A comparative study of the behavior and evaluation of analog and digital community currency: Research using gaming simulation

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1 Introduction

Recently, many types of digital currency have been issued. While some of these currencies are used globally, others are limited to use in a specific area, and are similar to a community currency (CC). Although many types of digital currencies have been issued and used as community currencies in Japan, other forms of CCs have been used since the 1980s[1].

There are at least three types of CCs issued in Japan. The first and most common type is the analog-paper currency, which includes SARARI, TODA-OAR, ATOM-TUKA, FUREAI-KIPPU, MORI-KEN, among others. It can be used in the same way as cash, but there are many ways to obtain it. For instance, certain CCs can be received as compensation for volunteer work (TODA-OAR, ATOM-TUKA, FUREAI-KIPPU), while others can be obtained as labor compensation in forestry (MORI-KEN). In most cases, people can obtain CCs in exchange for yen at the issuing office, and can also exchange CCs for yen (SARARI). The issuing office places a premium on CCs when issuing them, while it charges the exchange fees when exchanging CCs for yen.

The second type of CC is analog-LETS, or Local Exchange and Trading System. This type of CC is the second most common in Japan, and includes MITO, ECO-MONEY, and others. In this system, each person has a passbook. This passbook cannot be deposited in exchange for yen or vice versa. People withdraw from the passbook when transacting, that is, a debit is recorded in one passbook for the value of the transaction, and income is credited in another passbook. The total passbook amount for all people is always zero. The transaction history is displayed in the passbook, and it is possible to know with whom and when a transaction was per- formed and the balance amount.

The third type of CC is digital-reloadable. This type of CC has been increasing rapidly in recent years, and includes SARUBOBO-COIN, KINTETSU-HARUKAS-COIN, and others. This type of CC uses an application for the tablet or

[1] See Lietaer (2004) for a study of CCs in Japan.

smartphone. Each person can reload the necessary amount of CC at the issuing office in exchange for yen. Payments can be made using a bar code or QR code, and CCs can be converted into yen if needed. The transaction history is displayed on the tablet, and it is possible to instantly know with whom and when the transaction was performed and the balance.

Kobayashi, Miyazaki and Yoshida (2018) reported that approximately 800 different types of CCs were issued from the 1980s to 2016 in Japan, many of which are analog CCs. Most of these CCs are paper-type or LETS-type, and have been issued to revitalize the local economy and strengthen community ties. Considering the difference between analog and digital CC, although the initial cost is high, it is noted that digital CCs can reduce operating costs compared to analog CCs.

By contrast, the fact that the CC issuers have their own specific issuing purpose means that issuers have a social or economic goal that they would like to be realized by using the CC. This means that the CC is also used as a medium of communication. From this perspective, it is important to study the types of behaviors, responsiveness and opinions the CC user. Previous studies on the differences in analog CC found that while the paper-type CC promotes circulation, it does not bring com- munity-oriented value to users. Specifically, the LETs-type CC tends to bring com- munity-oriented value to users; however, there is a tendency to circulate among some members (Yoshida and Kobayashi, 2016). As the two CCs have the same issuing purpose in this study, this difference can be attributed to the difference in issue form.

When the share of digital CC increases, how do users evaluate digital CC as a medium? To answer this question, it is necessary to consider the impact that digital CC has on the user and how the user will evaluate the currency. Considering these circumstances, it is suitable to use a gaming simulation. Greenblat (1988) notes that gaming simulations bring about dynamic interaction among participants under a specific social context. We use this method to investigate the change in the evaluation of CCs and in behavior as the type of CC changes from analog to digital.

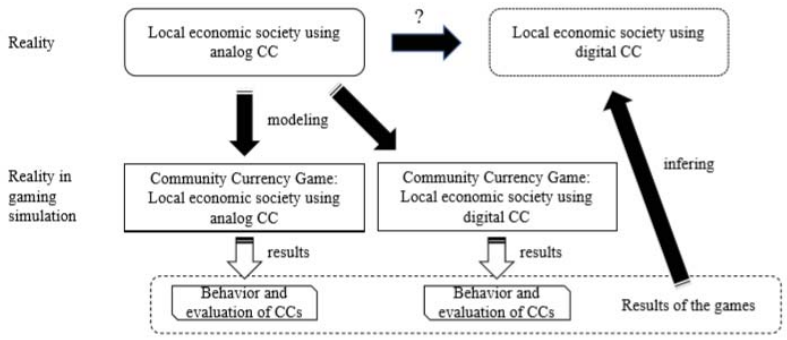
2 Research Plan

In this research, we consider changes in the features of CCs as a medium of communication, that is, CC changes from analog to digital. We adopt Community Currency Game (CCG), a face-to-face analog game. The goal of the game is to encourage participants to think about how local economic and community problems can be solved using CCs. Participants of the game can experience the two worlds by trading in both a local economic society without CC and a local eco- nomic society with CC. We adopt this game as a means of introducing the CC (Yoshida 2012a, 2012b, Yoshida and Kobayashi 2014a); as a means of considering the conditions for continuous distribution of CCs (Yoshida and Kobayashi 2014b, Kobayashi, Yoshida and Hashimoto 2013); and as a means of a design CC system (Yoshida and Kobayashi 2018). Yoshida and Kobayashi (2016) analyze the game results using analog-paper CC and

analog-LETS CC, noting that the LETS-type CC tends to increase the participant's monetary diversity and community-oriented perspective compared to the paper type CC. Although the earlier study was limited to the analog type CC, this study considers the question of how participants evaluate analog and digital CCs.

Figure 1 shows the research plan. We infer and consider the local economic society where the digital CC is used, building on a gaming simulation where digital CC is used.

Fig. 1. Research Plan



3 Community Currency Game: Rules and implementation method

In this game, there are five roles in the town, and each participant is assigned one role. The participants trade goods and services according to the dice[2]. The participants must make decisions on three points during each turn.

(a) Some items can be bought both inside and outside the town. The items that can be bought outside the town are cheaper than those inside the town. The participants must choose to buy inside or outside the town.

(b) Some roles can volunteer to provide services that other roles require. If asked to volunteer, participants must decide whether to do so.

(c) All roles must decide whether to participate in the town activities decided each turn. The number of people required for town activities is determined by rolling the dice. Participants must decide which roles will participate. If it is not decided, it will be outsourced by collecting money from all roles.

[2] Each role has one dice in this game.

The game consists of five turns. During the first two turns, participants trade only with legal tender (yen). In the last three turns, they trade with yen and CCs (unit is J). The value of a CC is equal to that of a yen. In the first two turns, the selling price of items is determined in advance and the price of volunteering is zero. For the last three turns, all roles must decide the proportions of CC in the selling price of each item, and the amount of CC received as compensation for volunteer work.

To avoid the influence of prior CC use experience, we conducted this game for university students who have never used CCs previously. We conducted four games with different types of CCs: analog-paper, analog-LETS, digital-reloadable, and digital-LETS (figure 2). To compare analog and digital, we set the digital-re- loadable CC as the digital CC corresponding to analog-paper CC, and set the digital-LETS CC as the digital CC corresponding to analog-LETS CC. The participants played two games using analog and digital CCs that corresponded to each other on the same day, and at the end of the day, they completed the worksheet with the evaluations of the two CCs. At the end of the second day, all participants completed a worksheet that compared the analog and digital CCs used in the two games and evaluated all four CCs.

In the worksheet, we asked participants to evaluate CCs considering the following four points of view: convenience of CC, contribution to economic revitalization, contribution to volunteer activities, and contribution to town activities. An evaluation was performed in four stages for each perspective. In addition, participants were asked to describe the images for two CCs used that day. These evaluations tend to reflect on the gaming experience. In the last half of worksheet 2, we asked participants to rank all four CCs based on the following three points of view: revitalization of the local economy, strengthening of local community ties, and the CC that should be introduced. Using this question, we can better understand the evaluation process for CCs that participants undertake through the game experiences.

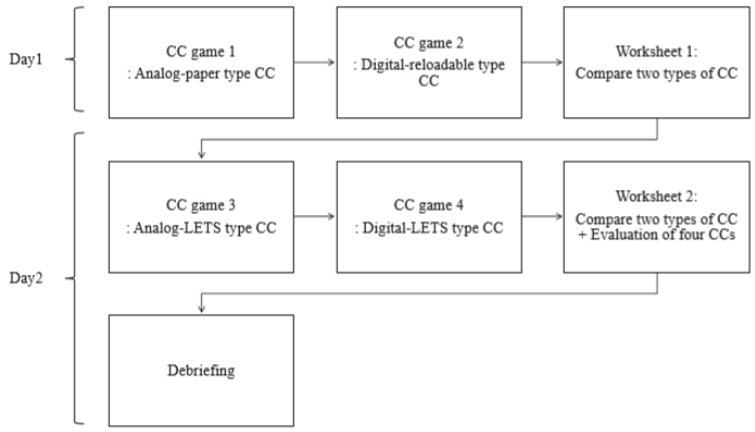


Fig. 2. Implementation of the game: Four games were played over two days.

4 Results

We conducted this game at Joetsu University of Education from December 1-2, 2018 with sixteen participants. All participants were students of the university who had never used CCs.

4.1 From the trade history

Table 1 shows the changes in the purchase frequency inside the town for all roles both before and after introducing the CC. The upper part of the table describes the results for each game, and the lower part describes the results by dividing the type of CC used in the game. It should be noted that the number of purchases in the town significantly increased in games 2 and 4 after introducing a digital CC. Focusing on the type of CC, we see significant change in the games using digital CC after introducing the CC.

Table 2 shows the change in the frequency of volunteering for all roles before and after introducing the CC. The upper part of the table describes the results for each game, and the lower part describes the results by dividing the type of CC used in the game. Importantly, the number of volunteers significantly increased in game 2 (which used a digital CC) after introducing CC. Focusing on the type of CC, we can see a significant change in the games using digital CCs after introducing CC.

Table 1. Purchase frequency inside the town

			avarage	N	SD	t	degree of freedom	p
game	game1	before introducing CC	1.2	5	0.84	-1	4	0.374
		after introducing CC	1.8	5	1.1			
	game2	before introducing CC	0.4	5	0.55	after -6	4	0.004
		introducing CC	2.8	5	0.84			
	game3	before introducing CC	0.8	5	0.84	-2.058	4	0.109
		after introducing CC	2	5	1			
	game4	before introducing CC	0.6	5	0.89	-4	4	0.016
		after introducing CC	2.2	5	0.45			
type of CC	analog	before introducing CC	1	10	0.82	-2.212	9	0.054
		after introducing CC	1.9	10	0.99			
	digital	before introducing CC	0.5	10	0.71			
		after introducing CC	2.5	10	0.71	-6.708	9	0

Table 2. Volunteering frequency

			avarage	N	SD	t	degree of freedom	p
game	game1	before introducing CC	1.67	3	1.16	-1	2	0.423
		after introducing CC	2.67	3	1.53			
	game2	before introducing CC	0	3	0	-5.196	2	0.035
		after introducing CC	3	3	1			
	game3	before introducing CC	1	3	0	-2	2	0.184
		after introducing CC	1.67	3	0.58			
	game4	before introducing CC	0.67	3	0.58	-1.109	2	0.383
		after introducing CC	2	3	1.73			
type of CC	analog	before introducing CC	1.33	6	0.82	-1.746	5	0.141
		after introducing CC	2.17	6	1.17			
	digital	before introducing CC	0.33	6	0.52	-3.081	5	0.027
		after introducing CC	2.5	6	1.38			

Table 3. Frequency of town activities

			avarage	N	SD	t	degree of freedom	p
game	game1	before introducing CC	1	5	0	-2.138	4	0.099
		after introducing CC	1.8	5	0.837			
	game2	before introducing CC	1	5	0	-3.162	4	0.034
		after introducing CC	2	5	0.707			
	game3	before introducing CC	1.4	5	0.548	-1.633	4	0.178
		after introducing CC	1.8	5	0.447			
	game4	before introducing CC	1.60	5.00	0.55	-0.343	4	0.749
		after introducing CC	1.80	5.00	0.84			
type of CC	analog	before introducing CC	1.2	10	0.422	-2.714	9	0.024
		after introducing CC	1.8	10	0.632			
	digital	before introducing CC	1.3	10	0.483	-1.765	9	0.111
		after introducing CC	1.9	10	0.738			

Table 3 shows the frequency of town activities before and after introducing the CC. The upper part of the table describes the results for each game, and the lower part describes the results by dividing the type of CC used in the game. In game 2, we see a significant increase in the number of town activities performed after introducing CC. In the game using analog CC, there are significant increases in the number of town activities performed after introducing CC.

4.2 From the worksheet

How did the participants assess the analog and digital CCs? First, we analyze the evaluation of the two CCs, which include the participants' reflections of the games. Table 4 shows a comparison of the two CCs in worksheets 1 and 2. The upper part of the table describes the comparison of the analog-paper CC and the digital-re- loadable CC that participants used on the first day, and the lower part compares the analog-LETS CC and the digital-LETS CC that participants used on the second day. The game confirmed that the digital CC has a high evaluation in both rounds of comparison regarding convenience and contribution to economic revitalization. This result shows that the participants, by playing the game, had a strong impression on the convenience and economic effect of digital CCs.

Table 4. Comparison of the two CCs: Analog-paper vs. Digital-reloadable, Analog-LETS vs. Digital-LETS.

			average	N	SD	t	degree of freedom	p
analog-paper vs digital-reloadable	convenience of CC	analog-paper	2.57	14	0.514	-7.87	13	0
		digital-reloadable	3.86	14	0.363			
	contribution to eocnomic revitalization	analog-paper	2.93	14	0.73	-2.28	13	0.04
		digital-reloadable	3.5	14	0.519			
	contribution to volunteer activities	analog-paper	3.07	14	0.829	-0.291	13	0.775
		digital-reloadable	3.14	14	0.535			
	contributio to town activities	analog-paper	2.93	14	0.475	0	13	1
		digital-reloadable	2.93	14	0.475			
analog-LETS vs digital-LETS	convenience of CC	analog-LETS	2.38	13	0.65	-5.333	12	0
		digital-LETS	3.62	13	0.506			
	contribution to eocnomic revitalization	analog-LETS	2.85	13	0.555	-1.897	12	0.082
		digital-LETS	3.08	13	0.494			
	contribution to volunteer activities	analog-LETS	2.85	13	0.376	-0.562	12	0.584
		digital-LETS	2.92	13	0.277			
	contributio to town activities	analog-LETS	2.69	13	0.48	-0.562	12	0.584
		digital-LETS	2.77	13	0.439			

Secondly, we see the rank of the four CCs (Table 5), which summarizes the participants' evaluations of CCs through the games. The participants ranked the digital-LETS CC as the most likely to revitalize the local economy but noted that the digital-reloadable CC is the CC they most prefer to use. Participants ranked the two analog CCs over the digital CCs as likely to strengthen local community ties. From these results, we found that participants evaluate digital CCs as the currency that brings economic effects and analog CC as currency that brings community effects. Additionally, we can see that the question on 'revitalization of the local economy' and 'CC that should be introduced' have clear ranks; however, none of the four CCs have clear ranks for the category 'strengthening local community ties.' The results show that participants had a strong impression on the economic effect of CCs, playing the game four times and establishing that digital CC should be introduced.

Table 5. Rank of the four CCs

median rank	Revitalization of the local economy	Strengthening the local community ties	CC that should be introduced
1	digital-LETS (1.54)		digital-reloadable (1.69)
2	digital-reloadable (1.92)	analog-LETS (2.08) , analog-paper (2.38)	digital-LETS (2.00)
3	analog-LETS (3.08)	digital-reloadable (2.77) , digital-LETS (2.77)	analog-LETS (2.92)
4	analog-paper (3.46)		analog-paper (3.38)

shown in parentheses is average rank

5 Discussion

When the share of digital CC increases, how do the users evaluate digital CC as a medium? Table 6 shows the results of the behavior of the participants and the evaluation of the CC. After introducing digital CC, the purchase frequency inside the town and volunteering frequency significantly increased. By contrast, the number of economic activities in the town had not significantly increased after introducing digital CCs. The results show that digital CC functions as a medium to encourage users to conduct economic activities. Such experiences from the game are reflected in the high participant evaluations of digital CCs as enhancing the eco- nomic effect and those of analog CC as enhancing the community effect. These evaluations have also led the participants to note that digital CC should be introduced.

Table 6. Results of behavior in the game and evaluation of CC

Behavior in the game	Evaluation of CC
purchasing in the town ↑ (Digital)	economic effect (Digital > Analog)
volunteering ↑ (Digital)	strengthen community ties (Analog > Digital)
town activity ↑ (Analog)	should be introduced (Digital > Analog)

median rank	Revitalization of the local economy	Strengthening the local community ties	CC that should be introduced
1	digital-LETS (1.54)		digital-reloadable (1.69)
2	digital-reloadable (1.92)	analog-LETS (2.08) , analog-paper (2.38)	digital-LETS (2.00)
3	analog-LETS (3.08)	digital-reloadable (2.77) , digital-LETS (2.77)	analog-LETS (2.92)
4	analog-paper (3.46)		analog-paper (3.38)

In this study, we found that digital CC emphasizes the economic effect of CC. Based on this, there are two issues to consider: (i) the problem of participants' individual characteristics, and (ii) the problem of application specification of digital CC. In this game, we made students the participants. It is possible that the result may be changed with more community-oriented participants. We may also be more aware of the community ties by changing the application specifications. These tasks can be examined in future studies.

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References

1. Greenblat, C.S. (1988). Designing games and simulations, SAGE Publications.
2. Kobayashi, S., Miyazaki, Y., & Yoshida, M. (2018). Historical transition of com- munity currencies in Japan, The 4th. International Conference on Social and Complementary Currencies.
3. Kobayashi, S., Yoshida, M., & Hashimoto, T. (2013). Study on the mechanism of community currency circulation using gaming and multi-agent simulation, Studies in Simulation & Gaming, 23 (2), 1-11 (in Japanese).
4. Lietaer, B. (2004). Complementary currencies in Japan today: History, originality and relevance. International Journal of Community Currency Research, 8(1), 1-23.
5. Yoshida, M. (2012a). Community Currency Game as a learning tool: consideration of the design of Community Currency Game and its results, The Economic Studies (Hokkaido University), 62 (1), 69-87 (in Japanese).
6. Yoshida, M. (2012b). Consideration of the process of the introduction of community currency in hilly and mountainous area, Joetsu Social Studies, 27, 31-40 (in Japanese).
7. Yoshida, M. & Kobayashi, S. (2014a). Community Currency Game: a tool for introducing the concept of community currencies, The Proceedings of the 45th ISAGA Conference, 788-794.
8. Yoshida, M. & Kobayashi, S. (2014b). The effect of community currency use in promoting the local economy and community: a gaming simulation consideration, The Annual of the Society of Economic Sociology, 36, 67-80 (in Japanese).
9. Yoshida, M. & Kobayashi, S. (2016). An analysis of changing consciousness and behavior according to different forms of community currency: a gaming simulation consideration, The Annual of the Society of Economic Sociology, 38, 144-160 (in Japanese).
10. Yoshida, M. & Kobayashi, S. (2018). Using simulation and gaming to design a community currency system, International Journal of Community Currency Re-search, 22, 132-144.