

Authenticity of a Diploma Using the Blockchain Approach



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ABSTRACT

A diploma is an academic legality that is obtained when a person has achieved his education. However, some people who are desperate to find work because of a minimum lack of educational qualifications, take action against the law by faking a diploma which is very easy to do. The purpose of this paper is to prove that the existence of blockchain technology can reduce diploma fraud and the benefits of blockchain in the world of education. The blockchain approach through qualitative descriptive methods and library research to be able to describe and prove the facts about diploma forgery in order to get decent work. The existence of 4670 Higher Education in Indonesia will certainly cause the diploma produced every year to increase, where the diploma is very easy and inexpensive to fake but difficult to validate its authenticity. So, many companies incur the cost of validating the authenticity of diplomas in order to get competent workers. There is a 25% level of fraud in the form of diploma forgery so that the increase in workers who are less competent to occupy positions in their fields more and more. This paper contributes to the field of education which cones on the falsification of diplomas. The contribution of this research is based on the use of blockchain technology in the field of education in proving the authenticity of diplomas which is feasible to be applied in Indonesia which has many cases of diploma fraud. The results expected from this paper can prove that the implementation of the blockchain in the field of education can reduce the level of diploma forgery.

Keywords: Blockchain, Counterfeiting, Authenticity, Diploma.

1. INTRODUCTION

In recent years the digital era has penetrated into all aspects of people's lives. Where information can be accessed easily via the internet. However, the internet is not about value. Easy access made through the internet creates a loophole in criminality in carrying out its actions. Falsification of diplomas is

one example. Based on the data obtained there are at least 5 cases that occurred in 2017-2018 with the number of forgery as many as 816 diplomas.

Based on Figure 1 about Record of Cases of Counterfeiting of Diplomas in Indonesia that Traces of cases from June 2017 to November 2018 occurred in almost all major cities in Indonesia involving activists, members of the DPRD, officials and candidates for officials and Private Universities [1]. This proves the existence of cases of forgery of diplomas in Indonesia is still very easy and inexpensive to obtain.



Figure 1: Record of Cases of Counterfeiting of Diplomas in Indonesia

Blockchain technology that is currently developing is a peer to peer direct transaction record that is connected with decentralization [2]. Every transaction in it is secured with cryptographic techniques that do not require a third party (third party) in the work process. Blockchain and the Bitcoin currency are very closely related, because the blockchain was created to perfect the Bitcoin currency. The technology is composed of two types,

namely transactions and blocks, wherein between transactions are stored in blocks that are related to each other [3]. In the world of technology, the existence of a blockchain is a very dramatic increase to collect information, distribute and manage information, blockchain is also a distributed database that is decentralized and permissionless [4]. So that computers contained in the network are connected between one and another [5]. Blockchain is structured data that allows a digital ledger to occur in which there is data then shared with those who are connected to each other in an independent network, Tiana Laurence (2017: 7) [6]. Provides several advantages over a centralized database [6]. Ledgers of publicly distributed transactions [7]. And used to solve various kinds of problems in the financial sector [8]. Blockchain technology is a revolutionary technology that will change the way we work and do business, and there are several types of blockchain including: 1) Public blockchains: A large distributed network that is run through native tokens. Anyone can access the code managed by the community. 2) Permissioned blockchains: This type of blockchain is like Ripple, a network that allows the sending of currencies between two parties with a very short span of time. This type of blockchain still uses a distributed system that uses native tokens. 3) Private Blockchain: This type of Blockchain has a smaller scope and does not use tokens. The membership system on this type of blockchain is strictly regulated, Nishith Pathak, et al (2018: 201) [9].

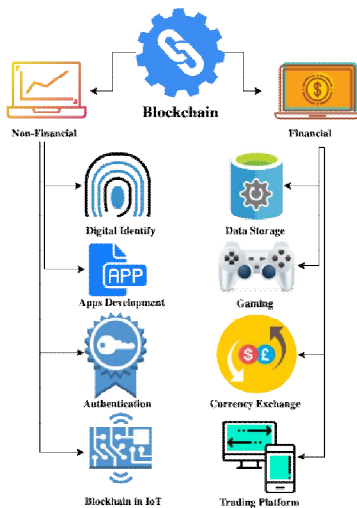


Figure 2: Blockchain Utilization Field

The blockchain can not only be implemented in the financial sector, but can also be implemented in all aspects as shown in Figure 1, one of which is the field of education. Along with the times, education has become the priority of the community in getting decent jobs, so that many are competing to complete their education [10].

The legality that states that someone has completed his formal education is by getting a diploma. Where a diploma can be obtained by someone after completing formal education, starting from elementary school level to college. According to the regulation of the Minister of Education and Culture of the Republic of Indonesia Number 81 of 2014, a diploma is a document that recognizes learning achievement and / or completion of a tertiary level after passing an exam held by a tertiary institution. Ownership of a diploma from formal education for someone is very important, because if someone has a diploma from high-level formal education, then the chances of someone to occupy decent work will be even higher [11].

This paper focuses on maximizing the workings of the blockchain approach [12] in reducing diploma forgery. Where to validate a diploma that is genuine or fake will take quite a long time, because the company that will recruit workers, must ensure the authenticity of the diploma manually to the relevant university [13]. So, the existence of the blockchain approach in this study, is expected to cut time significantly and reduce the level of diploma forgery in the education sector.

2. THE PROBLEM

The problem in this paper is the easy and cheap falsification of diplomas carried out by unscrupulous persons for certain purposes so as to disrupt and harm universities and related educational institutions [14]. When a company wants to check the authenticity of a diploma for applicants, it certainly takes quite a long time with complicated procedures, for example where the company must send a job applicant's file to the relevant agency and the agency will validate the diploma to the university or institution. That makes the process of validation of a diploma requires a lot of time and money. Of course, the simplicity of a falsified diploma can reduce competent human resources in Indonesia. With the blockchain approach it is expected to solve the above problems. Because the decentralized nature of the blockchain approach will certainly make it difficult for some unscrupulous people to commit fraud, this has a good effect on the speed of the facility in validating the authenticity of one's diploma.

3. LIBRARY RESEARCH

Library research is a method carried out by finding references, data and information from various books, scientific journals, literature, and opinions of experts who have the same research topic, so that it can be easier for writers to find various references, data, and

information. The purpose of literature study is to collect various kinds of results of previous studies that have a theme related to the research to be conducted, so that it can be proposed to conduct further research. There are a number of library studies that have been produced in previous research on blockchain technology and other related research.

- 3.1 Research conducted by Mike Sharples and John Domingue of The Open University on Adaptive and Adaptable Learning, 490-496 in 2016 entitled "The Blockchain and Kudos: A Distributed System for Educational Records, Reputation and Reward". The study discusses the use of blockchain technology as a distributed system to record all educational history and a list of one's achievements. [15]
- 3.2 Research conducted by NisharaNizamuddin, *et al* from Department of Electrical and Computer Engineering Khalifa University of Science, Technology and Research at Springer in 2018 entitled "IPFS-Blockchain-Based Authenticity of Online Publications". In this paper, we propose a solution to provide originality and authenticity of published and posted freely online digital. [16]
- 3.3 Research conducted by Alexander Grech and Anthony F Camilleri from in 2017 entitled "Blockchain in Education". This report introduces the fundamental principles of the Blockchain focusing on its potential for the education sector. It explains how this technology may both disrupt institutional norms and empower learners. [17]
- 3.4 Research conducted by Sabine Kolvenbach, *et al* from Fraunhofer FIT in 2018 entitled "Blockchain 4 Education". Certificates play an important role in education and companies, where individual learning records become essential for people's professional careers. It is therefore important that these records are stored in long-term available and tamper-proof ledgers [18].
- 3.5 Research conducted by UntungRahardja, *et al.* at the 7th International Conference on Cyber and IT Service Management (CITSM), in 2019 entitled "Design Framework on Tertiary Education System in Indonesia Using Blockchain Technology". In this research, it discusses that there are still In this study aims to study the impact of the blockchain in the Indonesian education system to use an artificial intelligence platform that is most suitable for Indonesian higher education. [19]
- 3.6 Research conducted by TaqwaHariguna, *et al* from STMIK AmikomPurwokerto, Indonesia in The Fifth Information Systems International Conference, 2019 entitled "Effect of Social Media Activities to Determinants Public Participate Intention of E-Government". This study aims to measure the intention of public participation in e-government services. The study confirms that information distribution activities with social media have a significant influence on public satisfaction which ultimately affects the intention of public participation. [20]
- 3.7 Research conducted by Pradip Kumar Sharma, SeoYeon Moon, and Jong Hyuk Park of Seoul National University of Science and Technology in the Journal of Information Processing Systems 13 (1), 184-195 in 2017 entitled "Block-VN: A Distributed Blockchain Based Vehicle Network Architecture in Smart City". In this study discussed that in the last few years, ad hoc networks have become a technology used to provide comfort and safety for drivers in traveling. But with the blockchain technology which is a new technology that is developing so fast that it can revolutionize the transportation system to become increasingly intelligent. In this writing, blockchain is used as a reliable and secure architecture that is used to build a new transportation system. [21]
- 3.8 Research conducted by UntungRahardja, et al from University of Raharja on Journal of Physics: Conference Series in 2019 entitled "Implementation Of Information Planning and Strategies Industrial Technology 4.0 to Improve Business Intelligence Performance on Official Site APTISI". The Association of Indonesian Private Universities or often called APTISI, has a membership of 4189. Compared to State Universities that only have 372, of course the presence of PTS is definitely a solution amid the lack of equalization of higher education in Indonesia. [22]
- 3.9 Research conducted by Jeff Herbert from Auckland University of Technology in 2015 entitled "A novel method for decentralised peer-to-peer software license validation using cryptocurrencyblockchain technology". This paper proposes the utilisation of a cryptocurrencyblockchain similar to Bitcoin, to provide a method for decentralised, peer-to-peer, publicly auditable software license validation that could be used by anyone from an independent software writer to a large software vendor. [23]
- 3.10 Research conducted by Yuqin Xu, *et al* from School of Computer Science and Technology Shandong University Jinan China in International Colloquium on Theoretical Aspects of Computing, pp. 288-304, 2017 entitled "ECBC: A high performance educational certificate blockchain with efficient query". This paper provides an education certificate blockchain (ECBC) that can support low latency

and high throughput, and provides methods to increase demand. [24]

- 3.11 Research conducted by Vipul H. Navadkar, Ajinkya Nighot, Rahul Wantmure from NCRD's Sterling Institute in the International Research Journal of Engineering and Technology (IRJET) 5 (6), 2287-2292 in 2018 entitled "Overview of Blockchain Technology in Government / Public Sectors". In this research, it discusses the development of blockchain technology that needs to be discussed in the e-government field, because this technology offers a new method but still requires some standardization and requires a solid management system. [25]
- 3.12 Research conducted by Arshdeep Bahga, Vijay K. Madiseti of the Georgia Institute of Technology in the Journal of Software Engineering and Applications 9, 533-546 in 2016 entitled "Blockchain Platform for the Industrial Internet of Things". In this study, discussing the Internet of Things (IoT) is being implemented in various industries and manufacturers that require trusted intermediaries to record transactions between users. We present a decentralized, peer-to-peer platform called BPIIoT for the Internet of Things industry based on blockchain technology. [26]

Based on the library research blockchain approach can be categorized as a technology that has a decentralized nature and can be used in all aspects of the field, one of which is education. Where, blockchain can solve various problems regarding fraud, forgery, and also verification of certificates. The existence of this blockchain approach can minimize unwanted fraud

4. RESEARCH METHOD

The presentation of this paper uses a descriptive qualitative method with a blockchain approach.

4.1 Descriptive Qualitative Method

Descriptive research is research conducted to find out about independent variables, either one or more variables, without making comparisons and linking. Descriptive method is to be able to explain the formulation of the problem under study regarding the existence of independent variables, independent variables are variables that can stand alone. That means that it can be concluded that the descriptive method is a method used to describe a symptom or problem to be studied, the aim is to present information of the problem to be studied and provide appropriate information about an issue. In this paper, the presentation of symptoms and problems taken based on facts from both sources and previous

research that will be associated with the blockchain approach to achieve the expected goals is to minimize the level of diploma forgery by applying the blockchain approach.

4.2 Blockchain's Approach

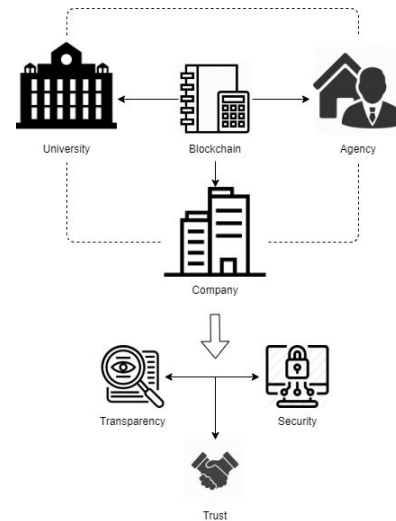


Figure 3: Validation of Diplomas with the Blockchain Approach

Figure 3. is an explanation of how blockchain technology can be utilized in education. By utilizing blockchain technology, students who have graduated from universities can publish their certificates on the blockchain. On the blockchain, these certificates can be seen and distributed to many institutions, including several companies, when students who have graduated come to a company to apply for a job, the company can quickly and easily prove the authenticity of their certificates from the blockchain. The same thing can be done by various agencies and government officials, they can easily prove the authenticity of a certificate with a fast time. So, this technology consists of transparency and security elements to produce trust between various parties [27].

5. RESULTS AND ANALYSIS

As much as 20% of the 2019 State Budget and Revenue is allocated to the education sector, which is valued at Rp. 492.5 trillion, an increase of Rp.4.6t from the 2019 state budget, there are 123 State Universities and 4547 Private Universities which if totaled there are 4670 Higher Education in Indonesia, so that the education sector is very interesting to be implemented using blockchain technology. With 4670 Higher Education Institutions, there will certainly be many certificates each year, where they are very easy and inexpensive to fake but difficult to validate. Many companies incur significant costs in

the process of recruiting workers, one of which is the cost of validating the authenticity of the prospective employee's certificate, but in the recruitment process found various kinds of fraud, including a 25% level of fraud in the form of certificate forgery. That way, many workers are less competent to occupy certain positions.

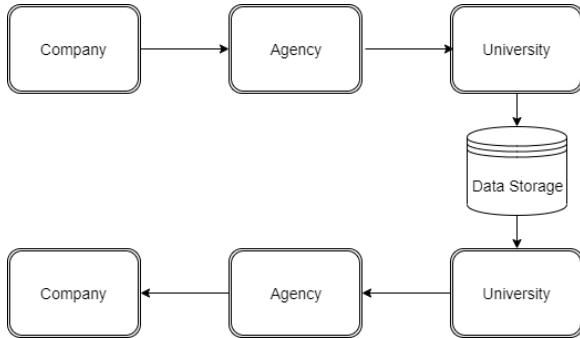


Figure 4: Certificate Validation

In figure 4 is the flow of checking the authenticity of certificates in the process of recruiting workers without using blockchain technology, where people who have graduated informal education will look for work at the company, they will bring a number of documents in which there are certificates and certificates, the company cannot determine the authenticity from certificates and certificates so that the company will send these documents to the relevant agencies that can ensure the authenticity of the certificates and certificates. The agency will send the file to the relevant university to ask the authenticity of the certificate where the university will search for any data from its server to ensure the authenticity of the certificate and will provide signatures and stamps if the certificate is authentic and send documents back to the agency and the agency will send the documents back the authenticity of the company has been checked. In the process, it is certainly very time-consuming because the certificate cannot be ascertained its authenticity in one day and requires no small cost because they have to pay to the relevant agencies only to prove the authenticity of a certificate. Plot validation course must be developed to be more effective, this research wants to utilize blockchain technology in the field of education which can be called Blockchain Technology on Education (BTE) to overcome this problem [28], which if without using blockchain technology can spend days but if using blockchain technology only takes minutes.

Blockchain was created by someone named Satoshi Nakamoto which is a pseudonym, created the blockchain used for Bitcoin which is a digital currency where Satoshi Nakamoto got success after making Bitcoin in the blockchain.

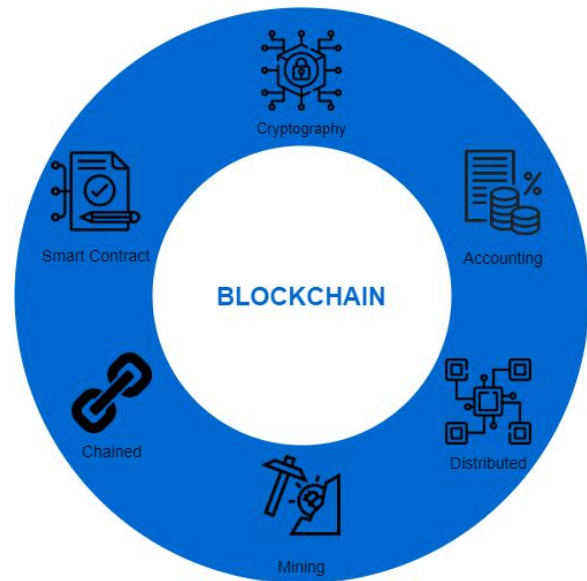


Figure 5: Characteristics of Blockchain

In figure 5 there are six characteristics behind a blockchain, namely: Blockchain is accounting, because in the blockchain recorded every transaction that occurs, such as when a transaction occurs, from whom the money comes from, how much nominal money is, to whom the money is sent. Blockchain is cryptographic because every transaction recorded in the blockchain undergoes an encryption process so that the level of security and privacy on each transaction is very high. Blockchain is distributed because blockchain is a large ledger that is distributed so it is very difficult to change the contents or manipulate the data in it. Blockchain is a chain because the blockchain consists of a group of blocks that connect like a chain that is connected by using an id number (hash) if the id numbers are not the same and the corresponding blocks will not connect into a chain. Blockchain is a smart contract because in the application of the blockchain there is a code that functions to bind an agreement between the two parties, so it is not possible to manipulate anything including a certificate. Blockchain is mining because, on every party that has been able to validate the truth and authenticity of a transaction, the party will get some Bitcoin [29].

Advantages and benefits of blockchain technology is applied in the field of education is the reduced level of fraud in the falsification of a certificate due to transparency in the blockchain where everyone who is connected to each other in a network has the same record, the record will be updated if all people who are connected to each other in the network agreed to the note. Thus, the records stored will be more accurate, and consistent when compared to without using blockchain technology [30]-[32]. And it will be

more time-efficient and cost-efficient to prove the authenticity of a certificate[33]-[35].

6. CONCLUSION

This study uses a blockchain approach to solve the problem of diploma forgery which is easily done in Indonesia. And can reduce the time if needed validation of a diploma by a company that is recruiting employees. Because with a blockchain approach that has six characteristics, it can solve at least four things including, blockchain can reduce the number of diploma fraud because it is peer to peer connected decentralized, with the company's blockchain can reduce the time used to validate diploma authenticity, reduce all costs disadvantaged by third parties, and graduates who are produced later can be in accordance with their respective competency levels due to the difficulty of forgery of diplomas[36]-[39].

In future work, the blockchain approach in the case of other document forgery requires more research so that this technology can be further implemented and developed. And make comparative research and observations with other countries that have implemented blockchain technology in checking the authenticity of diplomas. And assessment of the impact that will be caused by the application of the blockchain in the policy in the field of education is needed.

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