Analysis on the Management Mode of Virtual Currency under Complex Background

----Take Ethereum and Bitcoin as Examples

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Abstract. The functions and models of virtual currency have evolved to meet the needs of users and consumers as Internet technology has advanced and political and economic structures in various nations have undergone ongoing change. Among them, Bitcoin and Ethereum are of considerable study importance because they have the biggest market values of any virtual currencies. This paper focuses on the management of virtual currency in the context of the current complex business environment. It uses the PESTEL model to analyze the main business environment faced by virtual currency and the distinctions between the two in use functions, and it uses the decentralized management theory to compare the efficiency of the management mode. The final result shows that compared with Bitcoin, the management mode of Ether has a higher decentralization attribute, conforms to the requirements of the development of Web 3.0, and the management effect is also more effective.

Keywords: Cryptocurrency; Decentralization; Management mode; Ethereum; Bitcoin

1   Introduction

1.1   Introduction to e-Finance and Digital Currency

The pace of the financialization of the world economy has accelerated in recent decades as a result of the quick growth of electronic finance. The 2008 US subprime crisis set off a global financial crisis that amply illustrated the danger posed by a global monetary system based on the US dollar [1]. No central organization acting as a credit hub can be completely trusted. Financial dangers result from excessive money creation or deflation, and the legal currency system has also run into issues that are challenging to resolve. People's requirements for investment have been satisfied by the concept of building an intermediary currency system through the growth of the Internet. A cryptocurrency called Bitcoin has drawn more attention than other currencies among the myriad operations taking place in the electronic financial industry[2].   For   example,   digicash   released   in   the   early 1990s(https://www.wired.com/1998/11/digicash-outta-cash/) is a form of encrypted electronic payment, but it is not based on blockchain technology. The cryptocurrencies studied in this paper are based on blockchain technology.

1.2   Background of Bitcoin

Nakamoto first proposed the idea of digital currency Bitcoin in 2008. Nakamoto integrated and improved it by using Hash's algorithm and the operating principle of the anonymous distributed e-cash system B-money system to create a relatively safe and open cryptocurrency, Bitcoin[3]. Since Nakamoto (2008) first described Bitcoin in his paper and launched it in 2009, the price of Bitcoin has changed significantly[4]. In August 2022, the transaction price of Bitcoin was $24025.135, while in August 2012, the exchange rate of Bitcoin was about $10. Over the past 10 years, the price of Bitcoin has increased by 2400 times, which has a significant impact on the cryptocurrency market and the wider electronic finance industry [5]. Despite the rapid development of several new cryptocurrencies such as Ripple and Litecoin, Bitcoin continues to occupy 40.1% of the market share, more than twice that of Ethereum, which is the second largest cryptocurrency with a market share of 20.2% (Coinmarketcap. com, 2022).

1.3   Background of Ether

Ethereum is a specific blockchain-based software platform that can build and run smart contracts and so-called distributed applications (DApps). This technology also serves as the foundation for Ether, a related virtual money. The Ethereum blockchain uses the cryptocurrency asset known as Ethereum. Ethereum serves as a kind of fuel for distributed apps on the platform. Payments to other accounts or machines that carry out specific requested actions can be made using this cryptocurrency. Ethereum might be among the most intriguing solutions, even though Bitcoin is still the most well-known currency among the general public. This is so because Ethereum offers a wide range of smart contract-supported use case applications.

2   Literature Review

This chapter mainly explains the development status of virtual currency, including Bitcoin and Ethereum.

2.1   Bitcoin

According to Zhang and Yilu, there are two primary causes for the birth of Bitcoin. To start, some people want to do away with the central bank that already governs the established monetary system. Second, the current bank transaction fees and restrictions on international money transfers are unsatisfactory [6]. As a result, Bitcoin is a cheap, decentralised form of money that is fundamentally independent of the state and any other central authority[7]. The Bitcoin Foundation oversaw Bitcoin for a considerable amount of time in the beginning. It is committed to promoting and defending the distributed digital currency and trading system of Bitcoin, as well as the freedom of choice and financial privacy that come with using such systems. However, in the later stage, the Bitcoin Foundation deviated from its goal and focused on three tasks: paying Gavin Andresen, the Bitcoin developer; Arrange Bitcoin meetings; Promote Bitcoin to global regulators.

2.2   Ether

The second-largest digital currency, Ethereum, has grown quickly thanks to its sophisticated management system. A blockchain network called Ethereum enables

users to upload and run computer programmes called smart contracts. On July 30, 2015, the Internet Ethereum, powered by Ethereum, was launched. A smart contract can be written in a number of Turing complete languages, with Solidity being the most well-known of them (2017). The fact that the account book is open, transparent, and unchangeable is Ethereum's most crucial characteristic. The Enterprise Ethereum Association (2018) lists several features of the blockchain, including licencing, privacy, and secrecy. The private side chain must be deployable between parties with no previous connections. Andrew Spurr and Marcel Ausloos pointed out that the main difference between Ether and Bitcoin is that "intrinsic value is a better function" [8]

3   Methodology

3.1   Decentralization Model

Blockchain is frequently used as a decentralisation example. Virtual currencies' attributes and operational logic must be very comparable to blockchain as a key component of blockchain applications. As a result, the effectiveness of virtual currency can be determined more logically and scientifically by discussing its management and operation utilising a decentralised paradigm. In the virtual currency system, like the mining scheme in Figure 1, decentralisation is frequently used.

Decentralization, according to Jean-Paul Faguet, is one of the most significant reforms of the preceding generation in terms of both the number of countries it has affected and the potential for significant effects on the nature and calibre of governance[9]. According to YIRAN LIU and colleagues, the decentralisation model in the virtual currency system includes three characteristics: fairness, activity, and security. The prospect of a highly decentralised blockchain system will not last forever, according to Yujin Kwon and colleagues[10].
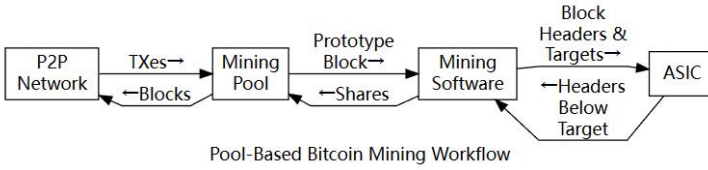

Solo Bitcoin Mining Workflow
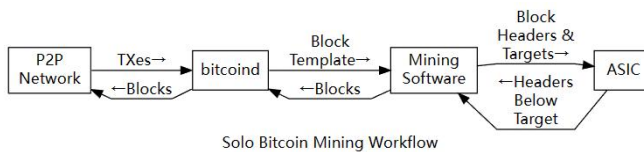
Fig. 1. Bitcoin Mining system

Source: https://developer.bitcoin.org/devguide/mining.html

3.2   PESTEL Theory

The framework of external macroeconomic factors that could have an impact on the current issues is represented by the analysis. It can be used to assess the external influence on initiatives, corporate divisions, and even the entire sector [11]. P.E.S.T. also makes sure that the business's performance is in line with the strong forces of change that are influencing the business environment. PESTEL analysis of Bitcoin and Ethercoin aids in product positioning and industry background research for virtual currencies.

Fig. 2. PESTEL Analysis

3.3   Organizational Conflict Theory

The theory of organizational conflict means that in a multi-ethnic society, there may be confrontation and conflict between community members or between national authorities and local communities, especially when the requirements of the latter cannot be met. [12] The team has adopted a more cooperative conflict management technique and the distinction between conflict/process state as the foundation for a data model that demonstrates how conflict has a detrimental effect on team performance. Conflicts exist in most elements of the Bitcoin management system. The inferior members disagree with the judgements made by the superior members and have their own ideas about how money should be spent and how to allocate employees. [13]

4   PESTEL Analysis

4.1   Political and Legal Elements

Business restrictions and political stability have a decisive impact on business organizations. Bitcoin and Ethereum are both virtual currencies, and they face roughly the same political and legal environment. The high anonymity of virtual currency can, to a certain extent, hinder the pursuit of the police, help criminal activities to obtain more profits, and transfer a large amount of funds to countries in a short time [14]. In addition, the price of virtual currency itself fluctuates greatly, and there are many unstable factors. As a widely used mainstream currency, Bitcoin will have a huge impact on the US dollar. Therefore, in the early stage, countries often strictly blocked Bitcoin, but in the later stage, countries saw huge profits in the rapid growth of virtual currency, so gradually relaxed the control of virtual currency. However, some countries still hold a negative attitude towards virtual currency in order to protect national security.

According to a report of the Library of Laws of Congress in November 2021, nine countries have banned cryptocurrencies. Countries include: China, Tunisia, Algeria, Bangladesh, Iraq, Morocco, Nepal, Qatar, Egypt.
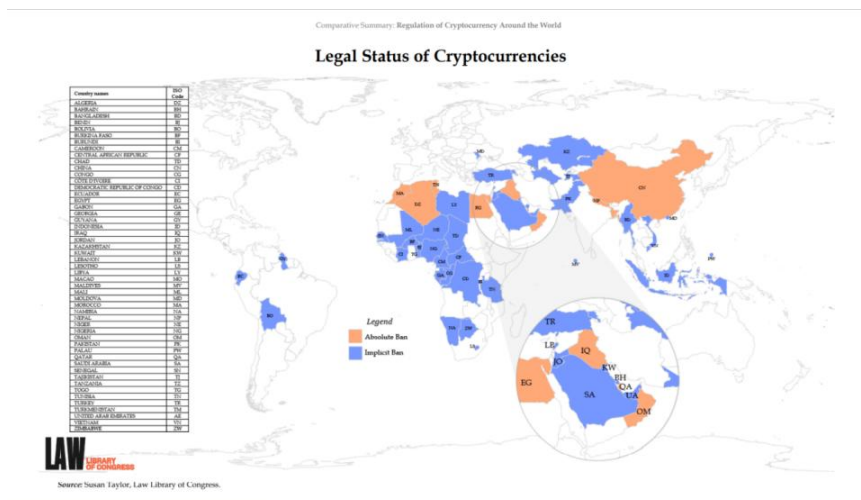
Fig. 3. Legal Status of Cryptocurrencies

Scource:

https://tile.loc.gov/storage-services/service/ll/llglrd/2021687419/2021687419.pdf

4.2   Economic Factors

Economic conditions will affect the ease of success and profitability at any time, because they will affect the availability and cost of capital and demand. For virtual currency, the economic factors affected mainly include the following three aspects:

First of all, Bitcoin and Ethereum, as typical decentralized currencies, have the storage function similar to gold and the exchange function similar to currency, so they can minimize the secondary losses caused by the currency crisis caused by the economic crisis[15].

Secondly, the return rate of virtual currency investment products is very high[16]. It has an effect that no financial product in the market can achieve. Nevertheless, the high return on investment also means that the investment risk of Bitcoin is high.

Fig. 4   Bitcoin price trend chart

Fig 5   Ether price trend chart

Finally, due to the existence of a large number of problems in illegal digital currency, the status of sovereign currencies of countries is threatened, and the legal digital

currency of the central bank came into being. There is obvious competition between non-legal digital currency and legal digital currency, which is a kind of competition between the virtual currency represented by the special currency and the ether currency.

4.3   Social Factors

Social trends determine work patterns and attitudes, consumer tastes and preferences, and specific types, forms and demands for products or services. To adapt to changing consumer needs, businesses might reposition their goods or services by concentrating on societal trends. People are now becoming more and more aware of the significant changes that modern technology web 3.0 has brought about.

Zhuotao Liu and colleagues believe that, web 3.0 is a computer epoch, and the term "web 3.0" is a shorthand signifying decentralization. Because Bitcoin is a point-to-point cryptocurrency, it is used in a web 2.0 environment. It can be said that Ethereum is ahead of Bitcoin in terms of the design of Internet finance because it has been able to use smart contracts to implement decentralized financial and semi-financial applications, has already complied with some web 3.0 requirements, and is more in line with social expectations and trends.
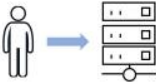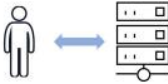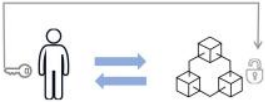

	Web 1.0	Web 2.0	Web 3.0
Main features	• One-way information • Professional generated content • Read-only and portal Internet • Centralization	• Interactive information • User generated content • Read-and-write and interactive Internet • Centralization	• Interactive information • User generated applications • Autonomous and user-based Internet • Decentralized
Financial application	Financial information release website	Online banking and online loans	Virtual teller, Metaverse virtual business hall

Fig. 6. Web 1.0-3.0 evolution diagram[18]

4.4   Technical Elements

Although the blockchain serves as the technical foundation for both Ethereum and Bitcoin, their specific applications and implementations differ.

They firstly issue various quantities. Since Bitcoin only ever releases 21 million, Ethereum never runs out of its supply. Thus, deflation will occur once more than 90% of Bitcoin has been mined. In order to reclaim the dug-up Ethereum, which is also in a deflationary state, Ethereum also implemented the PoS mechanism in December 2020.

Second, whereas Ethereum is a currency for all employees to freely construct smart contracts based on the Ethereum platform, making Ethereum more conceivable than Bitcoin, Bitcoin is a peer-to-peer currency built on P2P websites. For instance, create decentralized government, online voting, and financial apps on Ethereum.

Finally, their trading methods are also different. Ethereum adopts the POS mechanism, the average mining time is 20 seconds, and the unit of gas is to trade at the designated place; Bitcoin adopts the POW mechanism, with an average mining time of 10 minutes, and free trading is conducted in Satoshis. And the transaction rate of Bitcoin is much higher than that of Ethercoin.

4.5   Environmental Factors

The similarities between Ethereum and Bitcoin is that both use mining to create their virtual currency, which uses resources, raises transaction costs, and has a negative environmental impact[19].

The two vary in that the operations linked to Bitcoin will use a significant amount of energy while those related to Ethercoin will use a significant amount less. The numbers in the table show that while the value of Bitcoin in terms of money is more than double that of Ethercoin, it consumes more energy and emits more CO_2 than six times as much of it. As a result, compared to Bitcoin, Ethereum uses substantially less energy.

Table 1. Sustainability data for Proof of Work currencies(as for today)

Coin	Marketcap	Electricial Power	Electricity Consumption (annualised)	CO2 Emission (annualised)
Bitcoin	$442,795,687,684.00	13.66 GW	119.75 TWh	64.8 Mt
Ethereum	$189,540,957,246.00	2.51 GW	21.99 TWh	10.35 Mt
Dogecoin	$11,022,130,112.00	0.14 GW	1.2 TWh	0.65 Mt
Litecoin	$6,666,213,499.00	0.09 GW	0.82 TWh	0.44 Mt

Source: The Merge-Implications on the Environment Sustainability of Ethereum, 2022

The reason for the specific energy consumption difference is that Ethereum launched the Proof of Rights (PoS) mechanism in 2022 to support the consensus mechanism of Ethereum. Compared with the original Proof of Work (PoW) architecture, Ethereum is safer, less energy consumption and more conducive to the realization of new expansion solutions. However, Bitcoin still uses the PoW mechanism, which has some disadvantages in energy consumption.

5   Decentralized Analysis

5.1   Bitcoin Management Mode and Existing Problems

5.1.1. Early Governance

In addition to its core software, Bitcoin differs from conventional payment systems in that it lacks a governing structure. Early Bitcoin governance was a mess. The Bitcoin Foundation, which served as the early Bitcoin's management organisation, made no investments in areas where it should have been managed and supervised in order to implement the decentralised model envisaged by Nakamoto. Disputes in employee interactions between organisations, as well as between internal organisational aims and external cooperation. For instance, certain crucial information has not been shared, and there is also a lack of internal staff monitoring and restriction. Due to this, there is now corruption in the Bitcoin management, and a significant amount of Bitcoin is now being used in unlawful activities. Due to the high anonymity and lack of supervision of Bitcoin in the early stage, Bitcoin was particularly popular in the Silk Road market, mainly because a large number of contraband products were sold on the Silk Road website (as shown in the table 2).

Table 2. The Ten Most Popular Product Categories on the Silk Road Website in January-July 2012（Source:[20]）

Category	Number of items	Percentage
Weed	3,338	13.7%
Drugs	2,193	9.0%
Prescription	1,784	7.3%

In

Benzodiazepines	1,193	4.9%
Books	955	3.9%
Cannabis	877	3.6%
Hash	820	3.4%
Cocaine	630	2.6%
Pills	473	1.9%

addition, due to the immaturity of Bitcoin technology by the management of Bitcoin, and after the rapid rise of Bitcoin price, they did not invest too much resources in Bitcoin technology, resulting in Bitcoin exchanges often being attacked by hackers. The most notorious one was the hacker invasion of Mt.Gox, the largest Bitcoin exchange in the world at that time in 2014, which directly led to the bankruptcy of Mt.Gox exchange and indirectly led to the bankruptcy and collapse of Bitcoin Foundation [21].

5.1.2. Current Governance Mode

After the dissolution of the Bitcoin Foundation, Bitcoin has insufficient ability to prevent and control risks. For example, Bitcoin itself has the phenomenon of irreversible transaction, which leads to that if Bitcoin is sent due to error or fraud, Bitcoin itself cannot provide built-in mechanism to cancel the error.

In addition, Bitcoin has been issued for a long time and has a blacklist inside. An arbiter called on Bitcoin holders to reject these Bitcoin transactions from blacklist addresses, which brought more uncertainty to Bitcoin transactions and increased the risk of blacklist managers abusing the blacklist.

5.2   Ether Management Mode

5.2.1. Clear Division of Labor - on-Chain Governance and Off-chain Governance

The decision model of Ethereum is supported by blockchain technology and operates in a combination of "governance on the chain" and "governance off the chain". On-chain governance means that the proposed agreement modification is decided by the voting of stakeholders; Off-chain governance means that any agreement change decision is determined through the informal community discussion process.

A wide spectrum of stakeholders have been drawn to take part in Ethereum's off-chain governance. The chain serves as the foundation for Ethereum's

protocol-level governance. The benefits of the Ethereum platform's high engagement draw community conversations, and improvements are made throughout the discussion using open source algorithms. Many Ethereum-based use cases (like the DAO) employ a form of chain-based governance, producing final decisions through votes from developers, investors, users, and other relevant parties while upholding stakeholder rights. These two approaches serve as admirable examples of the decentralized management concept, at least to some extent. A center of absolute authority does not exist. Most decisions are made as a result of participant discussion and vote.

5.2.2. Decision Process of Learning Organization

As a learning organization, the Ethereum Foundation has a relatively complete decision-making process. There are two kinds of decision-making processes:

First, when the proposer puts forward the core Ethereum improvement proposal, the proposer will elaborate on the core Ethereum improvement proposal. Once accepted, this will be the formal specification of the Ethereum improvement proposal to be implemented by the protocol developer.

Second, when the proposer shows the improvement proposal of Ethereum to the protocol developer, the Ethereum platform encourages the proposer to achieve this goal by proposing to discuss in the AllCoreDevs call.
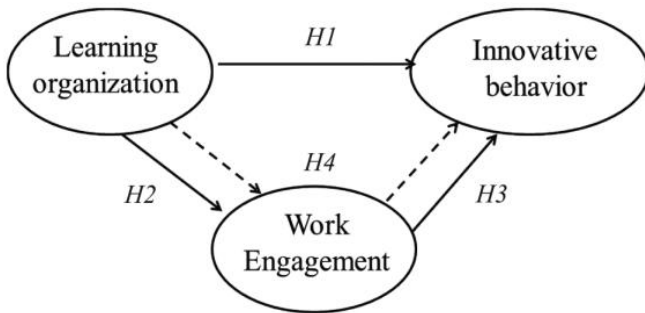

Fig. 7. learning organization[22]

5.2.3. Decentralized Decision-Making Mode

There are various stakeholders in the Ethereum community, and each person plays his or her own role in the governance process. Starting from the stakeholders farthest away from the agreement, the Ethereum holder, the application user, the

application/tool developer, the node operator, the author of the Ethereum improvement proposal, the miner/verifier, and the agreement developer (also known as the "core developer"). These roles play a key role in the governance process of Ethereum, ensuring that Ethereum's decisions meet the interests and needs of most Ethereum stakeholders.

5.3   Mining Method

According to Bohme, R., the distributed consensus mechanism is largely to blame for Bitcoin's ability to become decentralized. Decentralization of Bitcoin, however, is not possible in the mining and governance sectors[20]. Different levels of decentralization result from the various Bitcoin and Ethereum mining strategies. With the unlicensed blockchain, it is impossible to fully decentralize, according to the research of Yujin Kwon et al. We can show that DPoS is the most decentralized, followed by PoS, and that PoW mechanism is the least decentralized by comparing the experimental data of PoW, PoS, and DPoS. Because Ethereum currently completely utilizes the PoS mining process, its level of decentralization may be higher than that of Bitcoin[10].

5.4   Transaction Mode

Bitcoin realizes transactions through the exchange of point-to-point digital addresses built on P2P networks, with a certain degree of decentralization. But its essence is still to put Bitcoin in the sub-central link of P2P blockchain for data processing, so its degree of decentralization is still limited. And Ethereum can use smart contracts to make the transaction link in the Ethereum platform jointly managed and built by the whole community, which makes Ethereum more decentralized.

6   Conclusion

Through PESTEL model analysis, we combine the complex social background of the virtual currency, and analyze the difference of the impact of Ethernet and Bitcoin on society. In terms of saving resources, reducing environmental pollution and technological innovation, and meeting the needs of the social era, Ethereum has greater advantages than Bitcoin. Through the theoretical analysis of decentralization, it is found that in terms of governance mode, mining link and trading mode, the

degree of decentralization of Ethereum is higher than that of Bitcoin. Decentralization is crucial for a virtual currency, which also demonstrates why Ethereum's management approach is more deserving of consideration. In addition, there is no completely decentralized management model for virtual currencies, even though the current level of decentralization does not fully satisfy user needs. As a result, the future virtual currency should emphasize technological advancement and consider the prospect of decentralized technological development in order to support the management model.

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