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Blockchain-based Digital Currencies

Soichiro Takagi

(Associate Professor, Center for Global Communications, International University of Japan)

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Abstract

Blockchain technology has provided a new way of managing a community and the collective action of stakeholders which are not governed by authorities. On the other hand, social capital also plays the critical role to make community to function. This paper tries to reveal the hidden impact of blockchain technology on social capital, and how blockchain technology can help promote communities. This paper proposes the framework to assess the impact of blockchain-enabled services on social capital, and examine three case studies: local currency, token issuance by individuals, and Bitcoin split. From these exploratory analyses, it is inferred that the impact depends on the design of the services, and the positive impact on social capital would be more expected when the tokens are separated from capitalization based on fiat money and less focused on the direct economic returns.

Keyword
Blockchain, Social Capital, Digital Currency, Bitcoin

1. Blockchain-based Digital Currencies and Community Building

Blockchain technology was invented in the context of enabling a digital currency, Bitcoin. This technology has a significant importance to maintain the tamper-proof security of ledgers by anonymous participants who are participating in the network rather than by a central authority which control the stakeholder's actions. In other words, blockchain technology has provided an important innovation as a way of managing community and collective action of stakeholders which are not governed by authorities.

In case of Bitcoin, blockchain technology enables a coordinated action of "miners" through the token issuance which incentivizes them to manage ledgers, check transactions, and verify blocks which were made by other miners. Tokens also play important roles in other services using Blockchain technology, such as shared stakes whose capitalized value indicates the collective value of the community.

Tokens also play a role to coordinate the competition among participants. In Bitcoin, miners compete each other to get a newly created Bitcoins as a reward of managing ledgers. In terms of managing the software function, mining capacity, which is the performance to successfully "mine" the blockcs, play an important role as a voting power for decision making. As seen in these examples, blockchain technology is not a mere enabler of new currency, but also a new mechanism for managing community and coordinating collective actions.

On the other hand, social capital is another factor which affects the effectiveness of communities and collective actions. Social capital is characterized by trust, norm of reciprocity, and network, and widely analyzed as a hidden factor for why one community works and the other doesn't. Basically social capital reflects the continuous and dense interactions of people in the community. Because blockchain technologies provide a new way to manage people's interactions, the technology would have a significant impact on the social capital.

However, people's interactions which are mediated by blockchain and digital currencies are not simple and have multiple aspects as seen above. Hence, the impact of blockchain on social capital would not be straightforward. Therefore, this paper tries to reveal the hidden impact of blockchain technology on social capital, and how blockchain technology can help promote communities through conceptual argument and analyses with cases. In particular, this paper tries to explore how blockchain-based digital currency is related to social capital, and whether it increases or decreases social capital, and if it has a positive effect, what kind of uses of digital currencies can help community social capital. The following sections propose the framework to discuss these points, and examine three case studies to verify the effectiveness of the framework.

2. Social Capital

The term of social capital is used in a variety of context and its definition has been one of the sources of argument among scholars in the field such as sociology and economics. As Scrivens and Smith (2013) extensively investigated in their report of OECD, there is a wide divergence in the meaning and context for which the term social capital is used. Classical view of social capital focuses on the individuals' asset to access the human network to survive in their professional career as shown in Pierre Bourdieu (Bourdieu 1984). James Coleman takes the similar approach to consider social capital primarily as a resource for individuals, but considered it also as a public good and the capital which has the positive externality (Coleman 1988, Scrivens and Smith 2013).

On the other hand, there is a view on social capital as a shared norms rather than human connections. Fukuyama (2001) defines it as "social capital is an instantiated informal norm that promotes co-operation between two or more individuals" (p.1). Taking both of the networks and norms together, Robert Putnam takes a view of social capital more as a public good, defining it as "connections among individuals – social networks, and the norms of reciprocity and trustworthiness that arise from them" (Putnam 2000, p.19). The Putnam's view to consider social

capital as not mere connections but also norms such as trust and reciprocity has been widely accepted, such as seen in OECD's definition as "networks together with shared norms, values and understandings that facilitate co-operation within or among groups" (OECD 2001, p.41). Considering the widely accepted definition of Putnam (2000) and the importance of norms and trust in the consensus on software management, this paper proceeds the discussion based on the definition of Putnam (2000) and OECD (2001).

Among the characteristics of social capital, there are two important aspects that should be taken into consideration in the discussion on the impact of digital currency. The first is *externality*. Usually social capital refers to the external and positive impact which derives from economic transaction. It is not the summary of direct economic transaction such as buy and sell, but rather a spill-over from people's interaction including economic transactions, and those spill-overs are considered as social capital that should benefit those who are not directly involved in the previous transactions. In the digital currency's perspective, social capital is not the sum of transaction made from Bitcoin, but rather spill-over which should derive from those transactions. Therefore, *externality-focused* activity, rather than capitalized transactions, is important to accumulate social capital. In the digital currency's context, *externality-focused* property is related to whether the token is bought and sold solely for gaining a capital gain and exchange for other goods, or traded aiming to have an indirect benefit by owning the token.

The second aspect is *involvement of people's action and perception*. Because social capital is based on the people's perception and expectation on others such as trust and norms, a mere structure of network and automated transactions will not contribute to accumulate social capital. For example, the fact that one's computer is connected to billions of other computers via the Internet does not create a large amount of social capital. Instead, if people interact with others using the Internet such as by discussing and transacting each other, those actions possibly contribute to the accumulation of social capital. From digital currency's context, automated payment and transactions using Bitcoin will not necessarily contribute to social capital. In contrast, if people make a conscious payment to buy and sell goods using Bitcoin with the intention to support the counterparty, and invest in a project using ICO (Initial Coin Offering) aiming to support the project, it will have some external effect in terms of trust, norm, and network[1].

In summary, the following discussion is based on the framework shown in Figure 1. This framework represents hypothetical relationship between the attributes of the use of digital currency and its impact on social capital. Attributes of *Externality-focused use* and *involvement of people's action and perception* regarding the use of digital currency play important roles to raise social capital.

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[1] It is worthwhile to note that there is a proposed way to internalize the external value (social capital in this context) into the value of currency, such as PICSY (Suzuki, 2013). PICSY, one of the forms of digital currency, though it is not based on blockchain technology, tries to sum up the people's contribution through transaction, and give people based on their contribution through currency. However, the argument of the following section is based on the perception that some external value is accumulated though transactions in the economy.
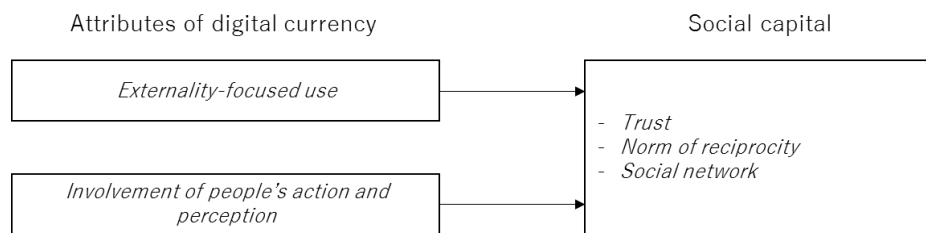
Figure 1. Relationship between digital currency and social capital

The following sections examine the case studies depending on the abovementioned framework. Each case is unique and different to each other, but the analysis of three cases would shed light on the hidden aspects of digital currency.

3. Case study 1: Moeka

Moeka is an experimental digital currency that is designed to vitalize local community (Takagi et al., 2017)[2]. The basic concept of this project is to raise the value of local community by promoting the communication among residents. To stimulate the incentives for people to communicate each other, Moeka (its unit is Moe) is issued based on the peoples' action to communicate to other people. Resembling to Bitcoin, which is issued by the miners' action to contribute to maintain its ledger, Moeka is issued by peoples' contribution to raise the value of community by their action to talk to each other[3].

Its proof of concept was conducted in Aizu-wakamatsu city in Japan in November 2017, in one-day event. In this experiment, people used the currency in two forms: one was to bet on a raffle to get Moeka goods; the other way was to buy goods such as coffee, popcorn, and cocoa directly. In this one-day event, a total of 160 users registered for using Moeka, and 774 payments were made in total. At the time of this event, Moeka has no value against to Japanese Yen or US Dollars, but it is supposed that if people continue to use it as a mean of exchange, the value of Moeka should be capitalized and exchanged with other currencies, so that it would have a wider opportunity to be used as a currency.

Moeka is designed to stimulate the communication among residents, therefore, its use is intended to have strong external effect other than economic transaction to buy and sell goods. It also obviously involves people's action in the form of conscious communication. Additionally, it is implicitly expected that the more communication will increase the amount of the currency owned by the people, and the more use of Moeka in the local community as a means of transaction will raise the value of the currency. In other words, Moeka is the collective asset of the community, and its value can be raised by residents' action. This design can raise the norms of reciprocity, and the communication which is promoted by the token issuance will increase the trust and social network in the community. In these ways, Moeka clearly contributes to increase social capital of the community.

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[2] The author acknowledge that the author also participated in designing this project.
[3] On the detail of technical implementation, see Takagi et al. (2017).

4. Case study 2: VALU

VALU[4] is the platform for individuals to issue their own tokens, which was launched on May 31st 2017. Using the platform, anyone can issue their own coin (VA token) whose initial market cap is calculated by the platform based on the social network such as Facebook. Individuals can sell their own token to other VALU members, such as selling 100 tokens among 1,000 total tokens. Other members can buy and sell the tokens in the platform using Bitcoin, therefore, the tokens are capitalized from the beginning and can fluctuate depending on the supply and demand of the VA tokens.

This service is intended to enable the mechanisms so that people can support other individuals who are pursuing a certain activity, therefore, it resembles to crowdfunding. However, the difference is that any members can buy and sell issuers' tokens, and the total value of the token of the issuer can be increased or decreased, through market mechanisms and also expectation on the future value which is based on the issuers' activity. From buyer's perspective, they own a certain "stakes" of other people, expecting its value will rise in the future, because of the issuer's activity. It is similar to ICO (Initial Coin Offering), but conducted by individuals rather than companies.

After the launch, VALU attracted a significant attention of users. Some users got a support from others on the social activities, and others issued tokens which are bought and traded intensively with the expectation on the price surge. There is a continual discussion on the legality and consumer protection regarding such services[5].

Original intention of VALU is to help peoples' will to support others[6], and buying others' tokens would have increased external impact such as trust and reciprocity. However, because its tokens are exchangeable with others and also to Bitcoin, it is easy for users to be attracted to make profit rather than supporting others. This makes the users more focused on economic gain rather than external impact. This smaller *Externality-focused use* might lead to smaller impact on social capital than expected, particularly on the trust and the norm of reciprocity. On the other hand, it is observed to have an effect to create social network by owning others' token.

5. Case study 3: Bitcoin Mining and Split

The third case is the split of Bitcoin that happened in August 2017. This is the issue of how to reach consensus on the update of software for operating Bitcoin. There are many stakeholders around Bitcoin, such as miners, developers, users, exchange operators, etc. As the general framework, developers propose the upgrade of software, and miners, who are taking charge of managing the ledger, have the right to vote for the proposals. Therefore, making consensus among miners is critical for the smooth upgrade of the function.

After the long discussion to solve the scalability challenge[7] of Bitcoin, three major solutions were proposed. The first is BIP (Bitcoin Improvement Proposal) 91, which proposed the reduction of the size of transactions by the method of "Segwit", and also the increase of block size to 2MB. BIP 91 also proposed the method to reach consensus which is similar to voting. When more than 80% of blocks signal the support for Segwit during about 2.5 days, any blocks onwards which do not support Segwit are considered invalid. These signals are embedded into

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[4] https://valu.is/

[5] For example, Taro Aso, the Minister of Finance of Japan, said it is important to protect consumer as well as promoting new services regarding VALU. See https://www.nikkei.com/article/DGXLASFL15HAT_V10C17A8000000/.

[6] https://valu.is/terms

[7] Bitcoin could process only 7 transactions per second, which was considered too small given the increasing demand as a remittances and payments.

blocks by miners. This proposal is based on miners' consensus that was reached in the face-to-face meeting at New York City[8], therefore, called as "NY consensus".

The second proposal is BIP148, which includes Segwit but no increase of blocks size. However, the more significant difference from BIP91 is that BIP148 does not require the consensus by voting. Instead, BIP148 tried to automatically enact Segwit by ignoring blocks which do not support it. BIP 148 set the date of implement of the proposal to August 1st, 2017. If this was implemented, Bitcoin would have split to those with Segwit and those without it. If BIP 91 obtained the support by the majority, BIP148 is dismissed because Segwit is already included in BIP91.

The third proposal was Bitcoin Cash, which intends to expand the block size to 8MB. This proposal also tried to automatically enact the expansion of block size on August 1st, 2017. If this happens, Bitcoin would also have split to those which support 8MB and those not.

As a result, enough signals were found for supporting the first proposal BIP91 at the end of July, BIP148 was dismissed. However, Bitcoin Cash was not affected by this decision, and the split actually occurred on August 1st, 2017. Currently both of Bitcoin and Bitcoin Cash are in operation and the both are traded with fiat currencies.

This story tells the failure to reach consensus among miners. Miners are holding same tokens (Bitcoin) that were obtained as a reward of managing ledgers, but their holding of Bitcoin is motivated by the direct profitability of investing in Bitcoin mining and its rewards, and its external effect was not taking a large part of their motivation. Additionally, their acquisition of Bitcoin was automatically given by the protocol of Bitcoin mining, so people's interactions were not explicitly involved in the mining process. As a result, Bitcoin mining has not contributed to accumulating social capital. NY consensus suggested a hint of social capital among miners, but this was not sufficient to reach global and collective actions. The split of Bitcoin is partly due to the lack of social capital among miners, and partly due to the lack of structural mechanisms to enforce a single solution to all members.

6. Conclusion

This paper analyzed how a use of digital currency contributes to building social capital by examining case studies using the proposed framework. A summary of these cases is shown in Table 1.

Table 1. Summary of case studies

Cases	Attributes of digital currency		Contribution to Social Capital		
	Externality-focused use	Involvement of people's action and perception	Trust	Norm of Reciprocity	Social Network
Moeka Mining	High	High	High	High	High
VALU Investing	Low	High	Medium	Medium	High
Bitcoin Mining	Low	Low	Low	Low	Medium

In Moeka case, its issuance involves the externality regarding peoples' conscious communication. This would have lead to higher social capital. On the other hand, investing in VALU has less externality, and is more focusing on the direct return on investment. Therefore, its impact on social capital would have been smaller than expected. In Bitcoin mining, incentives to participate in

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[8] For detail, see https://medium.com/@DCGco/bitcoin-scaling-agreement-at-consensus-2017-133521fe9a77 and https://www.coindesk.com/coindesk-explainer-bitcoin-bip-91-implements-segwit-avoiding-split/.

mining are mostly driven by direct economic returns and its transaction is fully automated. The resulting contribution to social capital by Bitcoin mining is relatively low, which was partly a reason of Bitcoin split.

From these analyses, it is inferred that Blockchain-based digital currencies can contribute to build social capital by creating shared stakes and coordinated activities, but the degree to foster social capital would depend on the design on how it is issued and traded. The impact on social capital would be higher when the tokens are separated from market mechanisms and less focused on the economic returns. Instead, when digital currency is used to capture and transact values that were not captured by conventional fiat currency, it is more likely to have higher external and positive impact. In this sense, digital currency should be to some extent separated from conventional economic mediums to fully utilize its potential to capture the hidden value in the economy.

The role of digital currency is not just a new medium of payment. Blockchain replaced the trust of organization by the trust of algorithm, and the technology enables anyone to issue their own medium of exchange. These new currencies and tokens are used to incentivize others to take a certain action, and also to promote collective and cooperative behavior. It is also used to create a vehicle for collective assets which are owned by stakeholders. Digital currencies do not simply replace the function of fiat money, but rather create a new means to capture value and to manage shared stakes, thus having the potential to contribute to social capital.

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