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A case study on business model innovations using Blockchain: focusing on financial institutions

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Abstract

Purpose – Blockchain is a distributed ledger, in which the blocks containing transaction details are connected chronologically to form a series of chains, thus raising the possibility of improving the process and innovating business model for the financial institutions. The purpose of this paper is to study the actual cases of Blockchain applied in Korea in 2017, so that a vision of business model innovation of financial institutions can be drawn.

Design/methodology/approach – The financial institutions in Korea are in the technology verification stage to introduce Blockchain technology. Since there is an insufficient amount of actual measurement data, case study method was adopted. The authors interviewed ICT officers of major banks in Korea. The purpose of the interview was to understand the relationship between Blockchain and business models of financial institutions, and the effects and challenges that Blockchain has on the business model of financial institutions.

Findings – From the perspective of financial institutions, the emergence of Blockchain does not just have technical significance – emergence of highly efficient database system – but has the possibility that if the business model of existing financial intermediaries disappears or get reduced, the financial services relying on them can disappear altogether, or some of them can be replaced, and financial transaction patterns of consumers can be changed. As a case studies researched for this paper, it was discovered that the distributed characteristic of Blockchain cannot be applied when actually developing financial services.

Keywords Case study, Business model innovation, Blockchain, Distributed

Paper type Research paper

1. Introduction

Blockchain is a distributed ledger created by blocks containing transaction details connected in chronological order to form a series of chain. It is a distributed ledger in which participants of Blockchain peer-to-peer (P2P) network, and not the central administrator, generate blocks.

The possibilities of use of Blockchain are acknowledged in many different fields, resulting in many developments and studies being conducted, and investments are being made actively (Cho and Park, 2017). From the perspective of financial institutions, the



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This paper forms part of a special section on 'Blockchain on business and entrepreneurship'.

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emergence of Blockchain does not just have technical significance – emergence of highly efficient database system – but has the possibility that if the business model of existing financial institutions or financial intermediaries disappear, the financial services relying on them may disappear altogether or be partially replaced, and financial transaction patterns of consumers can be changed. On the other hand, it is expected that the areas of use of Blockchain will be expanded to become the means to increase financial inclusion beyond being a new business model for the financial institutions (Santander, 2015). Therefore, in this paper, real cases of Blockchain introduced to financial institutions in 2017 are studied, so that we can grasp some ideas on the innovation of business model by financial institutions, and draw a vision of business model innovation.

In Chapter 2, this paper conducts literature study on outline, characteristics and types of Blockchain, and comes up with the suggestion that the distributed characteristics of Blockchain can innovate the business model of financial institutions. In Chapter 3, the relationship between the business model of the financial institution and Blockchain is explained. In Chapter 4, through the case study on introducing Blockchain by financial institutions, this paper will seek to come up with implications on Blockchain-based business model innovation. Chapter 5 serves as the conclusion to the paper.

2. Literature study

2.1 Blockchain

Blockchain is a technology to secure integrity and reliability of transaction records without trusted 3rd service provider, by having all the participants in the network create, record, store and verify transaction information jointly, and has the structure to realize various application services based on distributed network infrastructure using security technologies including Hash, Digital Signature and Cryptography (Bahga and Madiseti, 2016). This Blockchain technology was designed to save and use a cryptocurrency called Bitcoin safely. The Blockchain 1.0, which had main functions of issuing, distributing and transacting digital currencies, as the core technology of Bitcoin, is now overcoming the limitations of the existing Bitcoin and being developed into Blockchain 2.0, aiming for expansion into various areas (Financial Services Commission, 2016). The representative technology of Bitcoin 2.0 is Ethereum. Along with the cryptocurrency function, Smart Contracts, in which various types of programs for the transaction scripts of Bitcoins are made possible, are realized (UK, 2016). It is expected that Blockchain will be expanded to a platform in which various decentralized applications are developed and operated, including contracts for real estate and online voting (Tapscott and Tapscott, 2016).

2.2 Characteristics of blockchain

The characteristics of Blockchain are that, since it is a distributed structure, the cost incurred in P2P transactions can be reduced without the need for a trusted 3rd service provider, and there is no need for centralized organizations or trusted 3rd parties to guarantee trust (Dorri *et al.*, 2012). There is no need for centralized organizations such as Korea Financial Telecommunications & Clearings Institute, or a public certificate authority, and since new innovative processes can be introduced, the expenses necessary for the operation, maintenance, security and financial transactions of various centralized systems can be reduced (Financial Services Commission, 2016). Furthermore, since all users (nodes) have transaction ledger, even if some parts of the network encounter problems, they do not affect the whole Blockchain, and since it is a distributed structure, it is expected that it will not show vulnerability in security to the attacks such as DDoS (Lee, 2017). For these reasons,

it has the advantages of being more transparent, and easily tracked than those of the existing financial transactions (Table I).

2.3 Types of blockchain

Public Blockchain is open type, in which anyone can participate. All participants may freely access data and make transactions, but since numerous unverified users are participating, advanced encryption and verification are needed, and thus, network expansion is difficult and it is very slow. Furthermore, public Blockchain forms a perfect distributed structure, and participants of Blockchain network are pseudo-anonymous, and thus Public Blockchain is not appropriate for financial services that need to be controlled by the centralized information management system. Therefore, financial institutions are paying attention to Blockchain for consortium (Consortium Blockchain) and Private Blockchain that will make the most of the advantages of Blockchain such as cost reduction, while not losing the system control authority and initiative, which are needed in the financial service.

Unlike Public Blockchain, which provided pseudo-anonymity, it is possible to identify the subject in Private Blockchain. The transactions are handled fast, network expansion is easy and could be modified whichever way the user wishes, and thus, is suitable for the financial service. Therefore, it is receiving attention from the companies and financial institutions recently. Private Blockchain is the Blockchain in which the owner generates and manages the Blockchain. This is appropriate if the Blockchain owner wishes to manage the Blockchain as the centralized system. For example, you could consider the following: for the transaction system in which real-time transaction is important, it should be operated as the centralized system, while using Private Blockchain for the purpose of storing and verifying transaction details at a safe and low cost, after the transaction has been made (Financial Security Institute, 2015).

Characteristics of blockchain	Advantages	Disadvantages
P2P	P2P transaction is possible without trusted 3rd service provider Unnecessary fee is reduced	When problem occurs, it is uncertain who is responsible for it
Scalability	Easily established, connected and expanded by disclosed source Cost of system development is reduced	The possible number of transactions that payment can be handled is very slight compared to the transaction scale within real economy
Transparency	It is possible to publicly access all transaction records. Legalization of transactions and reduction of regulation costs	Since transaction details are disclosed, all transactions could be tracked, in principle Perfect guarantee of pseudo-anonymity may be difficult, and reidentification by combining is possible
Security	The ledger is jointly owned (integrity) Cost related to security is reduced	When private key is hacked or lost, there is no general solution It does not provide confidentiality
System stability	There is no single failure point. If errors or decline in function occurs in certain participating systems, the effect on the whole network is very slight.	Excavation focuses on large mining pools. It is difficult to execute real-time, large volume handling

Source: Financial Services Commission (2016)

Consortium Blockchain is the intermediate type of Public Blockchain and Private Blockchain. Unlike Private Blockchain in which the owner has the authority, the pre-set nodes have the authority in this Blockchain. Therefore, the Consortium Blockchain maintains a distributed structure while strengthening security through limited participation, and resolves the problem of slow transaction speed and network scalability problems raised in the Public Blockchain. Thus, Consortium Blockchain could be used for such transactions between financial institutions ([Financial Services Commission, 2016](#)) ([Table II](#)).

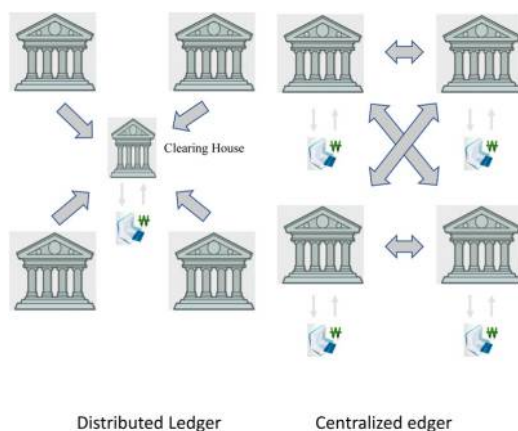
3. The relationship between blockchain and financial institution

Blockchain is a distributed ledger technology, designed in the form of network participants saving and verifying the transaction data. The existing tasks of financial institutions was decided by the ledger of the records and managed by a specific institution, regardless of whether there was an actual storage of the ownership on the assets. In the demand deposit, which accounts for most of the currency being circulated today, banks manage the balance for each customer, to approve and record deposits and withdrawals, and the central bank records in the ledger the balance for each bank, and handle the transfers of funds between the banks. That is, the existing system for financial institution, in which the ledger is managed by trusted 3rd service provider, was developed in the way such that Trusted 3rd Service Provider (refer to Clearing House of [Figure 1](#)) is established, and then the trust in the organization concerned is secured ([EU, 2016](#)). Therefore, it has the problem of management

Types of blockchain	Public blockchain	Consortium blockchain	Private blockchain
Managing entity	All participants (decentralization)	Participants who belong to the consortium	One central institution holds all the authority
Governance	It is very difficult to change the rule that has been made	The rules could be changed relatively easily according to the agreement among the consortium participants	The rules could be changed easily according to the decision made by the central institution
Transaction speed	It is difficult to expand the network, and transaction speed is slow	It is easy to expand the network and transaction speed is fast	It is very easy to expand the network and transaction speed is fast
Data access	Anybody can access it	Only authorized users may access it	Only authorized users may access it
Identifiability	Pseudo-anonymous	Identifiable	Identifiable
Transaction Proof	The entity for proof of transaction is decided by algorithms such as PoW and PoS, and cannot be known in advance	The entity for proof of transaction is known through authentication, and transaction verification and block generation are made according to the rules agreed in advance	Proof of transaction is made by central institution
Utilization cases	Bitcoin	R3CEV	Linq, a stock trade market platform for NASDAQ unlisted companies

Table II.

Types of blockchain **Source:** [Financial Services Commission \(2016\)](#)



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Figure 1.
Centralized ledger
and distributed
ledger

cost to prevent the trust on the system being damaged due to problems such as manipulation, and hacking.

Blockchain does not require a third party in the middle, so you can see the effect of reducing fees and management cost, and the information is jointly owned, so it is difficult to manipulate arbitrarily. As numerous institutions are involved in the transaction, the international remittance service, in which the customers have to pay a high fee, is recognized as the field where the Blockchain technology is most useful, in which transactions between the individuals without an intermediary is possible (Davidson *et al.*, 2016). Due to the characteristics that random modifications and forgery on the records is almost impossible, attempts have been made to use the Blockchain in financial asset transactions of the financial institutions as well as general contracts (referred to as "Smart Contract") such as transfer of ownership, inheritance and succession (Ekblaw *et al.*, 2016). Blockchain takes the ledger with the transaction details, and distributes it into P2P network, instead of putting it into the central server of a certain organization, and thus making the participants record and manage jointly, solving the high cost of management and hacking problems. Therefore, we hypothesize that it can innovate existing business model of the financial institutions (Feenan, 2017).

Blockchain technology takes over the transaction information of ledger and distributes it into a P2P network instead of putting it into the centralized server of the financial institutions, thus making the participants record and manage the transaction information at the same time, which solves the high cost of information management and hacking problems. Currently, financial institutions are managing transaction records with other institutions based on the trusted 3rd service provider. Today's financial institutions are building and operating their business model based on the participation of the trusted 3rd service provider. Therefore, Blockchain technology will be able to innovate the business model of the financial institutions because it can manage transaction records using a P2P network between trading partners without the trusted 3rd service provider.

4. Research methods

4.1 Case study

Case studies are useful methods when verifying or expanding well-known theories or challenging a specific theory (Han and Park, 2017). At this point in time, since the

Blockchain is technically immature and is in an initial state of providing stakeholders with opportunities for innovation from a management perspective, and researchers are unable to exercise control, it focuses on research strategies that explain the boundaries between phenomena and context, not theoretical verification (Yin, 1981, 2003).

In this paper, we will examine a case study of the contemporary phenomenon of Blockchain diffusion in the context of business model of financial institutions. In particular, we examine the boundary of the phenomenon and the context in which financial institutions can innovate the current business model (centralized) into a decentralized business model using the distributed technology characteristics of the Blockchain.

Cases of Blockchain application in financial institutions were collected using search services. In this paper, we mainly refer to newspaper articles. Newspaper articles on Blockchain applications in financial institutions were found to be insufficient in terms of information abundance and specificity of related cases. To make up for this, we interviewed the ICT officers of a major bank in Korea. The purpose of the interviews was to understand the relationship between Blockchain and business model of financial institutions, and the effects and challenges that Blockchain has on the business model of financial institutions.

Also, this study can be used for the innovative patterns and educational purposes of the Blockchain for students who are interested in the innovation and entrepreneurship brought about by the diffusion of Blockchain.

4.2 Cases in the financial institutions

4.2.1 KB financial group. In 2016, KB Financial Group developed Blockchain-based overseas remittance service and beta-tested it. It has completed the test for the overseas remittance service and the technological verifications between KB Kookmin Bank Headquarters in Korea and overseas branches. Blockchain-based overseas remittance service is using Blockchain network as the remittance information network, instead of SWIFT network (overseas remittance network that goes through the intermediary bank), which is currently being used. Thus, it was expected that the foundation for handling overseas remittance service was safe and fast using the Blockchain which uses distributed transaction ledger where forgery and falsification is impossible, but in the process of providing test service in connection with other financial institutions, it was identified that Blockchain did not play any role. Therefore, officially Blockchain-based overseas remittance service is not being provided.

From December 2016, KB Kookmin Card started to provide Blockchain-based easy authentication service in the App credit card K-motion. If a customer enters the information of the credit card currently being used into the K-motion App credit card, and then sets the six-digit password, the customer can use various services with one password. Unlike the Public Key Certificate currently being used, customers do not have to re-issue Public Key Certificates every year. Furthermore, customers can easily change their passwords (Figure 2).

In 2015, KB Kookmin Card provided a service to transition Pointtree into Bitcoin. Pointtree was the point accumulation system of the KB Kookmin Card. If the accumulated points reached 1,000 points or more, you could exchange them for Bitcoin on a one-point scale, up to 300,000 points annually, at the market value of the Bitcoin trading platform Coinplug through the KB Kookmin Card website or mobile application.

Using the Blockchain technology, it has established a “non-face-to-face real name verification evidence material storage system”, which could confirm whether non-face-to-face real name verification evidence materials are forged or falsified. If bank account is opened through the mobile, the confirmation of ID card and transfer details must be proved

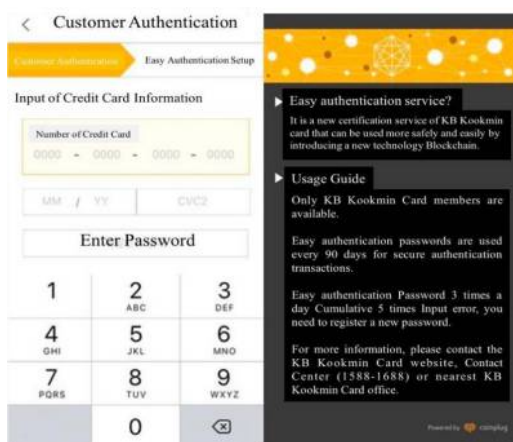


Figure 2.
Blockchain-based
easy authentication
service of the KB
Kookmin card

online, for the non-face-to-face real name verification. During this process, malicious attackers cannot forge the data of the evidence materials, and forgery and falsification of data can be verified without the need for the original data. Therefore, efficient proof of data is possible.

In the process of developing and verifying overseas remittance service on the Blockchain network to replace the existing SWIFT-based overseas remittance service for the innovation of business model, KB Financial Group discovered that Blockchain was not useful at all, and thus stopped developing it. This indicates that the distributed characteristic of Blockchain is not appropriate in the current financial service environment.

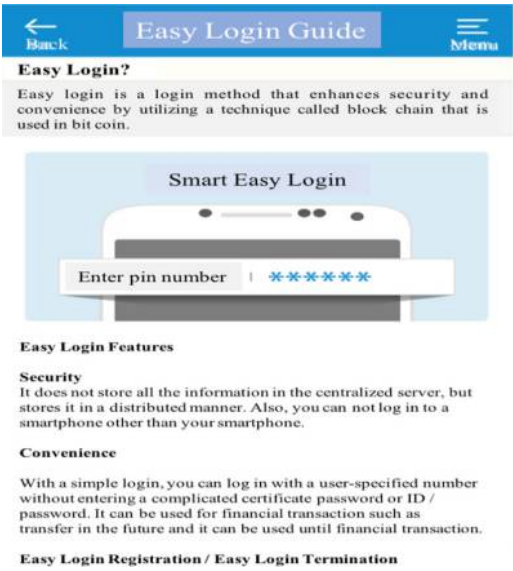
In this case, it is very difficult to innovate the international remittance service field, such as SWIFT, by utilizing the characteristics of the dispersion technology of the Blockchain by a specific financial institution alone. To innovate international remittance services such as SWIFT, it is necessary to innovate at the level of ecosystem perspective.

4.2.2 JB Bank. JB Bank provides an easy login service based on the Open Keychain technology of Blockchain for the New Smart Banking App, which is the new version of mobile banking. Customers can simply login by installing the Blockchain Certificate in the JB Bank banking App, and then entering the password for the certificate. The service is limited to just easy logins, and thus customers cannot use Blockchain-based authentication in purchasing financial products and services. It is known that JB Bank plans to apply Blockchain-based authentication service to all online financial services (Figure 3).

In this case, Smart Easy Login service applied to mobile banking App of JB Bank is limited to increasing convenience of the mobile App banking service with the Open Keychain technology of Blockchain.

4.2.3 KEB Hana bank. KEB Hana Bank has been participating in R3CEV, which is a global Blockchain consortium, from 2016 until now, and is verifying Blockchain technology by implementing payment-, settlement- and authentication-related projects. KEB Hana Bank is using Blockchain as follows: using Smart Contract, which is a digital automatic contract of Blockchain, KEB Hana Bank made non-deliverable in Korean currency process into an automatic process, and through Blockchain-based customer authentication, customer authentication process (CDD/EDD) is automated to prevent money laundering. Through this automation process, it is expected that cost will be reduced and efficiency will be enhanced.

Figure 3.
Blockchain-based
easy login service of
JB Bank



It is determined that KEB Hana Bank has set its strategic goal as reducing cost and increasing efficiency by making Blockchain-based non-deliverable in Korean currency, and customer authentication process automatic.

In this case, rather than innovating the business model using the Blockchain technology, it is merely improving the business process.

4.2.4 NH Bank and Shinhan Bank. NH Bank has entered into partnership agreement with KORBIT, a Bitcoin Trading Center, to take measures to incorporate Blockchain technology into authentication, remittance and more. The Blockchain-based fingerprint authentication service has been provided by NH Bank since 2016. This service registers fingerprints in the smartphones, and allows customers to make transactions on an internet banking account without a separate self-identification process. If customers follow the guide to scan their fingerprints on their smartphones, they can make all the transactions, including checking the account, transfers and registering for a financial product, without needing to go through a separate self-identification process.

In 2015, Shinhan Bank has been trying to enter into collaboration with Streami, a startup specializing in Blockchain, to develop Blockchain-based foreign currency remittance system. It has made equity investment of KRW 500m to Streami, a Blockchain technology startup, and is jointly developing foreign currency remittance system using Blockchain technology as of now. It provides “Digital Kiosk”, which is an automated teller service storing data in Blockchain format. Kiosk, using palm vein recognition, stores the information in a Blockchain format, and each of them is equipped with security system, to match the information in the server. Thus, even if you complete the authentication information, it cannot be reused. Furthermore, it has registered to become the member of the global Blockchain consortium “R3CEV”.

Shinhan Bank has developed Digital Kiosk, which is a Blockchain-based data storage service, and NH Bank has developed and is providing Blockchain-based fingerprint authentication service that could be used on smartphones. These are just simply making

business process automatic to reduce cost and enhance efficiency, rather than innovating the business model.

In the literature study, it is argued that the Blockchain can innovate the financial institutions at the business model. Through case studies, it is concluded that the Blockchain enables the financial institution's process automation and cost reduction rather than innovation at the business model level. It was because business model innovation reflecting the distributed characteristic of Blockchain introduced by the domestic financial institutions, cannot be found.

5. Conclusion and discussion

In this case study, this paper has some important findings regarding business model innovation related to Blockchain of financial institutions.

First, for the financial institutions to introduce Blockchain, there are some problems that need to be solved, but from the standpoint of providing technological methodology that improves efficiency and security of transactions, it was identified that Blockchain had a potential to improve the existing information handling process of financial institutions. Actually, financial institutions are introducing Blockchain to improve information handling process. Currently, Bitcoin-based Blockchain is an open network, in which anybody can register, and all the members can participate in the decision-making. In particular, it is determined that various consultations are necessary to set up risk management and other matters, with parties concerned including other financial institutions.

Second, since Blockchain technology can be applied to the entire financial system rather than an individual financial institution, partnerships are being established with Blockchain companies related. For example, numerous central banks are reviewing the possibility of applying the Blockchain technology to financial infrastructure, with Monetary Authority of Singapore announcing that they would grant funding for the related research to build an Asian Blockchain hub. In November 2016, Korea Federation of Banks launched Blockchain Consortium of Banks, centered on 16 banks and 2 cooperation organizations. Blockchain Consortium of Banks has set the goal as conducting researches on Blockchain-based customer authentication, on electronic document verification, etc., and additionally discovering joint research field in the future. Domestic financial institutions are concentrating on improving the processes of current business model rather than building a large-scale decentralized Blockchain system to innovate current business model. For example, KB Kookmin Bank had developed Blockchain-based foreign currency remittance service to replace the currently used SWIFT, but because Blockchain did not play a single part in foreign currency remittance service process, it did not lead to actual foreign currency transaction service.

This paper suggests reviewing the suitability of the distributed structure of the Blockchain for the automation of financial institution's business process, rather than applying it to the entire financial system or individual financial institutions.

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