralized and decentralized.

Not only selecting members, this measurement component here also captures how this organization initializes their new members. In the blockchain concept, new members are usually given a record of transactions from organizations that have occurred in the organization, if in this case financial organizations, but if they are in a social movement, they might be able to know how to work in this organization, notes on what other members have done , or guidance notes for new members to know how to work the organization's vision and mission.

Workflow. This measurement component is more to capture how the organization works. The workflow in this measurement component can determine the type of blockchain used, how centralized the organization is, how tight the rules of the organization are. Capturing these in the measurement component can be a test for this organization, how well the blockchain is being implemented in this organization.

Spread. This measuring component is more to capture how the organization grows. With the concept of blockchain, trust is the main reason why this concept is getting bigger. So, the main purpose of this measurement component is to find out how members of this organization have confidence in the vision and mission of this organization and want to share ideas about this organization.

Effectiveness. This measurement component is more to capture the effectiveness that members feel about the concept of blockchain that has been applied to this organization. Choosing this concept as the backbone of the organization is a new challenge in this era, knowing that this is new technology and many researchers are still debating or experimenting on this new technology is a big challenge from an organization that applies this technology.

With this measuring component, we can see whether this new technology can be implemented in social movements, which in this case is the Fun School Movement (GSM), one of the social move-

ments that focuses on education. By focusing on effectiveness as a measuring component, we can see the impact of this technology as the backbone of the organization.

Efficiency. Just like the component of measuring effectiveness on this measuring component, we are still focused on members of the organization. We try to capture the efficiency of this concept that is applied to the organization. Knowing that effectiveness and efficiency are the main keys to the success of implementing this new concept, we want to capture it in the measurement component, so that it will be a statement to the organization whether or not they have successfully implemented this concept.

4 CONCLUSIONS

According to all references that have been reviewed, it shows that with the characteristics of the blockchain, it can be applied to the education sector. With transparency, decentralization and data storage systems that belong to the blockchain concept, this will be one solution to close the gap made by education regulations for schools in the suburbs and city centers. By closing the gap between them, it would make the same situation for schools in the suburbs and city centers, students from both schools would have the same knowledge and quality.

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