Study on Observing the Evolution of Blockchain from the Perspective of Participatory Design

Zhijun Du
School of Architectural & Artistic Design
Henan Polytechnic University
Jiaozuo, China 454000
College of Fine Arts
Seoul National University
Seoul, the Republic of Korea 08826

Abstract—There are many opinions that the credible exchange of data will be at the heart of many processes during the coming fourth industrial revolution. For this reason, in finance, insurance, and logistics, blockchain technology is regarded as the next huge disruptive force. Up close, the state of the entire blockchain domain is not as rosy as it seems. There are many problems with schema replication, with inferior or slightly modified schema replication versions emerging in an endless stream. Why technologists and managers with the best intentions cannot bring a better experience to the world? Few existing blockchain platforms have been successful, but what are the reasons for their success? The charm of blockchain attracts unlimited capital and technology investment and triggers a series of emotional reactions and public discussions. How do these events affect the world in turn? There are many developers and leaders who are trying to challenge the status quo and innovate. Some of them are committed to shaping the scene and designing the interfaces of blockchain applications, while others are bent on trying to influence the current social functioning system. They do this work for the purpose of rationalizing the foundations of trust in finance or other business, thereby improving people's quality of life. However, the results are often far from the original intentions. Regarding the blockchain events occurring between 2009 and 2019 as an experiment in participatory design, this paper analyzes the characteristics and trends of the times, the community's response, social discussions, and application examples. Finally, it is concluded that network applications based on the blockchain will be further developed, the corresponding legal system should be improved faster, and the human spirit of the contract needs to be updated and further improved so as to strive to become masters of the times.

Keywords—blockchain; participatory design; network

I. Introduction

Disciplinary and interdisciplinary design, as well as social participation issues, has been discussed repeatedly to prompt designers to put forward some new design initiatives, such as 1) solving the social problems of design and life pattern design, 2) daily life and design, 3) and social reformation design. Design concepts unceasingly innovate. Nowadays, the research field of design is no longer limited to visual presentation, material products, architecture, engineering, and other fields. With the enhanced performance of computer hardware and the military computer system as the starting point, computer software performance has also improved, and more research on human-computer interaction design (HCI), interface design, and complex system design has been done in the field of design research. With the development of various technologies, the design field is also adapting to the needs of technological development and constantly expanding its research perspective. The ethical problem of design is related to anthropology, sociology, politics, and other fields, and this interdisciplinary issue is an important research direction. Based on this, this study examines design ethics and other social issues from an interdisciplinary perspective.

Bitcoin based on blockchain technology was born in 2009 [1], and subsequently, quite a small number of applications based on blockchain technology were developed successively. Blockchain-related capital reached a climax at the end of 2017, and the emergence of a high point of relevant public opinion lasted until the middle of 2018. The author believes that this example can be regarded as showing a wide range of social practice involved in participatory design. At this level, there is a need to study its systems, ethics, and applications.

In this paper, from the perspective of design research, the whole process, from the emergence of bitcoin to the wide application of blockchain technology, will be regarded as having a wide range of uses and fully opening the participatory design process. Regarding the stages of development, this participation went through the stage of obscurity; then the prosperity of capital speculation; and then progressed to the final stage, the current leveling-off. From the perspective of public opinion, its starting point is the phrase "peer to peer," which evokes people's high expectations of its technical possibilities in helping to solve the problems of daily life as well as some international issues. However, there are many negative views of it, due to the fact that it is turned into a speculative tool on most occasions during actual operation. From the beginning stage to the current state of the practice, its use demonstrates the following characteristics. First, the value of safety and

accurate data in the post-network era has gradually become more obvious. Second, across society, interest in technology has increased, and people's discussion of, and participation in, technology development is increasing. Third, the limits of the current monetary architecture must undergo some degree of rethinking. Finally, in the context of today's world, the positions and limitations of various regimes are reflected to some extent in this life-changing practice design. This article will analyze the problems described above.

II. INTERNET GENERATION AND POST-INTERNET GENERATION

Regarding the Internet generation's characteristics, scholars have differing opinions. The first viewpoint is that compared with the pre-Internet era, the Internet generation has not changed, but it may seem quite different. The reason for the apparent difference is that the Internet allows us to see things that were there before, but that haven't been seen before. The second opinion is that the Internet age tends to polarize society, and with everyone viewing only what they want to see, the Internet has made the world enter a post-truth age. The third claim is that the Internet generation has broken down the boundaries that controlled access to knowledge and information among different classes of people. People can get a lot of free information, knowledge, high-quality courses, professional skill training, etc. through the Internet, and it allows individuals the possibility of a breakthrough that is not restricted by regional or class boundaries. Young people who grow up as part of the Internet generation may develop a stronger cosmopolitan "global soul," and they may be more willing to help others and become better at sharing what they have. Because of the complexities and contradictions in society, the phenomena of the internet generation observed by scholars are internalized at different levels simultaneously, even though they are sometimes incompatible.

With the accumulation of such phenomena, the continuous progress of network technology, and expanding network communities, the spirit and thoughts of society will change. Owing to the reasons described below, members of the internet generation have an easy way to contact each other all over the world. Access to digital resources, knowledge, and information has expanded, gradually breaking down social classes and barriers.

Due to the reasons described above, society may gradually enter a post-Internet generation, and then the data will become productive to a certain degree, which will almost surely produce many new issues.

Generally, the internet (or post-Internet) age will be an era of increased opportunities. However, there are personal information leakage problems, hacking, or manipulation issues that can occur from time to time. From the perspective of most people and regarding the overall level of development, the advantages of this approach to technology outweigh the disadvantages, constituting an upward trajectory.

III. COMMUNITY RESPONSE

Blockchain is well-known on account of being a kind of basic technology behind imaginary currencies like bitcoin. Blockchain technology can be applied in many fields, not just in the monetary realm, and it will become an innovative technology that will change society, as Yukio Noguchi said in the book, "Blockchain Construction and Theory" [2]. Blockchain technology is a combination of cryptography algorithms that exist in many forms. The turning point in blockchain technology was the birth of bitcoin in 2009. Satoshi Nakamoto published a paper online entitled "Bitcoin: A Peer-to-Peer Electronic Cash System" [3], and in the article, the author described it as follows: "A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution." One year after the article was published, on January 3, 2009, the first 50 bitcoins were excavated, marking the birth of bitcoin.

Governments' attitudes toward bitcoin and the blockchain, as well as their definitions of bitcoin, are in a state of flux. Regulation of bitcoin also varies from country to country. Germany, a developed European country, adopted the bitcoin designation through its Ministry of Finance in August 2013, recognizing bitcoin as a currency unit and as private property. Moreover, the German Ministry of Finance said in March 2018 that it would not tax bitcoin payments. As the first official positive indicator from a government, this policy has attracted the attention of all countries and all levels of society. On April 1, 2017, the Japanese government canceled the consumption tax on bitcoin transactions, officially recognized bitcoin as a legal payment method, and had already started to accept bitcoin as payment for utilities. However, relevant regulations were enacted in 2019 to limit the investment quota of ICO. America has a license system but it is hard to get one. The buying, selling, receipt, and storage of bitcoins are licensed and regulated by the Financial Services Department of New York ((FSDNY). China banned bitcoin trading, and on December 3, 2013, the People's Bank of China, the Ministry of Industry and Information Technology of the People's Republic of China, the China Banking Regulatory Commission, the China Securities Supervision Commission, and the China Insurance Regulatory Commission jointly issued the "Yinfa [2013] 289" document [4], which pointed out that bitcoin was not money. Financial institutions are prohibited from engaging in business related to bitcoin, but in 2014, the People's Bank of China set up a legal digital currency project team. Russian citizens were banned from holding and trading bitcoin, but the attitudes of the Russian government have since softened.

In addition to the steps taken by the government, many enterprises also produced their own responses, and Microsoft, which is the largest computer platform, agreed to recognize bitcoin as a currency. In addition, the computer manufacturer Dell, the commercial airline Virgin Galactic, and Internet retailers like Overstock, Tiger Direct, and the electronic products sales platform New Egg, as well as the Internet gift card retailers eGifter and Gyft, the satellite TV company Dish Network, the auto parts company Auto Parts Way, and others accept bitcoin as payment. Furthermore, there are

many schools and colleges, such as Nicosia University in Cyprus, Cumbria University in the UK, the University of Applied Science and Art in Switzerland, Flinders University in Australia, and The European School of Management and Technology (ESMT Berlin), as well as others, that accept bitcoin as currency to pay for tuition and other expenses.

In accumulating and cultivating knowledge, which lets a person experience the power of social development, universities and education play an important role. On November 25, 2013, the University of Nicosia, the largest private university in the Republic of Cyprus, announced that it would become the first private university in the world to accept the use of bitcoin to pay tuition fees and that it would also offer a master's degree in digital currency. A free digital currency course called "Introduction to Digital Currency" was launched on March 15, 2014. The course was taught by bitcoin experts from the fields of computer science and finance and professors from the University of Nicosia in English, not only to on-campus students but also online. The University of Nicosia has designed courses for financiers, business people, entrepreneurs, and public managers who want to learn more about the digital currency base, how digital currencies interact with existing monetary systems, and opportunities for digital currency system innovations. In addition to its commitment to developing the prestige of bitcoin, the University of Nicosia has proposed that the Cypriot government develop the island into an international hub for bitcoin trading, processing, and banking. The University of Cambria in Lancaster (northern England) became the first public university in the world to accept bitcoin as payment for tuition fees in January 2014. On February 16, 2015, the University of Cambria announced the launch of a free online master class focused on the future of bitcoin, with more than 100 students signing up for it. The Tsinghua University of China set up a blockchain lab called x-lab in 2014, and it has made some progress in the application of blockchain technology. In late April 2014, the Massachusetts Institute of Technology (MIT) initiated a $500,000 bitcoin airdrop program. At the end of October, each MIT undergraduate received the equivalent of $100 in bitcoin for free. The money was distributed to more than 4,500 MIT undergraduates to promote the academic and entrepreneurial climate of bitcoin on campus, according to the organizers. In September 2014, Geoffrey Miller, a law professor at the School of Law at New York University (NYU), and David Yermack, a finance professor at the Stern School of Business, started a graduate course on the "Law and Business of Bitcoin and Other Cryptocurrencies," with the goal of assessing the value of bitcoin and its impact on the economy. Duke University finance professor Campbell Harvey's digital currency course followed the one offered at NYU, and the course is entitled "Innovation, Disruption, and Cryptographic Adventures" and focuses on the commercial potential of blockchain technology. The program is offered to students of computer science, law, and business at Duke University. However, Harvey said that the potential of blockchain technology is not being given the attention it deserves due to a lack of understanding and that this is something academics should accelerate by providing more information about it. On October 15, 2014, Imperial College

London, one of Europe's leading polytechnic universities, and the Organization of Entrepreneurs (OE) announced a partnership in which they agreed to give credits for bitcoin-related courses and set up a fund to reward students who do well on bitcoin-related projects. The national-level blockchain talent cultivation course, which is supported by the Ministry of Science and Technology and the Ministry of Labor in South Korea, is open to recruiting students from all over South Korea. It offers courses on subjects like public blockchain, private blockchain, dApp development, and so on, and the classes have been offered for two terms so far. The Gangwon province government of South Korea hosted the Pyeongchang International Blockchain Forum in January 2019, inviting professionals from multiple countries to share blockchain projects and expressing the hope that Pyeongchang might assume a leading role in the blockchain industry.

IV. SOCIAL DISCUSSION

From the view of participatory design, rather than saying that the blockchain is a new technology, it provides a new model. Blockchain is the data of the transaction records of all the people involved in the network. Blocks with the data are linked in chronological order to become blockchains [5].

Since the birth of bitcoin, the discussion of it, and the blockchain technology behind it, has been evolving, reaching a peak from the end of 2017 to the first half of 2018. The discussion has mainly focused on economic status, technical levels, and social structure. There has been much discussion at the social level on the following topics: coin revolution, democracy, decentralization, international relief, transparency, anarchism, community with a shared future for mankind, the concept of a technology-driven society, public value, trust, coin systems, exchange systems, sovereignty in the digital field, and so on. Each country has different concerns.

Many global problems have also been mentioned in relevant discussions, such as the subprime crisis, Arab spring, the refugee problem, poverty eradication, Britain's exit from the EU, and so forth. Blockchain technology is urgently expected to be used as a trust machine to solve the problem of human survival in extreme conditions. Digital currencies can play to this strength in an emergency international bailout.

Blockchain technology can support the guarantee of the "trust process" without any third party. In people's daily lives how many situations require a third party as a guarantee of trust? Is it possible to solve this problem with blockchain technology? On a technical level, the answer is essentially yes. However, in the current global environment, people must realize that there are still many problems. For example: Firstly, digital sovereignty issues and supervisor mode and security issues, such as transnational cyber-crime issues. If most countries agree on the necessity of supervision and the complexity of regional supervision of the actual situation, the plan of establishing an international management network becomes a prominent issue. Even in the case of blockchain events that are relatively easy to authenticate, consensus and

the spirit of the rule of law are very important in the context of human interactions. Secondly, blockchain technology has the ability to equally empower everyone, but should there be a limit on this? (How to set reasonable limits? What kind of changes will freer people bring to society? Will this lead to changes in the structure of society? How should people respond to these changes? How should individual obligations and regulatory mechanisms make corresponding adjustments?) There is also the issue of integration between online and offline contexts and the boundary between privacy and regulation. Thirdly, what about the economic benefits and administration and maintenance costs of using blockchain technology and so on? These questions are yet to be answered completely.

V. APPLICATION EXAMPLES

There have been several cases in which using blockchain technology has attracted widespread attention. Chief among them is the Estonian government's "e-Estonia" project. Because of Estonia's winding road to independence and its national conditions, the e-Estonia project has been in effect since 1997. As shown in "Fig. 1", after launching sub-projects on "e-Governance", "e-Taxe", "X-Road", "Digital ID", "i-Voting", "Public safety", "Blockchain", "e-Health", and "e-Residency", it has accumulated many years of experience and the Estonian government's Internet service system has been improved. The system was originally designed for Estonians, and then it announced e-Residency for people throughout the world in October 2014. People from other countries can apply for e-Residency online and then pick up the e-Residency ID card at their local Estonian consulates. As described in the video [6], the functions of e-Residency include international payments, company registration and operation, online contract certification, and so on. Such a service is available for anyone who holds e-Residency without any limitations due to race or nationality. It breaks through the limitations of national boundaries and provides a barrier-free multilateral cross-border service platform.
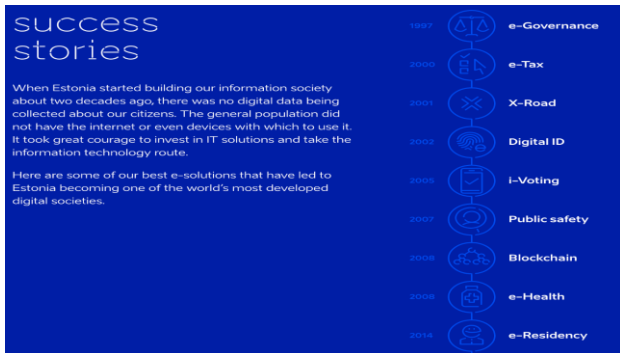

Fig. 1. Development timeline of Estonian e-government.

In Estonia today, there are only a few things a person cannot do online, such as registering for marriage and obtaining personal identification. Everything from the enrollment of children in school, buying a house or a car,

seeking medical treatment, obtaining certificates, voting in elections, entering into business contacts, and so on, can be completed through the Internet.

The technology behind the "digital nation" was the launch of X-Road in 2001. Simply put, X-Road is a distributed data storage and exchange platform. Every Estonian e-Resident who logs in with his or her ID and PIN can access all the data related to him or her and can easily access the public data of the government. In other countries, for example, the process of getting a passport might involve filling out several forms, handing in physical photographs, and pressing a fingerprint. When you apply for a driver's license, you must also fill out several forms (the information you need to fill in is often the same as the information you provided when you applied for a passport earlier) and repeat the process. In Estonia, as long as the data were input in the application for the identity card, follow-ups for a variety of procedures that require the data only require the user to input the password. In addition, in the X-Road system, individuals have absolute control over their own data and can control the degree of authorization and openness of information. For example, doctors can only access their own medical information, but not financial information. Moreover, Estonia also created a "data embassy" based on the idea of a "digital country," to ensure that the digital system could resist the entire spectrum of threats and to ensure that it would work even if the country were invaded by another country (Russia, as a neighbor of Estonia, is often regarded as a putative foe). At the beginning of 2017, the Estonian government set up a long-distance backup for e-Estonia in Luxembourg. In the jargon of the IT industry, this is known as "remote living," and it is seen as part of the digital Estonian territory. It is called a "data embassy," which is built on the same body of international law as a physical embassy, so that the servers and their data are on Estonian "soil." The Estonian information system is shown in "Fig. 2" [7].
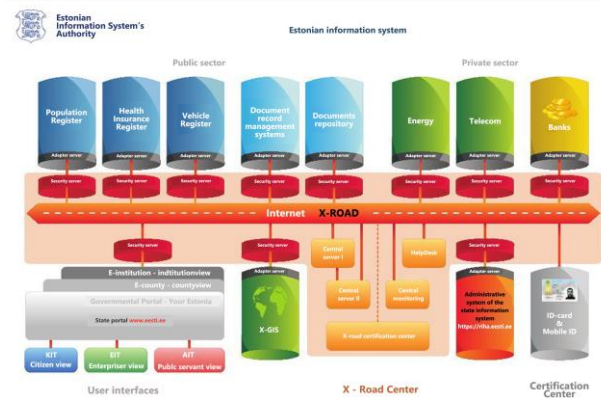

Fig. 2. Estonian information system.

As another example, let's take a look at the Ethereum (ETH) and EOS blockchain technology application platform.

Generally, in mature markets, technology and the consumer are separated by product development, development managers, market segmentation, multi-channel retail, and sales. Follow-up feedback, tracking, and after-sales service are also involved in professional handling. Mature markets have many segments. In contrast to the well-developed traditional product market, in the new type of technology-driven product market, the distance between core programmers, professional developers, and real users (or consumers) are very short. Not only do the developers try to make sincere communication, but a large number of users have an active role in product development. These users are no longer satisfied with passive product acceptance, so they contribute active experience, positive feedback, and even give various levels of professional suggestions for improvement. This makes the users and enterprises grow together. Enterprises fully respect users, and users also give more tolerance and a sense of identity to enterprises. The operational mode of Xiaomi Corp. clearly reflects this change. Trusting, forward, benign interactions between enterprises and users have been formed, which indicates success. This approach not only helps the company greatly reduce losses, with a gradually maturing user market, but this method of operation is also bound to become a trend. Such operational characteristics are also reflected in a number of platforms and applications using blockchain technology. The founder, as a technician, often communicates directly with users, and the founder's image is directly related to the company's image, even forming a "fan effect." A white paper entitled "A next-generation Smart Contract and Decentralized Application Platform" was published by Vitalik Buterin, the main founder of Ethereum (officially launched in 2015), along with the launch of a well-known development platform known as the Smart Contract program code. The EOS platform was born in 2017, further improving the technology, broadening the bandwidth, and ensuring the passage of a large amount of data. With the encouragement of users and the market, its technical problems are still being improved gradually. A comparison of bitcoin, Ethereum, and EOS is shown in "Table I" [5].

TABLE I.   A COMPARISON OF BITCOIN, ETHEREUM AND EOS

	Bitcoin	Ethereum	EOS
Classification	Public, Consortium, Personal	Public, Consortium, Personal	Public, Consortium, Personal
Algorithm	PoW	PoW → PoS Ready for Changes	DPOS (Delegated Proof of Stake)
Speed	The Block production interval is 10 minutes; confirmation takes 1 hour.	The block production interval is 12 seconds; confirmation takes a few minutes.	The block production interval is 0.5 seconds; parallel processing.
Poundage	A higher price (more than $10)	small	NO
Role	Gold/Asset	Share/ICO	Currency/OS
Intelligent Contract Development	Script languages have limited stability.	Smart contract complete with Turing, Dapp with Solidity language DAO is provided.	Simpler intelligent contract to provide API, SDK, DAC for Dapp.
Developers	Satoshi Nakamoto（2008）	Vitalik Buterin（2015）	Dam Larimer（2017）

a.   source: w.k. Cho, "blockchain change industry and society," Walton block chain research institute, 2018

VI.   CONCLUSION

From a macro design perspective, this paper regards bitcoin and the evolution of blockchain applications as a large-scale practicing ground for participatory design and describes the activity of participatory design by observing the behaviors, propositions, and views of various organizations and individuals, reaching the following conclusions:

First, in the Internet age, each person is a producer of data, and the data can become a kind of productivity in the post-Internet era. This will lead to a new amendment of the network model that will revolve around the "privacy, trust, rights, and interests" dispute phenomenon. An emerging or mature platform, which may be better equipped to deal with the disputes and make real optimizations, may become the winner because this is the most important and urgent matter that needs to be resolved in the post-Internet era. Based on this fact, there is a lot of space for the new application scenarios.

Second, it must be noted that the birth of bitcoin and the subsequent development of various other digital coins show a trend of being "a game of speculation in the capital field, and the harmful capital bubbles caused by this scenario are numerous. Strict supervision, reasonable management methods, the formulation of relevant laws and regulations, and research on technology and ethics construction are necessary.

Third, technology can help improve the rational aspect of something "instrumental," creating perfect "instrumental rationality." However, if dominated by a user's malicious intent, "instrumental rationality" can become more damaging. At the other extreme, are users who rely on the "rationality of instruments" or "tool rationality agents" so that they may give up thinking risk becoming an appendage of a tool. Such value-building issues in the context of human nature should instantly be accorded great importance.

The limitation of this study is that the data are not comprehensive enough because this field is still developing rapidly. Continued attention and further research are needed.

REFERENCES

[1] J. Zhu. Virtual and real bitcoin, The board of directors, 2014, 1:pp. 104-105.

[2] A. Yoshiharu. Blockchain construction and theory, 2017.

[3] S. Nakamoto. Bitcoin: A Peer-to-Peer Electronic Cash System [J/OL]. 2009, https://bitcoin.org/bitcoin.pdf.

[4] http://www.csrc.gov.cn/pub/newsite/flb/flfg/bmgf/zh/gfxwjfxq/201401/t201440122_242972.html.

[5] W.K. Cho. "Blockchain change industry and society," Walton Block Chain Res. Ins., p. 7, November 14, 2018.

[6] https://www.youtube.com/watch?V =1IxLHLEDY0Y

[7] K. Vassil. Estonian e-government ecosystem: foundation, applications, outcomes, digital dividends. June 2015.