



USING DIFFERENT TYPES OF BLOCKCHAIN TO INCREASE EFFICIENCY FOR SPECIFIC APPLICATIONS

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Abstract:

In this paper, we deal with the essential concepts of Blockchain technology, in what forms we find it, ways and types of use, disadvantages, and advantages of this technology, and the direction of its future development. This paper aims to acquaint the reader, who has no experience in this field, with the essence of Blockchain technology, as well as to help them to decide which type of Blockchain to use depending on the potential application.

Therefore, we will introduce a completely new way of applying this technology in the creation of digital currency based on art.

Due to the popularity and wide field of using Blockchain technology, there is a growing number of articles about it. Consequently, it can be difficult to make the right choice when studying certain areas. Thus helping the reader to choose the right direction for their further study and to look at new perspectives on the use of this technology.

For the authors themselves, this article is the starting point in trying to solve problems in the functioning of Blockchain technology through optimization with the help of artificial intelligence and the beginning of utilizing this technology to create a sustainable value system.

Keywords:

Blockchain, Art-Based Currency, Digital Currencies, Smart Contracts, Decentralization.

INTRODUCTION

Most people, who do not deal with Blockchain technology, think of crypto-currencies, especially Bitcoin, when Blockchain is mentioned. Although it must be noticed that Blockchain technology was created by S. Nakamoto's project and bitcoin electronic money [1], similar concepts of decentralized encrypted networks have been considered before [2]. However, the most interesting is that the application of Blockchain technology goes far beyond the basic idea of application on crypto-currencies. That's why in this paper we focus on the type of blockchain depending on the need for the efficiency of the system on which it is used, and that's why we present the idea of a completely new use of Blockchain technology through two connected Blockchains, to create a digital currency based on works of art as a value base.



Blockchain technology has multiple applications, and it is proficiently used in various areas of finance and economics, the Internet of Things, social activities, reputation systems, security, and privacy. It can be said that the field of Blockchain technology is increasing every day, and it is difficult to guess what applications it may have in the future. Accordingly, there is a great increase in scientific interest in Blockchain technology. Many scientific papers on various topics related to Blockchain have been written. Some universities have opened departments that deal only with the study of this technology, and thousands of scientists around the world are trying to improve the technological solutions that are currently available in the Blockchain [3].

Blockchain technology is proof that humanity is finding new ways to apply technology and improve processes so that the most important of all civilizational achievements, the storage and sharing of important data can be improved, decentralized, and consolidated.

To begin with any innovation or research, one must first have a good understanding of the issues we face and the potential of the technology we use, so we need to understand the issue in its essence and comprehensiveness, and then move on to solving the problem. Therefore, in Section 2 we explain Blockchain technology, in Section 2.1 how that technology works, in Section 2.2 we list the types of Blockchain, in Section 2.3 we show the advantages of Blockchain technology, and in Section 2.4 the disadvantages of Blockchain technology. In Section 3 we present an art-based currency concept, a completely new way of effective usage of Blockchain technology to create a digital currency that is based on works of art as its basis of value. In Section 4, we present a summary conclusion about using different types of blockchains depending on the application requirements.

2. EXPLANATION OF BLOCKCHAIN TECHNOLOGY

The most complete definition of Blockchain technology is “The Blockchain is an incorruptible digital ledger of economic transaction that can be programmed to record not just financial transactions but virtually everything of value” – this statement is, also, one of the most popular definitions of the Blockchain, which is developed by Don and Alex Tapscott [4]. Thus, Blockchain technology can never be understood through one application or one type of application, but as a platform, or even better as a decentralized principle of recording and storing data that can be used for many purposes.

The essential role of Blockchain technology is the secure and decentralized recording and storage of information. This can be information on ownership of electronic money and other digital values. However, the very important role of Blockchain technology is also becoming the storage of data on the ownership of things that have a real physical existence. Blockchain technology can be applied in the field of democratization of society through decentralized voting systems, and it can enable direct non-representative democracy in the future. Perhaps it must be emphasized as most important for the future of the human community.

„Blockchain is an open ledger where every transaction taking place is recorded and everyone is connected to each other. Blockchain implements a unique P2P (peer-to-peer) distributed database communication that allows for storage, verification, and auditing of the transaction by the peers present in the network. Once a transaction is added to the Blockchain it is impossible to change, delete, or tamper with the transaction this is one of the critical technical features of Blockchain technology” [5]. Whoever would like to change or delete something within the Blockchain system, would have to do it for all users separately, which is almost impossible because there are thousands of computers that should be hacked at the same time. It is very important that any change is made only by adding a new one, and all previous ones are saved so that the history of transactions is visible to everyone, which prevents malversations.

Blockchain systems can generally be divided into three types, public, consortium, or private. The main difference between these three types of Blockchain systems is that the public type is completely decentralized, the consortium Blockchain system is partially centralized and the private one is completely centralized and one user or group of them has complete control over it. Anyone in the world can access the public Blockchain system, so the main difference from the other two is that requires permission to access them [6].

Table 1. Comparisons among *public Blockchain*, *consortium Blockchain* and *private Blockchain*[6].

Property	Public Blockchain	Consortium Blockchain	Private Blockchain
Consensus determination	All miners	Selected set of nodes	One organisation
Read permission	Public	Could be public	Could be public
Immutability	Nearly impossible	or restricted	or restricted
Efficiency	to tamper	Could be tampered	Could be tampered
Centralised	Low	High	High
Consensus process	No	Partial	Yes
	Permissionless	Permissioned	Permissioned

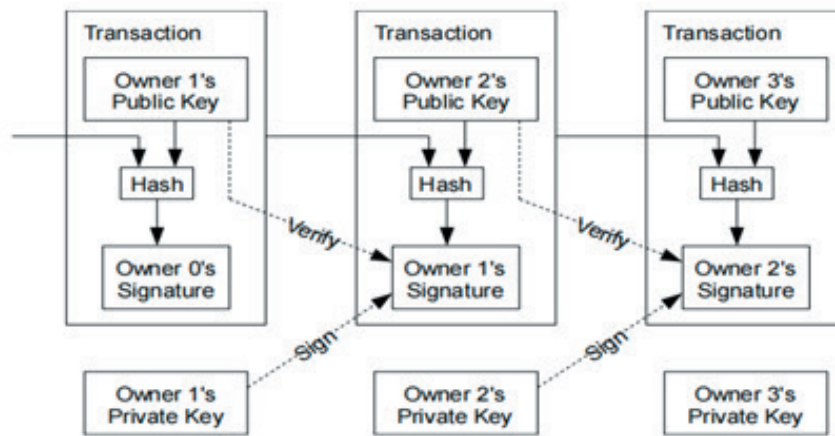


Figure 2. The principle of transaction validation [1].

2.1. HOW BLOCKCHAIN WORKS

Aside Blockchain is a technology based on the idea of storing data in blocks that are distributed to multiple locations, which is why the whole process is decentralized. The blocks are linearly connected into one series which is upgraded with new blocks at certain intervals and thus a chain of blocks is formed. The type of information in the blocks depends on the network, but the timestamp, transaction, and hash exist in all Blockchain variants. Each block contains the hash of the previous block, and all the hash information is generated automatically, which means that it cannot change the information in it. Due to this method of verification, each subsequent block increases the security of the entire chain. The more blocks in a chain, the more secure is the Blockchain [7].

Blockchain technology enables decentralization using the P2P architecture in user transactions. This avoids a centralized network that often slows down or restricts communication. By copying all the blocks for all users, the stability and resilience of the entire system is achieved.

Anonymity is ensured by the fact that the user communicates with others in the network with an encrypted generated address, and can generate them as much as he wants.

Transactions are performed with the help of private and public keys of users who participate in the transaction and verification given by other users in the system by acceptance by the majority of the transaction that follows in the time. Timing the transaction is very important since it is impossible to change earlier blocks in the chain.

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„This process is facilitated by applying a so-called consensus mechanism, which e.g. requires the calculation of a proof-of-work. A proof-of-work may be regarded as a computational puzzle, which takes a lot of effort to



solve, but whose solution is easily verifiable by others. In case a user finds the solution, it is shared with the remaining participants in the network, who in turn can verify its correctness, thereby reaching a consensus on the solution. One crucial aspect of the proof-of-work is that the puzzle a user is solving depends on the previously accepted and agreed-upon blocks of the Blockchain. Since a variety of participants are trying to form and append new blocks to the Blockchain, changes in the Blockchain would result in varying solutions, revealing misuse or manipulation” [8].

2.2. TYPES OF BLOCKCHAIN TECHNOLOGY UTILIZATION

There are many uses for Blockchain technology, but we can divide them into several fields of applications.

The field of finance and economy includes financial Blockchain systems such as Bitcoin or Hyperledger, and it can be said that Blockchain is best known for that. However, there are many companies that have very successfully applied Blockchain technology in their businesses, such as in the systems of delivery, supply, sales, etc.

The field of public and social activities is perhaps the most extensive field of application of Blockchain technology. The application within the framework of registration and keeping of land registers and property rights can be singled out as the great possibility of applying Blockchain in education. Still, in the future, perhaps the most important application of Blockchain technology will be that it can be used to organize decentralized anonymous voting without the possibility of manipulating the results of any party and with the possibility of complete freedom of speech and access to information of each participant.

The field of record and reputation has great potential because, with the help of Blockchain technology, it is possible to create a reputation system that is trusted and impossible to falsify, which has been a common case so far. The best implementation can be achieved within the academic record and reputation system.

The field of security and privacy is very important for the application of Blockchain technology due to the excellent capabilities of this technology to advance these areas. So far, centralized virus defense systems have also been vulnerable to attacks, which could destroy the entire defense system. Blockchain has a different principle of protection that is distributed to multiple users and special processes minimize malicious activity.

2.3. ADVANTAGES OF BLOCKCHAIN TECHNOLOGY

Blockchain technology has many advantages over other technologies used for the same purposes. Before the concrete advantages, however, we must emphasize a very important feature of the Blockchain, and that is the possibility of using it for so many purposes and in so many different areas. In all these areas, somewhere less, and somewhere more, Blockchain shows its positive sides.

Decentralization as a basic feature of Blockchain enables the functioning of a system without a central hub. Data is stored in several places and the possibility of their loss is reduced. If a malfunction of one part of the network parts occurs, the others continue to work normally.

Transparency is a very important feature of Blockchain. Insight into all transactions of all users prevents malicious changes that can compromise the entire system. Without transparency, the invariability of previously entered data could not be maintained.

Invariability is one of the most important features of Blockchain because changing once entered data in large chains with thousands or even millions of users is impossible. All records entered in Blockchain can be changed only if more than fifty percent of all users agree.

Open source code for most Blockchains allows even greater transparency and the possibility of additional verification of the functioning of the system. Since everyone is allowed to download the code, it is possible to use Blockchain for different purposes and different applications.

Autonomy is ensured with the help of the principle of consensus. Every user can be sure when updating data that their veracity is not guaranteed by one person but by the entire system by consensus, which prevents some malicious users from manipulating it. Trust towards an individual user is not required or necessary, the transaction is performed using encrypted private keys, and the correctness of the entire transaction is confirmed throughout the system [9].

All these positive features of Blockchain lead to the fact that this technology has become the choice to solve many problems and a way to meet the need to record and store important data of many individuals, companies, educational and social institutions.

2.4. DISADVANTAGES OF BLOCKCHAIN TECHNOLOGY

Some scientists, however, believe that Blockchain technology is full of shortcomings that adversely affect the business and technical characteristics of the system.



Sometimes the biggest advantages are cited as the biggest disadvantages of Blockchain. Thus, the problem for them is decentralization, because there is no control of transactions from or its guarantee by the trusted institution. The speed of transactions is also questionable with Blockchain due to the verifications performed by the complicated encryption of a large number of users and their consensus requirements. There is also an unnecessary consumption of resources and energy, and thus the unfavorable impact of Blockchain on the preservation of the natural environment. There is a further question of the problem of scaling and obstacles to compliance with legal regulations. According to some, irreversibility is also a big problem in Blockchain, because it makes it impossible to correct mistakes. Those who care about the protection of valuable data and property believe that without a formal regulator and institution to resolve disputes, there is a serious security risk with Blockchain technology, which is based on complete freedom in mutual transactions between users.

Scaling is a problem that arises due to the exponential growth of the network due to joining new members and performing new transactions. The only way to solve the problem of storage and increase the volume of transactions is to centralize the process across a smaller number of nodes, but then decentralization is lost as one of the main features of Blockchain.

Critics also believe that the security of the Blockchain network is very problematic because every new member can be a security threat to the entire system. Blockchain-based cryptography is only effective in the case of local digital currency and does not cover other aspects of the network [10].

3. THE PROPOSED APPLICATION MODEL - ART-BASED CURRENCY

Functioning of a digital currency based on Blockchain technology and works of art as a value base is realized through two connected blockchains. The first one is used to store information about the author of the artwork, the ownership of the artwork, and the value of the individual artwork as well as all the images in the chain and it is partially public.

The second chain is used to create new denominations of the art-based currency, storing data on the ownership of denominations and the amount of denominations in circulation. This blockchain is centralized and very efficient, however, conditioned by the first chain and data on the amount of artworks that exist in it.

Since the beginning of the 20th century, the trend of issuing currencies that are not backed by precious metals or any material base has begun. The cover of most current currencies is the strength of the issuing country's economy. However, no institution or country issuing the coin guarantees that you will receive any lasting value in return for that particular amount of denomination. The art-based currency operates on a completely different philosophy than all other currencies because the basis of its value is not the strength of the state, the institution that issues them, or even material values i.e. precious materials that would be the value reserve of the coin.

Art-based currency is artistic creativity i.e. time spent creating works of art (*in some works of art e.g. photographs, the time it took a novice artist to reach the level of knowledge needed to create an artistic photograph is also taken into consideration*). That's why ABC (abbreviated from Art-based currency) denominations are divided into minutes, hours, and days. Since the value of the work of art by established artists cannot be determined by the time spent creating that work, Art-based currency refers to works of art by beginners - students of art schools.

Any denomination of any currency that functions according to the principles of ABC can be issued only when a work of art is provided as the basis of the value of those denominations. That's why every ABC denomination can be directly exchanged for a work of art that exists in the reserve of the guarantee institution. Also, any artwork within the system can be exchanged for the appropriate number of ABC denominations. The institution issuing Art-based currency must guarantee that the currency will be fully covered by works of art that will be adequately stored to preserve their value. It must also be guaranteed that artworks will be realistically evaluated by trained mentors and that the ABC value will be formed transparently in accordance with market trends and the needs of young artists.

The main goal of introducing Art-based currency is the construction of a sustainable value system that basically has immaterial, artistic value - the artist's time spent in creativity as the basic foundation for all other values.

Another goal, but no less important, is to raise awareness in society about the importance of art and its value, as well as support and help young artists to engage in creativity and explore it to the point of complete affirmation.



In addition to the obvious benefits for artists, art, culture, and society as a whole, Art-based currency is extremely profitable for investors, as it allows safe, risk-free investment with the possibility of large profits through increasing the price of ABC and increasing the value of the artwork. Unlike other investments, here the profit is guaranteed at some point, and the security of the investment is absolute. The price of each work of art is the lowest when the artist is a beginner and it can never be any less than that, but with his progression and with the passage of time it can be many times bigger.

Currently, artistic work is not appreciated, especially when done by novice artists. With the introduction of Art-based currency, this will change, and since Art-based currency is directly dependent on the value of the work of a beginner, it will also increase in value. In particular, Art-based currency will be stable compared to other currencies, because it is tied to the time spent on artistic work, which cannot be devalued because the artists would work only for respectable rates. All types of art, including digital, are represented in the Art-based currency value system.

4. CONCLUSION

Blockchain technology has brought many positive things to the field of information technology. The ability to decentralize processes, ensure the stability of information, and provide free access to all people, all while maintaining their privacy is a huge benefit of this technology. A blockchain is a tool for the development of civilization through multiple possibilities of application, which is realized in various areas of finance and economics, the Internet of Things, social activities, reputation systems, security, and privacy. One of the application fields of Blockchain that we have proposed digital currency based on works of art as a value base, in which the wide field and multitude of applications of Blockchain can be observed.

Of course, there are many shortcomings and problems in the functioning of Blockchain, but with new improvements in this technology, they will be eliminated. Thus, scaling in Blockchain technology is one of the processes that improve Blockchain and make it more functional [11].

It is important that in the future, in addition to the necessary improvements and changes, Blockchain technology preserves the basic characteristics that made it so important, namely: decentralization, transparency, immutability, openness, autonomy, and privacy.

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