경영학 석사학위 논문

Understanding the influential factors in continuance usage of Blockchain-based Game

유저의 블록체인 게임 지속 이용에 관한 연구

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이 상 민

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Abstract

Blockchain technology is also integrated into the game industry, and technology makes new types of online games. In such a blockchain-based game, game items are connected to a cryptocurrency network. Unlike existing online games, the game items can be accurately tracked even if the items are directly exchanged between users. The researches on the blockchain game has recently started to be studied. In this study, we collected and analyzed transaction data of users in Crypto Kitties, the earliest form of blockchain game. The game engagement of the user and the extent of social interaction in the game have a positive effect on the continuous use of the game, and the user continues to use the game more when he or she pursues the hedonoic value in the game. The results show that the users of blockchain games do not differ in attitude toward the existing online games. The implication is expected to contribute to blockchain game developers and blockchain game researchers.

Keyword : Blockchain game, Blockchain, continuance intention, value expectation, social interaction, consumption theory, logit regression
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Table of Contents

Chapter 1. Introduction

Blockchain technology has been spread into various industries. Games that use block-chain technology are also emerging, and the fields where block-chain technology is combined with various uses are called decentralized apps. Decentralized applications (dApps) based on cryptocurrency network attract public attention. Blockchain games are one of the typical dApps. Recently, the overall number of blockchain games is over 300 and still growing (dappradar.com).

Blockchain games are different from casual games in two perspectives: monetization and lack of fun. In casual games, users have to use outside-market trading virtual goods to earn money by selling in-game items. Even if they use the marketplace, they are in danger of being scammed. But in blockchain games, users can trade their virtual goods safely through blockchain network. Blockchain games usually lack the most basic game mechanic: fun. Cryptokitties, one of the most popular blockchain games, emphasizes the collectible potential of in-game items, while neglecting gameplay mechanics. Due to above two facts, it is appropriate to say that blockchain games are another form of the cryptocurrency rather than native games.

As one of the most successful blockchain games and even a milestone in the development of blockchain games, Cryptokitties may be the most well-known blockchain game nowadays. Due to its tremendous trading volume amount, Cryptokitties had temporarily made Ethereum network clogged in 2017 (cnbc.com). In Cryptokitties, users can buy, sell, and breed digital cats by using a smart contract on the Ethereum network. Every cat has its unique characteristics called genes

which decide the cat's uniqueness and appearance. Such a rare appearance and uniqueness encourages users to breed cats. (Wei Cai, et al., 2018).

Cryptokitties uses a Dutch auction to trade its digital cats. Thus, the price of each kitty completely depends on the traders. Usually the rarer traits a digital cat has, the higher price it deserves. There are three methods for users to collect digital cats: buying, breeding, and siring. When a user buys a digital cat, he or she knows exactly what he or she will get and the approximate value of the cat. When a user breeds his or her cats, he or she never knows what he or she will get. Therefore, the user can estimate the value of the new cat in comparison with the cats with similar traits have been uploaded to the auction, or directly register the product in the auction and receive the evaluation of the market. This uncertainty is same for siring. In short, a user should have various expectation when taking breeding or siring behavior. Whether a user takes uncertainty or not to collect digital cats depends on his or her value expectation on the game items.

Our study aims to examine what factors affect a user to decide continuous use blockchain game. To understand the factors, we examined the extent to which the user was engaged in the game, the extent to which they had a social relationship in the game, and the user's attitude toward value expectation on the game.

The paper is organized as follows. The related literature is reviewed in the next chapter. In Chapter 3, our hypotheses are stated. In Chapter 4, we describe our dataset and explain the key variables. In Section 5, our econometric model and result are proposed. Lastly, the limitations of our study and the future plan are mentioned.

Chapter 2. Literature Review

2.1. Blockchain Game

Though, many other dApps have been widely used, CryptoKitties is expected to be the primary use of Ethereum as a digital collectible. (Coindesk, 2017) Blockchain game, which was originally thought to be one of the main uses of cryptocurrency, is not something else different, but rather introduces the concept of blockchain technology into the game. In well-known online games, users have invested heavily spend their times for playing, progressing and spend even money in the game such as a role-playing game like WoW, or first-person shooter, Call of Duty. Until now game users are willing to spend some of their cash to purchase in-game items such as gems, swords, or skins.(venturebeat.com) But until now, there has been no way for players to easily exchange these in-game items with other players. However, users are willing to spend their time and money to get these in-game item. A convenient way of transactions and exchanges of unique digital game items, represents a tremendous opportunity both for developers and for gamers.

Gamers have been looking for advanced ways to buy and sell the products. The products are normally significantly more valuable than standardized or common items, which any users can easily get. This is precisely where the blockchain is stepping in, making it possible for game develops to create exclusive in-game assets that cannot be copied. (Plarium 2018) It is because each item or tool is tied to a unique identification block on a blockchain's public ledger, which is transparent to all and is unable to be duplicated. When players purchase blockchain

based assets in-game, they are now assumed that the item will hold some form of future value, as potential buyers will be able to easily validate its authenticity on the blockchain. As gaming companies adopt blockchain and begin conceiving of a wider array of unique assets, those blockchain-based transactions will be able to drive more in-game sales as well as open the door for more exchanges between players themselves.

The idea of linking in-game items to blockchain network to ensure uniqueness of items in the game and to track them transparently to the owners has been around before CryptoKitties. (pocketgamer.biz,2017) The collecting of items tied to blockchain networks was from Rare pepe wallet (2016) before CryptoKitties. (vice.com, 2017)

According to the developers of CryptoKitties, the game can be described as follows; “CryptoKitties are digital, collectible cats built on the Ethereum blockchain. They can be bought and sold using ether, and bred to create new cats with exciting traits and varying levels of cuteness. At launch, 50,000 “Gen 0” cats (colloquially referred to as “Clock Cats”) will be stored in a smart contract on the Ethereum blockchain. These Clock Cats will be distributed automatically via smart contract at a rate of one cat every 15 minutes. Each cat will be sold by auction.”

CryptoKitties are unique in appearance, with a distinct visual appearance (phenotype) determined by its immutable genes (genotype) which are saved in the smart contract. By allowing the cats to breed, they are not just a digital collectible. CryptoKitties is an exciting, self-sustaining community where users can create new collectibles and trade them on the Ethereum blockchain.

In this game, two CryptoKitties can breed to produce a new cat that is the genetic combination of its parents. Users are encouraged to breed cats for

anticipating the uncertain outcome, since the possibilities for new and rare genetic makeups of a CryptoKitty are endless. In each breeding pair, one cat acts as the sire, and after siring, the cat needs a recovery period before it can breed again. The second cat incubates the kitten, during which time it cannot engage in another pairing. There is no limit to the number of times a CryptoKitty can breed, but the recovery and gestational period increases the more they mate.

2.2. Continuous Usage in Blockchain Game

Blockchain game, whether it is an IT system with a hedonic value, or an IT system with utilitarian values associated with a cryptocurrency network, it is clear that a blockchain game is a form of IT system There have been various discussions on the importance of the continued use of this IT system. The IT system's viability depends fundamentally on the ongoing use of individual IT systems. (Karahanna et al. 1999; Bhattacherjee 2001) The long-term return on IT systems is also related to the decision on retention or retention rate of users (Parthasarathy and Bhattacherjee 1998; Reichheld and Schefter 2000; Bhattacherjee 2001). According to these studies, users' blockchain-game post It is important to examine the factors that interfere with continuous use after the -adoption behavior.

Persistent use of IT system by users is also meaningful in the following respects. According to IS research results, research on consumer behavior suggests that post-adoption behaviors are the keys to a firm's survival in the highly competitive marketplace. (Reichheld et al. 2000) Gaming is a big part of the entertainment industry, and it is also an IT system that people can easily use in everyday life. In this regard, many studies have been conducted on user behavior research in games,

a kind of IT system.

2.2.1 Value Expectation in Game

Consumption theory studies suggest that consumption is motivated by empirical results, including pleasure and utilitarian outcomes. (Batra and Ahtola, 1991; Childers et al., 2001, etc.) Playing a game can be regarded as an another type of consumption, the expectations of both utilitarian and pleasurable things can be factors that can motivate continued gameplay. For example, a gamer invests time, energy, and sometimes money in exchange for gaming experiences such as fun and pleasure and / or external rewards (e.g. money, grades or prizes). In other words, the two outcome expectations from consumption theory relate to the outcomes related to personal goals when engaging themselves in activities. Expectations of utilitarian outcomes relate to expectations of goal-oriented outcomes, including those that capture the recognition of others and receive external rewards (e.g., upgrades, prizes, experience, money, etc.) whereas hedonic outcome expectations are defined as expectations associated with online game playing that may result in different forms of enjoyment (such as playfulness, fun and pleasure). Favorable experience (i.e., practical value and pleasure value) results in longer website stay time and more frequent online use (Hoffman and Novak, 1996; Scarpi, 2012). Both are assumed to influence the intention of continuing gameplay, as they are both motives that motivate individuals to take action.

2.2.2 Game Engagement in Game

We know that customer engagement is associated with many positive

outcomes. For example, in the organizational literature, engagement is closely related to the citizenship behavior and organizational commitment of the organization (Macey and Schneider 2008, Saks 2006). In the service literature, Patterson et al. (2006) argued that customer engagement is a good predictor of customer loyalty. In the marketing literature, how the involvement of the branded community affects the retention intention was empirically shown in the recommendation of the community, and the intention of the community participation (Algesheimer et al 2005). In line with these perspectives, participation through purchasing behavior in online games brings positive behavior to game players, (Hennig-Thurau et al. 2010, Malthouse et al. 2013). If game players are deeply involved in online games, they will spend more energy, time, and effort in the game with high interest and enthusiasm, and understand that they have greater tendency. In addition, increasing the time, frequency, and recent participation in which the game player participates in the online game is likely to spend more money (e.g., purchase of virtual items) on a particular game.

2.2.3 Social Interaction in Game

The IS literature suggests that the adoption of innovative products or services can be decided by social impact perspective. (Turel et al., 2010; Venkatesh et al., 2012) Social influence is interpreted as the degree of influence on interactions between people in social networks (Rice and Aydin, 1991), and as perceived pressure gained to conduct certain actions (Venkatesh and Brown, 2001). For example, people can debate their opinions about service experiences such as media consumption and use, and these shared experiences are likely to produce a combined reason for conversations in social networks. In the process of building a

social network, social ties represent individuals whose social networks are aware of the strength of their social bonds with others. These social ties have the role of forcing the rule of conduct among collective members and elevating the diffusion of information (Chai et al., 2011). Bond strength is often measured in terms of duration, frequency of contacts, and social importance (Money, 2004). Strong social ties give customers a wealth of opportunities to recommend services to others, and in such circumstances, these ties depend heavily on customer gratification. Generally speaking, social influence has a stronger impact on younger people than the elderly, as it is approved by others to experience a sense of community and connection, especially in the use of mobile phones or other types of new technologies (Smetana et al., 2006). Therefore, from the social point of view, in this research, we consider that social interactions have a positive relationship with continuous usage.

Chapter 3. Hypothesis

3.1. Value Expectation

As consumption theory studies suggested, the user has different valued expectations when the user uses the game.(Hoffman and Novak, 1996; Scarpi, 2012; Wang et al., 2007 Accordingly, there are two different outcome expectations; depending on the two expectations the user has for the game, we thought that there would be a difference in whether the game was continuously used or not.(Hoffman and Novak, 1996; Scarpi, 2012; Wang et al., 2007) As mentioned above, CryptoKitties is a collectible game that collects digital-cats. Also collected cats are related to the cryptocurrency called Ethereum. In these contexts, users can be

classified into two groups; users who do a lot of goal-oriented actions related to cryptocurrency or achievement in the game, and other types of users who seek a hedonic value from a cat collection to find a secret recipe. Based on the value expectation tendency of the users, we set the following research hypothesis to see the difference in the game continuation use.

Hypothesis 1: The more user plays hedonic behavior in this game, the more user continuously uses the game.

3.2. Game Engagement

Several articles have suggested that game players have willingness to spend more money as they want to participate more deeply in the game. Users may purchase game items for character identification or character competency in games, or spend money on games for self-image expressions (Park and Chung 2011; Kim et al 2011). In this game, if users are more engaged in the game, a user should increase the number of cats to find new cats or collect more cats. Having more cats or unique cats means that the user has more competency in the game than other users. Even if the purpose of spending is not collection but investment, it means that users spent more money using Ethereum in this game. And in this game, users can get more cats by only repeating actions that require spending. Thus in this study, we thought that the more amount of Ethereum used to use CryptoKitties, the stronger the engagement with the game, the more continuous usage of user will increase. In this context the hypothesis is as follows.

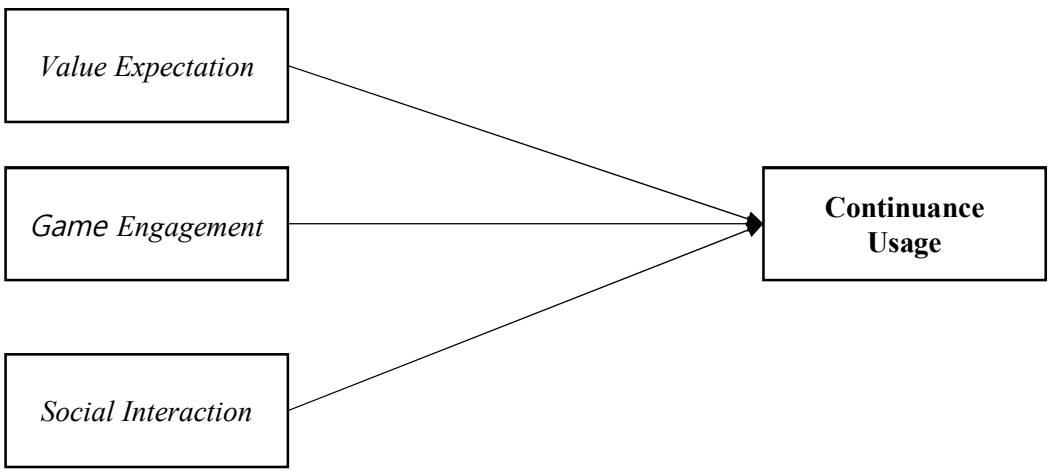
Hypothesis 2: User's total amount of cryptocurrency spent for playing blockchain game is positively related to their continuous usage.

3.3. Social Interaction

An emerging stream of literature about the value of "social design" find that services which are designed with social features help users' initial adoption (Dou et al. 2013; Hildebrand et al. 2013). The concept of adoption is studied by IS studies as becoming a user of certain service or a paid user (Oestreicher-Singer and Zalmanson 2013; Sykes et al. 2009). Also, based on the users and gratification theory, there is researches that show the intention of users to use games with social interaction and social presence. The theory described the voluntary use of users for various IT systems, including virtual communities, emails, and so on. (Cheung and Lee. 2009; Xu et al.2012) Many studies have been conducted based on the theory. In this regard, we hypothesize that if users who have more intention to continuously use the game, the impact of social interaction activity becomes larger, helping their continuous usage to the game:

Hypothesis 3: User's extent of social interaction in blockchain game is positively related to their continuous usage.

Fig.1 Research Model



Chapter 4. Data

4.1. Data Description

The dataset used in the study used data from CryptoKitties, one of the most popular block chain games. CryptoKitties launched services from on November 23, 2017 and Python web scraper is designed to collect user transaction data from the game service start date to August 23, 2018. The transaction data includes the number of individual users bidding, siring, and breeding cats for one day, the amount of spent Ethereum for bidding, siring breeding, and the amount of Ethereum earned by selling cats and earned by siring through a siring auction. The initial dataset was collected in the form of panel data, but the transaction data of the users were extremely concentrated at the early stage of the collection period, so the initial data could not be used as panel data. During the collection period, the total amount of transacted Ethereum is more than 28,000 and a total of 34,744 users made 306,214 transactions.

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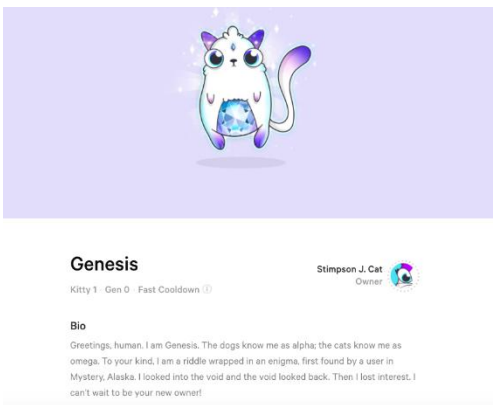
4.2. Collecting Behavior in Focal Game

Cat collection is the biggest gaming element in the game called CryptoKitties. Users will be given a default cat as soon as they start, and in order to continue playing the game, they must either buy a new cat for breeding or sire auction to get a new cat through crossbreeding with another cat. It is not the goal of simply having more cats, but finding a hidden cat through crosses is another goal of the game. Such hidden cats are usually very expensive, and the goal of the game is to let the users find new cats while getting more cats.

Figure 2. Examples of unique CryptoKitties



Users can play the game in two different ways in this situation. First of all, there is a way to buy a cat that a user does not have right now and to collect it quickly, another option is that user can choose 'mating' option, though user does not know what kind of cat it might be. The former is a very rational decision, but there is no fixed price for in-game items (cats) in this game. In a Dutch auction style auction, a transaction occurs at the price agreed upon by the seller and the buyer, and the value of the cat is determined accordingly. When user buys a cat through this auction, user can figure out the exact value of cat, which is fairly reasonable compared to the fact that a value of cat from ‘mating’ does not be known to users. Especially since hidden cats are very difficult to find, users may not be willing to excessively spend money than they expected, but users can choose to own more cats of value and at the same time enroll in a siring auction and lend a user’s cats to others to earn Ethereum income have. Earning Ethereum through ‘mating’ auction

is quite reasonable for risk-averse users, since they can expect a certain amount of Ethereum incomes in portion to the number of cats.

Another way is to increase the number of cats that a user possesses through 'mating' a user's cats or other users' cats. This way takes longer than in the former case, and it does not know the value of the cat that will be obtained through crossbreeding. In the case of the CryptoKitties game using cryptocurrency, this study assumes that the cats will have a very high liquidity due to the cryptocurrency of Ethereum. The high liquidity of the virtual cats makes the users have different attitude toward this game whether the focal game is a casual game, or whether it is just collecting virtual cats for fun or seriously looking at the monetary value.

4.3. Variables

The dependent variable used in the study is the user's *continuance usage*. Since the dataset collected from the first date of game service, CryptoKitties is collectible game as mentioned above, and the number of cats acquired and the number of cats sold within the period during which the user collected the cats. In order to measure the *continuous usage* of the user, it is assumed that a user stopped the game if he or she sold all of the cats collected during the period. In other words, if the user has sold all of the cats collected, he or she decided to abandon the game. Even if, some users dispose of the collected cats, they may have an intention to continuously use the game. This is because the users in the focal game can obtain the Ethereum through selling cats later or enrolling cats to siring auction. In this context, the user

is considered to keep use the game though he or she sold most cats and had only one cat.

Table 1. Summary of Key Variables

Variable		Description
Dependent Variable	Continuance Usage	The binary variable represents that user's continuous usage of blockchain game: when user leaves the game, then the variable is 0 otherwise it has 1.
Independent variable	Value Expectation	The ratio of bidding behavior to collecting behavior
	Game Engagement	The amount of Ethereum which a user *i spend*
	Social Interaction	The amount of gift that user *i* gives kitties to another user

The main independent variables used in the study are as follows.: The degree of social interaction, the degree of engagement of the game, and the value of the most important user's expectation in the game. The degree of social interaction is measured by how many user has presented the cat to other users. By presenting cats to others, other users may be more satisfied with the crossing of cats or collecting better cats.

The degree of user's *game engagement* in the game was measured by the amount of Ethereum used while using the game. In previous research, there were studies measuring the immersion of the game in the money used for the game, and also used as a measure of the engagement about how hard the game was because the

small amount of commission was spent in the whole process for the collection. A description of the *Value Expectation* follows. When the user uses the game, the number of collecting actions is set as a parameter, and the number of times the user purchases the cat in the Dutch auction is numerated. As the value of this variable is closer to 1, the user regards it as a simple collecting action rather than finding a hidden cat through a cat breeding act. On the other hand, the *Value Expectation* of a user, who prefers uncertain but who collects more cats through mating acts, has a value close to zero. As shown in the descriptive statistics table 3, in the case of *Game Engagement* and *Social Interaction*, the deviation and the maximum value are too large when compared to the value expectation variable.

Table 2. Descriptive Statistics

Variable	Obs.	Mean	Std.Dev	Min	Max.
Value Expectation	34,215	0.6012	0.2600	0	1
Game Engagement	34,215	437.1	4919.209	0.0022	469164.7
Social Interaction	34,215	0.8002	21.2073	0.	2724

Chapter 5. Analysis And Results

5.1. Empirical Model

$$\log\left(\frac{P}{1-P}\right) = \beta_1 Value\ Expecation_i + \beta_2 \log(Game\ Engagement_i) + \beta_3 \log(Social\ Interaction_i) + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

In this section, the econometric model is specified to conduct hypothesis testing and to understand the factors related to users' continuous usage. To conduct hypothesis testing, simple logistic regression model is proposed. This is because *continuous usage* as a dependent variable has a discrete value. Continuous usage means that a user of the game does not use game or continuously uses game. In equation (1), i denotes a user. *Value Expectation* is the ratio of goal-oriented behaviors among the collecting behaviors selected by individual users and has a value between 0 and 1. *Game Engagement* and *Social Interaction* were log-transformed because their absolute values were too large and the variance was large compared to *Value Expectation*.

5.2. Result

We discuss about the result of estimating equation (1). Result table 4 represents the result of our empirical model. To check multicollinearity issue, variance inflation factors (VIF) is calculated for the independent variables. All the VIF values are less than 4, therefore, multicollinearity issue is not a serious problem.

Table 3.Variation Inflation Factor

	Value Expectation	Game Engagement	Social Interaction
VIF	1.2058	1.0491	1.1011

The results of the study showed that McFadden R^2 and AUC were significantly high. However, even though the correlations between the variables used in the study were not high through the correlation test, the results were highly explicable. Similar results were obtained from when K-fold cross validation tested with different train set for 5 times.

Table 4. Result Table

	Coefficient	Std.Error	Z value	P>|z|
Intercept	5.5734	0.1573	35.423	<2e-16***
Value Expecation	-6.6878	0.1362	-49.085	<2e-16***
Log(Game Engagement)	0.331108	0.0208	15.903	<2e-16***
Log(Social Interaction)	0.2286	0.0568	4.021	5.79e-05***
McFadden R^2	**0.3715**			

AUC	**0.8836**

In the result table, we observe that the estimated parameter related to the *value expectation* in the game is consistently significant and negative (-6.6878, $p<0.01$). In other words, the more users expect monetary incomes, the less they are willing to continuously use the focal game. However, users who expects hedonic value more than utilitarian value are more likely to use the game. Therefore, we support hypothesis 1.

Also, in the hypothesis 2 that users are more likely to engage in game intensive use, *game engagement* is statistically significant and positive. (0.3311, and $p<0.01$) The fact means that the more users are immersed in the game, the more likely they will continue to use the game. Next, the estimated parameter of *social interaction* is also significant and positive, as well (0.2286, and $p<0.01$). These result reports that the more items the user presents to other users in the game, the more they continue to use the game. Thus, hypothesis 3 is supported.

To summarize these results, the following comments can be made. Interestingly, *log (Game Engagement)* has a larger coefficient than *log (Social Interaction)*. In this regard, it can be seen that the focal game has a greater influence on the continuous use of the game than the interaction of users with other users in the game. This may be because the focal game, like other online games, does not offer various social features, but only a 'gift' function that sends cats owned by other users' accounts. Or, as mentioned earlier, a user can get a cat only by spending Ethereum to get a cat, so it may be more sensitive to in-game items than other casual online games. In summary, users tend to be more engaged in games and more socially interacting with other users as they continue to use games.

Lastly, the more users who expect for the monetary value in the game, the more they tend to quit the game. Also, the coefficient of the factor was, negative but, much higher than other factors. This means that users who expect and use hedonic value for the IT system have used it for a longer period of time, and conversely users who have expectations for utilitarian value can easily interpret the game. Blockchain game has emphasis on monetary factors, so gaming aspects of blockchain game have been discussed. However, in these results, users who are fascinated with gaming functions are found to use more continuously.

Chapter 6. DISCUSSION AND CONCLUSION

6.1 Business Implication

The purpose of this study is to investigate the factors affecting users' continuous use of game in the block chained game. Although the results of this study are limited to the analysis of one game called CryptoKitties, the results of the study can be extended as follows. As can be seen from the analysis results, the factors that determine users' continuous use of games are not different from the existing online game researches. In other words, users' persistent use of the block game has been influenced by the user treats the game, the social context, and the degree of involvement. This shows that although users are using a block chain based IT system that handles game items with high liquidity, users basically use focal games like online games or mobile games.

The study of block cryptography and cryptocurrency is proceeding in various

ways. However, studies on blockchain based games are still in progress. In case of blockchain based game, the function of game is often limited compared to general game. This study is meaningful in this regard, and it can provide implications for developers and game distributors who are interested in servicing or developing future blockchain games. The implications are as follows.

First, since the blockchain game uses the existing cryptocurrency network, even if the in-game items have a high degree of liquidity, the users will have to enjoy the game and continue to use the game. It is obvious from the above-mentioned preliminary study that the continuous use of users helps the game itself to be served for a longer time.

6.2 Limitations

The limitations of this study are as follows. First, CryptoKitties is basically connected to the Ethereum network, and the value of in-game items is greatly influenced by the price of Ethereum. For example, users' perceptions of in-game items when the value of Ethereum is worth about $ 480 (November 29, 2017) and when they exceed $ 1000 (January 10, 2018). However, even though CryptoKitties collected data from the start date of the formal service, the panel analysis could not be conducted in this study. This is because most users do not often use it as general online game. Therefore, we could not analyze the effect of individual users on the continuous use of games due to price changes over time.

Another limitation of this study is that it is limited to one case of CryptoKitties among blockchain games. Still, this study is considered to be meaningful because

there are not many studies on game continuity use in blockchain game. Even though CryptoKitties is the earliest form of blockchain games, there are also services with different gaming characteristics, such as games with gambling or role playing features, including collectible games, as in this study. In this regard, more research is needed as to whether blockchain game users are statistically valid for continuous use of games due to the same factors in other types of blockchain games.

6.3 Future Research

To understand blockchain game situations further, we need to extend the scope of the study to various blockchain games with different functions as mentioned in the above limitations. CryptoKitties belongs to the Ethereum network, but other games belong to the EOS network or the steem network. It is also an important issue that difference may exists in the use of games for different network users. In addition, I think that various researches are needed to understand more about the blockchain game, such as whether there is a difference in the game use behavior among the users according to the game types.

Other areas of further research are considered to be as follows. In the case of the CryptoKitties conducted in this study, since the value of cryptocurrency highly fluctuates than the general currencies (e.g. USD, JPY, etc), it is necessary to consider the change of the attitude of the user due to the price fluctuation. The scope of this study can be extended by further investigating the relationship between price fluctuations and in-game item sales points of users.

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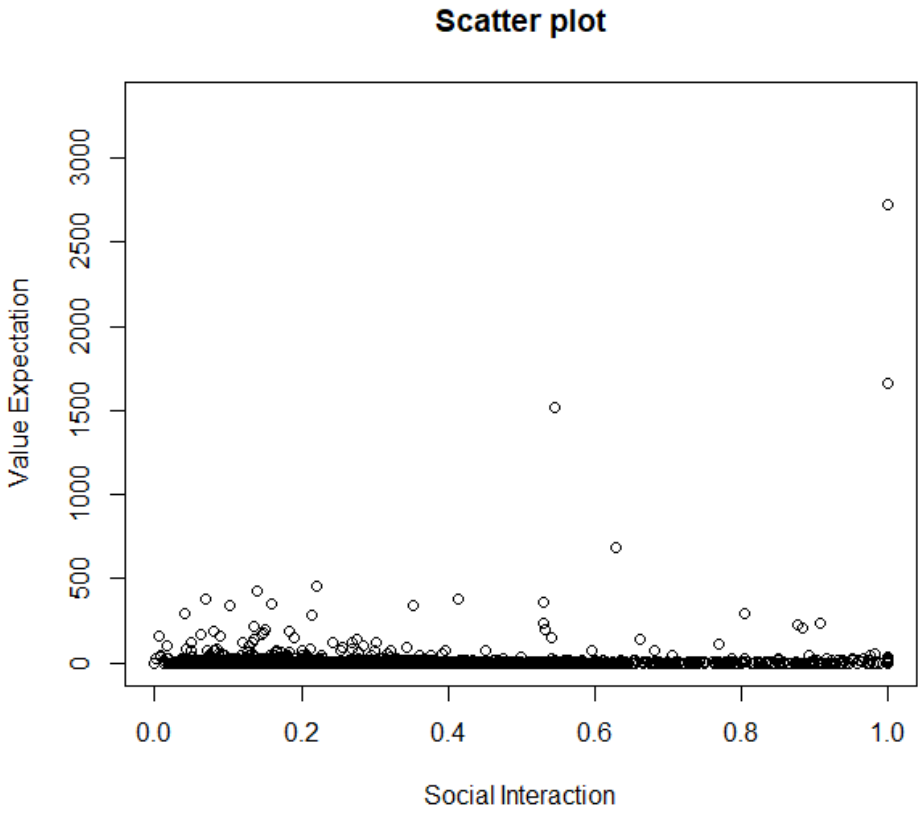
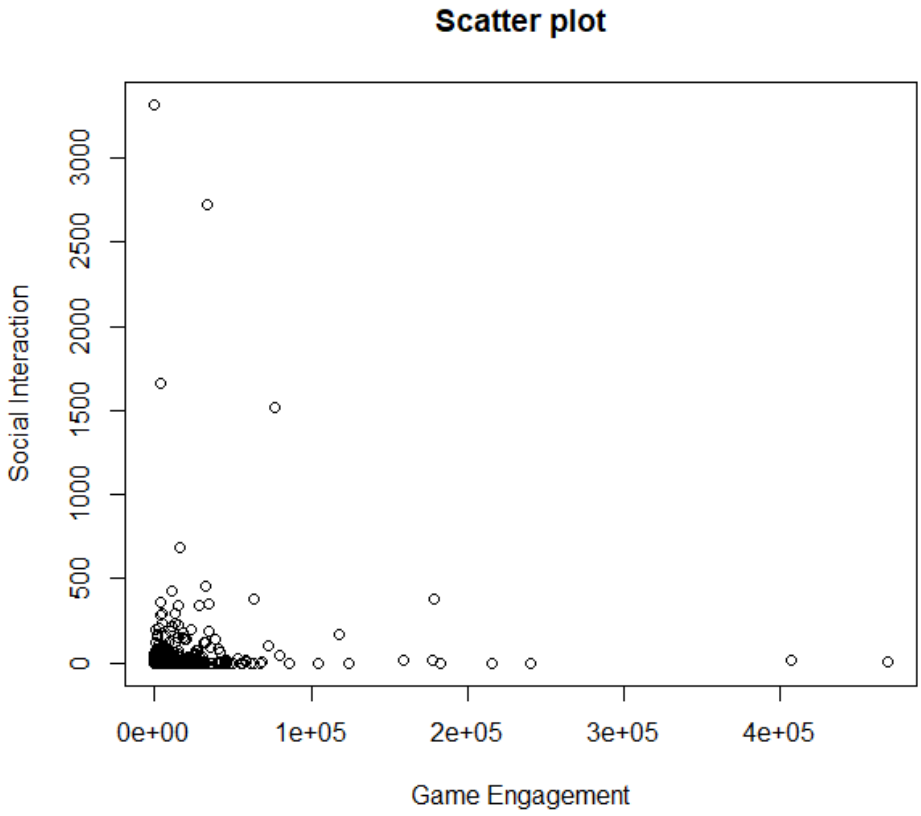
APPENDIX 1: Correlation Matrix

Correlation Matrix			
	Value Expectation	Game Engagement	Social Interaction
Value Expectation	1		
Game Engagement	0.56	1	
Social Interaction	-0.019	0.10	1

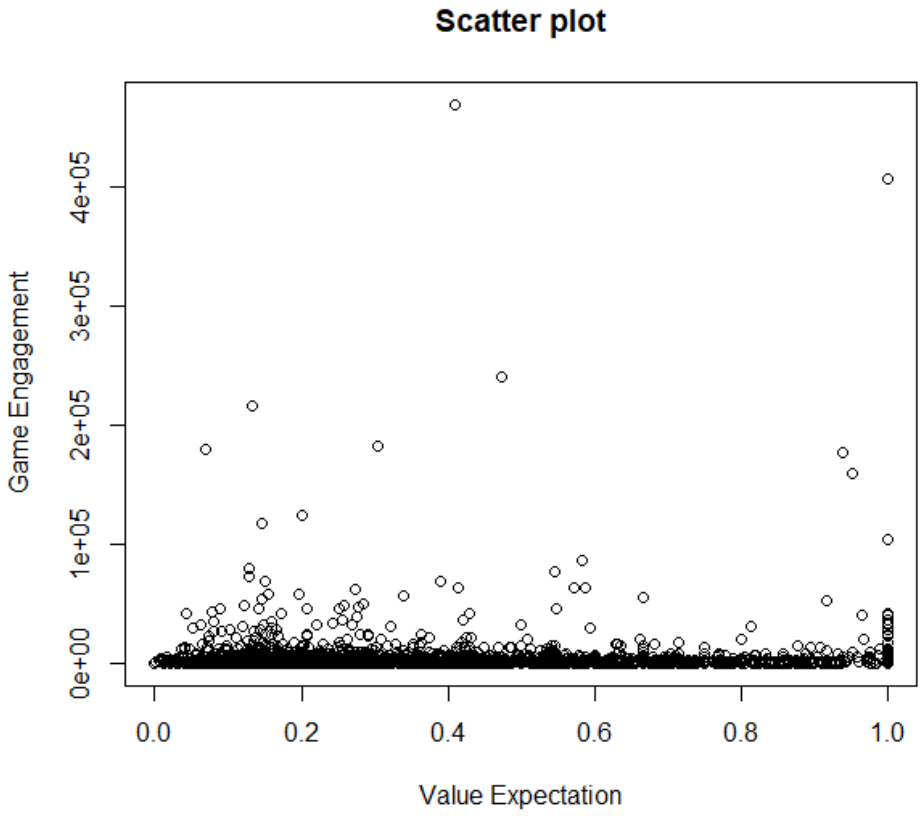
APPENDIX 2: Scatter Plot of Value Expectation vs. Social Interaction



APPENDIX 3: Scatter Plot of Social Interaction vs. Game Engagement



APPENDIX 4: Scatter Plot of Game Engagement vs. Value Expectation



국문 초록

유저의 블록체인 게임 지속 이용에 관한 연구

블록체인 기술이 게임 산업에도 접목되어 새로운 유형의 온라인 게임이 등장하고 있다. 이러한 블록체인 게임에서는 게임 아이템들이 암호화폐 네트워크 안에 귀속되어, 기존의 온라인 게임과는 다르게, 유저끼리 직접적으로 아이템 거래를 하더라도 정확하게 추적할 수 있다는 점이다. 블록체인 게임에 관한 연구는 최근 새롭게 연구가 되기 시작한 분야이다. 본 연구는 이러한 블록체인 게임의 사용자 지속사용 의도에 미치는 요인들을 파악하고자, 블록체인 게임 중 가장 초기형태인 크립토키티에서 유저들의 거래 데이터를 수집하고 분석하였다. 유저의 게임 몰입도와 게임을 통한 사회화 정도가 게임의 지속사용에 긍정적 영향을 미치고 있었으며, 유저가 게임에서 재미를 추구할 때 게임을 더 지속사용하는 것으로 나타났다. 기존의 온라인 게임연구에서 밝혀진 게임 지속사용 요인과 크게 다르지 않은 결과가 나타났고, 이는 블록체인 게임의 사용자들이 기존의 온라인 게임을 대하는 태도가 다르지 않다는 것을 시사하고 있다. 이러한 시사점을 통해 블록체인 게임 개발자의 제품 개발과 블록체인 게임 연구자에게 긍정적인 도움을 줄 것으로 기대한다.

주제어 : 블록체인게임, 블록체인, 지속사용, 가치기대, 사회적 상호작용, 소비이론, 로지스틱 회귀분석