Development and Application of Value *Karuta* to Understand Value in Lean Management: Initial Small-group Trial in Japan and the UK

Tamao Kobayashi, Koichi Murata[*]

Department of Industrial Engineering and Management, Graduate School of Industrial Technology, Nihon University, Izumi 1-2-1, Narashino City, Chiba, 2758575, Japan

A B S T R A C T

This study proposes the Value Karuta (VK), an application of the traditional Japanese card game karuta. Its goal is to contribute to the understanding of value, which is the first principle of lean management. After stating the problems of lean management and the specifications of VK, this paper confirms the validity of the proposal by discussing two surveys. The first survey explored the utility factors of the cards themselves; it was conducted with a group of students and businesspeople in Japan. The second survey observed the actual situation in the game and was conducted in a group of academics at two UK universities. Both surveys used qualitative methods, such as observation and discussion, and quantitative questionnaires. The results confirm the role of VK as a fundamental tool addressing the need to understand customer value in lean management.

1. Introduction

First, this paper is an extension of work [1] originally presented at the 2023 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) and contains two surveys. The original work focused on the first survey. This paper also considers the second survey for a comprehensive discussion of the proposal of Value *Karuta* (VK). This necessitated extensive revisions to the Introduction and Literature Review sections of the original work. First, we review the main text.

The difference between the Toyota Production System (TPS) and lean management is that value is added explicitly. This is the first of the five principles of lean management; the other four principles—value stream, flow, pull, and perfection—are included in the TPS. Additionally, across its legacy, there have been many cases in which the methodology has been applied to realize the four principles.

Value can only be defined by the ultimate customer [2], although its identification is difficult. This is because value designers are not customers themselves, and customers are someone else; thus, understanding the value of a customer that one has never met is difficult.

The second principle is that of the value stream. Although its name includes the word "value," the principle focuses on waste in the value stream. In other words, value is not a direct concern. Value-stream mapping (VSM) is used as a methodology for this principle. It visualizes the overall waste in a value stream. The third to fifth principles include ideas for drastic changes to the value stream and its continuous activities. In other words, the four principles are consistent with the TPS philosophy, namely the absolute elimination of waste [3]. Most studies on lean management have focused on these four principles. The first principle has been addressed in several previous studies. However, if the customer's true value is not understood, the effects of the other principles will not be realized.

This study contributes to understanding customer value, providing an approach that helps people understand many different types of value around the world. Knowing the breadth of the value world suggests the need to understand customer value. To realize this approach, we developed VK by adapting the traditional Japanese card game *karuta*. This paper reports a survey of the initial applications of the game. Two surveys were conducted: the first was conducted in Japan with two groups of university students and businesspeople, and the second was conducted with academics at two UK universities. The first survey focused on the evaluation of the cards, which were game materials. Multiple cards were

developed, each containing an academic definition or an example of one value. The survey explored the factors that made these cards effective. The methods used included observing the actual game experience and distributing a questionnaire to the participants. The second survey confirmed whether values were truly being learned from VK, building on the perspectives of the first survey. It also evaluated whether this Japanese card game can be used internationally. These methods are the same as those used in the first survey.

The paper is organized as follows. The next section describes a way of thinking about value in lean management, conventional tools for understanding value, and the relationship between conventional and developed tools. Section 3 describes the research procedure based on two surveys in Japan and the UK in which the game was implemented and evaluated using a questionnaire. Section 4 presents and discusses the research results. Finally, section 5 presents the conclusions of the study.

2. Conventional and Developed Tools

2.1. Value

While searching the literature on values, we discovered that many types of value have been studied. This section reviews 24 types of values by 15 authors of works spanning approximately 150 years, from Marx's time to recent years. These types of value are used in the VK and can be classified into the following four academic fields:

Economics literature illustrates seven types of value: use, exchange, perceived, acquisition, transaction, firm, and intangible value [4-7]. The first four value types were studied relatively early in this review. The fifth and sixth value types were considered in recent years. In seventh value type, intangible resources are becoming what gives firms competitive power.

Psychology literature illustrates two types of value: terminal and instrumental [8]. These two value types comprise the Rokeach Value Survey. Each value has 18 subcategories that organize the essential attributes of human beings. This system continues to be used in numerous investigations.

Sociology literature illustrates three types of value, linking value, cultural value, and dominant social value [9]-[11]. Value in this field expresses social phenomena in the relationships between people. For example, the dominant social value states that the K-pop boom in Korea is a contemporary social phenomenon [11].

Marketing literature illustrates 12 types of value: experience, basis, convenience, sensory, idea, customer, context, consumption, semantic, sticking, self-expression, and environmental value [12]-]19]. Marketing includes the most value types of the four academic fields reviewed in this study. It flourished around the year 2000 and interpreted how people attached meaning to products. Multiple value types are a characteristic of works authored in this field. For example, Wada [14] and Nobeoka [18] propose four and three values, respectively.

This review shows that value has been studied in many fields, especially marketing, which is closely related to the customer. However, no such research has been conducted in the field of lean management.

2.2. Value in Lean Management

How, then, is value handled in lean management? Value is the first of the five principles of lean management [3]. When one reads into the related literature, one learns that if value is not accurately defined, it will be skewed by value chain functions such as strategy, engineering, supplier, and sales. The skew of value (SoV) within each function is as follows [3]:

SoV 1: Preexisting organization-oriented

"Business school-trained senior executives of American firms tell us about their short-term competitive problems and the consequent cost-cutting initiatives."

SoV 2: Technology-oriented

"Designs with more complexity produced with ever more complex machinery were asserted to be just what the customer wanted and just what the production needed."

SoV 3: Supplier relationship-oriented

"The immediate needs of employees and suppliers were prioritized over the needs of the customer, which must sustain any firm in the long term."

SoV 4: Preexisting service-oriented

"Many producers want to make what they are already making. And then, many customers only know how to ask for some variant of what they are already getting."

Lean management has proposed dialogue to overcome SoV. Many value chain players only imagine customer value. If value is something they have never seen before, they will never be able to reach it even if they have a dialogue with the customer.

2.3. Tools to Understand Value in Lean Management and Others

Tools to understand value have been developed outside lean management. The following reviews value proposition (VP) and value engineering (VE) in addition to VSM in lean management.

VSM is a well-known method for identifying waste and improving performance proposed in the lean-manufacturing approach [20], [21]. This tool has been used for process improvement [22] and has been illustrated graphically [23]. Its primary goals are process modeling, investigating process waste, estimating the lead time associated with a certain product flow throughout a system, and estimating process efficiency [24].

The VP is a multifaceted bundle of products, services, prices, communication, and interactions that customers experience in their relationship with the supplier [25]. This conceptualization of the VP as a multifaceted bundle enables a better understanding of the complexity that emerges when integrating sustainability into the value propositions of business models [26].

VE refers to processes designed to reduce costs while maintaining standards [27]. VE complements the target cost and increases the chances of simultaneously reaching cost targets and guaranteeing quality [28].

Although these tools contain the word 'value' within their names, they only consider factors other than value.

2.4. Proposed Value Tool

VK is a valuable tool developed with the concept of "learning value in a fun and easy-to-understand manner" in mind. We have developed VK to be enjoyed as a game. Japan has several indoor games, and *karuta* is a traditional Japanese playing card game [29], [30]. VK was created with reference to the layout and rules of *karuta* [31].

Karuta contributes many functions to Japanese culture, such as community creation and spiritual fulfillment in daily life. It is played in classrooms and family gatherings in Japan, whereas European card games often feature in gambling [32]. *Karuta* also maintains a religious record and features as decoration of Buddhist shrines [33]. Today, competitive *karuta* is a popular sport. Players analyze how to improve their skills using the latest motion capture technology [34]. In an era of low birth rates and an aging society, *karuta* contributes to intergenerational social interactions between older people and children in Japan [35]. Furthermore, it has spread to other Asian countries. For example, an elementary school in Indonesia tried to use *karuta* as a tool for language education [36]. This highlights how *karuta* can have a knowledge acquisition function.

Value *karuta* is designed to understand the 24 types of values described in Section 2.1.

Two cards are used for each value. One was *torifuda* and the other was *yomifuda*. The *torifuda* consists of a front side with the name of the value and an illustration of the corresponding value, and a back side with the name, concept, and outline of the value. The *yomifuda* has three features: the name of the value, an overview, and an easy-to-understand explanation. In the game, one person reads the *yomifuda* (reader) and multiple people read the *torifuda* (takers). The rules are as follows: (1) all cards in *torifuda* are arranged in front of the takers; (2) the reader then reads one *yomifuda*; (3) the takers compete to pick up the *torifuda* with the name of the value read by the reader; and (4) steps (2) and (3) are repeated until no cards remain. Victory or defeat in the game is determined by the number of *karuta* cards taken. Both readers and takers can learn about value through the game. Figures 1 and 2 show examples of *karuta* cards. The advantage of this value tool is that it can be played like a game, and the value can be understood from multiple sources of information. Players receive the visual information of the characters and illustrations written on the *karuta*, and they receive auditory information read during the *karuta* game. Additionally, because *karuta* is a traditional Japanese game, the tool is easily accepted by the Japanese people. A disadvantage of the tool is the need to explain the game to people unfamiliar with *karuta*, including foreigners. Another disadvantage is the fact that the game can only be played with multiple people and not as a single-player game.

3. Research Method

This study consisted of two surveys, as shown in Figure 3. The first survey aimed to evaluate VK materials. The materials refer to the cards that play a central role in the game. The game's success or failure depends on the quality of the materials, and this motivated the first survey. The second survey evaluated the game experience. It aimed to clarify the players' feelings toward the game their impressions of it, and what they learned from the game.
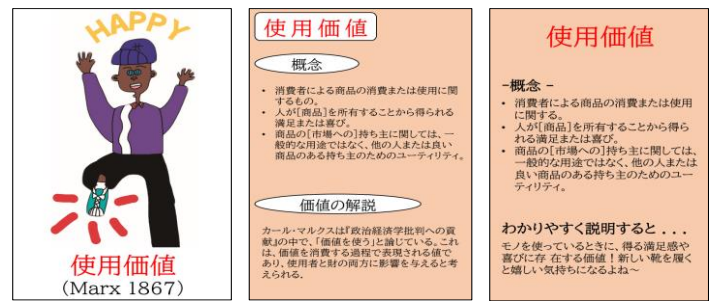

Figure 1: Value Karuta (Japanese version) (From left to right, torifuda, torifuda back, yomifuda)
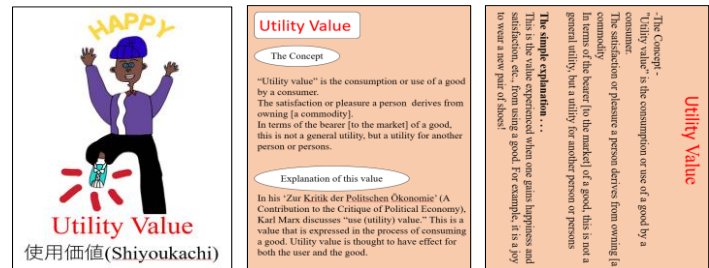
Figure 2: Value Karuta (English version) (From left to right, torifuda, torifuda back, yomifuda)
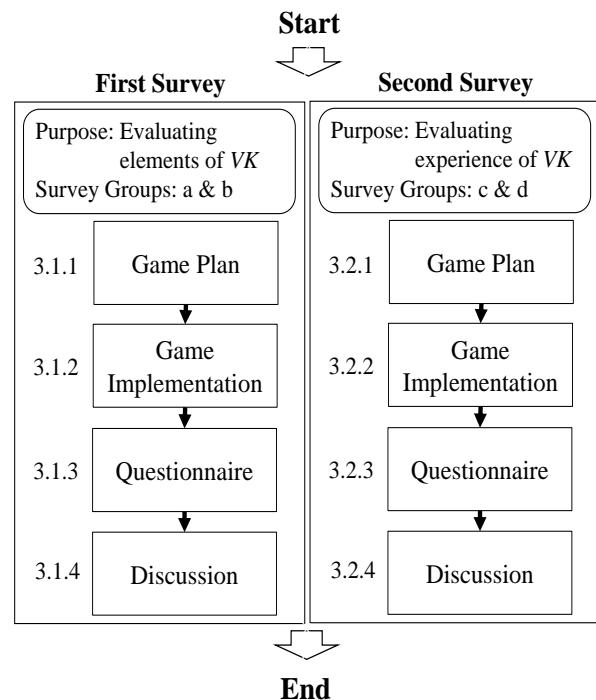
Figure 3: Survey Procedure

Both surveys followed the same four steps: game plan, game implementation, questionnaire, and discussion. Details of the procedure for each survey are provided below.

3.1. First Survey

3.1.1 Game Plan

The survey involved two groups, Group a and Group b. Group a consisted of 13 college students in their twenties, six men and seven women. Two male students were foreigners (Chinese and Turkish), whereas the other students were Japanese.

Group b consisted of seven practitioners of different ages: one in their twenties, two in their thirties, two in their forties, and two in their fifties. There were four males and three females. All were Japanese. Their industries included manufacturing, retail, tax accounting, and real estate.

3.1.2 Game Implementation

Each group played the game twice. When conducting the experiment, we prepared an environment in which the cards were spread out, and the participants could sit around them.

The game for Group a was held at a university seminar camp. In the gymnasium, cards were laid out on the floor, and the game was played while players sat on the floor. The game for Group b was held as an icebreaker for a seminar on lean management. The cards were arranged on a table in the seminar venue, and the participants sat on chairs to play the games.

3.1.3 Questionnaire

After the game ended, we distributed a questionnaire consisting of Questions A–G. Question A was, "Were you satisfied?" This was the players' overall rating of the game. The respondents were asked to respond on a three-point scale (satisfied, neutral, and dissatisfied) and state the reasons for their responses. Question B was, "How was the visibility of the characters on the table of the *torifuda*?" Question C was, "How was the visibility of the characters on the back of the *torifuda*?" Question E was, "How was the visibility of the picture?" These four questions were used to evaluate *karuta*. There were three levels: bad, normal, and good. Question D was, "How much did you enjoy the game?" The aim was for players to have fun. The respondents answered on a six-level scale: 100%, 80%, 60%, 40%, 20%, and 0%. Question F was, "Please write down your favorite value." This item investigated which value players tend to recall and therefore which value tends to leave an impression. Last, Question G was, "Please write down any good points or concerns you have about this game in free description."

3.1.4 Discussion

We analyzed whether the game was effective in promoting the understanding of value. From the results of the questionnaire, we extracted the internal and external factors that promoted the understanding of value. Issues raised by these results were examined further in the second survey.

3.2. Second Survey

3.2.1 Game Plan

The survey had two groups, Group c and Group d. Group c consisted of 15 academics from different UK universities: three in their twenties, seven in their thirties, one in their forties, one in their fifties, and three of unknown ages. There were eight males, four females, and three of unknown gender. Nationality was mixed.

Group d consisted of six academics from a UK university not included in Group c. Three were in their thirties, one in their forties, one in their fifties, and one of unknown age. Nationality was mixed.

3.2.2 Game Implementation

In the first survey, the game was played as part of an event. Before the game, the participants received an explanation of the game rules. In the second survey, the game was played after receiving a detailed explanation of its background and purpose.

Both groups' games were held at UK universities. Another purpose of this second survey was to understand whether *karuta*, a card game that is culturally Japanese, would be accepted in an international environment. For this purpose, we also created and used *karuta* translated from Japanese into English. The cards were made of Washi paper, which is a traditional Japanese paper.

Both groups played the game twice. They arranged cards on a table in the meeting room and sat in chairs to play the game.

3.2.3 Questionnaire

The questionnaire for the second survey consisted of Questions A2–G2. Question A2 was, "Which types of value left an impression on you?" The participants were asked to write an answer regarding the type of value that made an impression on them while playing the game. Question B2 was "How well do you understand value?" Using a five-point scale (5 = understand well, 1 = do not understand), we evaluated whether participants were able to understand value by playing the game. Question C2 was, "Please tell us why you chose the number in Question B2." This item was used to determine the points at which the participants understood the value during the game. Question D2 was, "Please tell us about the difficulty level of VK." Using a five-point scale (5 = easy, 1 = difficult), participants were asked to rate how easy it was to play the game. Question E2 was, "Please tell us your impression of the appearance of VK." It asked the participants how they felt about the game's appearance. The evaluation was performed by selecting one or more of the following seven items: pretty, pleasant, bright, cool, sober, quiet, and other. Question F2 was, "Please tell us about a scene in the game that left an impression on you." This aimed to determine when players concentrate while playing the game. The participants were asked to select one or more of the following four items: "When taking a card," "When looking for a card," "When deciding the winner," and "Other." Question G2 was, "If you have any other comments or opinions, please let us know." These questions sought opinions on aspects of the game other than those addressed in the previous six questions.

3.2.4 Discussion

This step demonstrates the possibility of promoting an understanding of value through VK. The first survey confirmed the effectiveness of the game's materials, specifically the cards themselves. Additionally, the second survey confirmed whether VK would be enjoyable for players who were unfamiliar with the game and whether these players had time to think about value.

4. Research Results

4.1. First Survey Results

Table 1 shows the questionnaire answers by Group a. Twelve people answered "Satisfied," and one person answered "Neither" to Question A. Men who answered "Satisfied" were satisfied with the overall design of the game and *karuta*. The women were satisfied with the cuteness of the illustrations and the rules of the game. Men who answered "Neither" were dissatisfied with the

game's outcome. For Question B, 12 people answered "Good," and one person answered "Bad." For Question C, 12 people answered "Good," and one person answered "Normal." For Question D, 12 out of 13 people answered "100%," and one answered "80%." For Question E, 11 out of 13 people answered "Good," and two answered "Bad." For Question F, two people listed the link and commitment values (respectively), and the other eight values were each listed by one person. These are the value types whose meanings can be inferred from their names. Question G was answered by 8 out of 13 people, five of whom were anonymous. Men's impressions considered how to play *karuta* and the environment. Women's impressions considered the cuteness and fun of *karuta*.

Regarding Group b (Table 2), five people answered "Satisfied," and two answered "Neither" to Question A. Men who answered "Satisfied" commented on the rules of *karuta* and their impressions of *karuta* itself, as well as their nostalgia for playing *karuta*. One commented on the women he enjoyed playing with and how nice the illustrations were. Those who answered "Neither" offered advice on how to improve the rules to achieve the game's goals. All respondents answered "Good" to Questions B and C. Question D was 100% for four people and 80% for three people. All the respondents answered "Good" to Question E. Question F assessed the ability, semantics, and instrumental values. All the respondents answered Question G. Participants primarily raised suggestions for improving the *karuta* rules.

Table 1: Questionnaire Results for Group a

Question	Evaluation	Number of people	Men	Women	Comment
A	Satisfied	12	5	7	*1
	Neither	1	1	0	*2
	Dissatisfied	0	0	0	−
B	Bad	1	1	0	
	Normal	0	0	0	
	Good	12	5	7	
C	Bad	0	0	0	
	Normal	1	1	0	
	Good	12	5	7	
D	100%	12	5	7	
	80%	1	1	0	
	60, 40, 20, 0%	0	0	0	
E	Bad	2	1	1	
	Normal	0	0	0	
	Good	11	5	6	
F	Link Value	2	1	1	
	Sticking Value	2	2	1	
	Intellectual Value	1	1	0	
	Semantic Value	1	1	0	
	Convenience Value	1	1	0	
	Corporate Value	1	0	1	
	Environmental Value	1	0	1	
	Exchange Value	1	0	1	
	Social Value	1	0	1	
	Transaction Value	1	0	1	
G	With Comments	8	3	5	*3
	No Comments	5	3	2	

<Comments on Question A>

*1: That was very fun. / The text and images were easy to understand. The fact that an English notation was included was good. / It was good to know various types of value. / I learned a lot of different values. / I learned a lot of new values. The pictures were cute and fun. / I was able to know the value that I do not usually use. / Good to know the value. /Aiming to be number one, we were able to do it while cooperating. / It was fun. The difference in game activity was easy to understand. / It was fun.

*2: The number is slightly less.

<Comments on Question G>

*3: It is hard to judge by looking at a picture. / Good to learn about value. / Perfect with cushions. / The letters were easy to read, and the pictures were cute. / The pictures were so cute and funny. / I was able to study in an easy-to-understand manner and enjoyed it. / It was nice to have cute pictures on all the karuta cards. I had fun. Thank you. / Good to learn about value. / The writing on the back of the card was a little hard to read. However, I thought it would be easy to understand and global owing to the word notation.

Table 2: Questionnaire Results for Group b

Question	Evaluation	Number of people	Men	Women	Comment
A	Satisfied	5	4	1	*1
	Neither	2	1	1	*2
	Dissatisfied	0	0	0	−
B	Bad	1	1	0	
	Normal	0	0	0	
	Good	7	4	3	
C	Bad	0	0	0	
	Normal	1	1	0	
	Good	7	4	3	
D	100%	4	2	2	
	80%	3	2	1	
	60, 40, 20, 0%	0	0	0	
E	Bad	0	0	0	
	Normal	0	0	0	
	Good	7	4	3	
F	Ability Value	1	1	0	
	Semantic Value	1	0	1	
	Instrumental Value	1	0	1	
	Perceived Value	1	1	0	
	Intangible Value	1	0	1	
	Link Value	1	1	0	
	Unanswered	1	1	0	
G	With Comments	7	5	3	*3
	No Comments	0	0	0	

<Comments on Question A>

*1: It was fun. I think I noticed a lot. However, I think it would be more interesting if the rules were stricter than the karuta itself. / I played karuta for the first time in a while. / I really liked the illustrations. I had a lot of fun learning about values. I had no idea it was worth so much. Please keep doing a good job. / I was able to learn about value while having fun. I learned a lot. / The illustrations were very nice.

*2: It was fun but difficult. / The content was very interesting and a new experience, but I still do not fully understand it.

<Comments on Question G>

*3: It was hard to tell the difference between the values. / The value and its explanation just could not connect, but it was fun. / It is the perfect icebreaker because moving your body creates conversation and stimulates your intellectual curiosity. Awareness of "heh" is a strong motivation to read the text. / It was great to get to know each other as an icebreaker, and it was a great opportunity to learn about values. But the best part was being able to talk to all the students. It was great because I do not usually talk with students. / The pictures were so unique and cute! I think I would have been more absorbed in playing *karuta* if I had had more time to deepen my understanding. It has been a long time since I have played karuta in this form, and it was a lot of fun! / I was able to learn the value through the game (*karuta*) using pictures and easy-to-understand words, so I thought it would be a good idea to get it into my head more smoothly. I would like to hear a more detailed explanation of each value. / I think you can enjoy learning about value through *karuta*. I think it was good that I chose *karuta* as a tool. How about

creating a *karuta* role with rules that are conscious of the understanding and connection of the game and value of *karuta*? Five points if you have XX value, XX value, and XX value, which are connected to XX.

The results of the questionnaire survey confirmed three factors that make the VK effective: (1) nostalgia and design, (2) Japanese naming and type, and (3) the implementation environment. Each of these factors is discussed below.

Regarding nostalgia and design, two observations can be drawn from the questionnaire results. First, *karuta* is a game played by Japanese people when they are young. This is evident from the comment by the businesspeople group: "I played *karuta* for the first time in a long time." Second, the college students expressed many opinions about the illustrations, such as "The pictures were very cute and interesting" and "I'm glad that all the *karuta* cards have cute pictures on them." The illustrations on the *karuta* cards create familiarity.

For naming and Japanese type, college students and businesspeople listed two value types in Question F: linked value and semantic value. Among the 34 values, the linked value was the only one in Japanese *katakana* notation. From the college students' answers, multiple people listed the sticking value. Among the 34 types, the commitment value was the only one in *hiragana* notation. Because the other 32 symbols were written in Chinese characters, it can be assumed that they left an impression. Additionally, it is easy to imagine the meaning of the word "stickiness," and the word "link" has an image that makes one wonder and want to investigate. Both are attractive words that modify value, suggesting that the naming and notation of types of value influence their understanding.

Third, the implementation environments differed between the two groups. The college student group held an event during a seminar camp, whereas the businesspeople held an educational seminar. Comparing the comments on Question G, the college student group had monotonous impressions of the game, such as "It was fun" and "It was interesting." The businesspeople group said, "I want to hear more detailed explanations about each value." This answer makes one aware of technical aspects, such as the rules of VK and the motivation for value learning.

4.2. Second Survey Results

Regarding Group c (Table 3), responses were received from 15 people: eight were men, four were women, and three did not answer. Their ages ranged from their twenties to their fifties, with an average of 30 years. For Question A1, three people answered "Link Value," and two answered "Cultural Value" and "Dominant Value," respectively. For Question B2, the average level of understanding of value was 3.6, and for Question D2, the average level of difficulty was 3.4. From Question E2, 20% of participants answered "pretty" and "bright" regarding the cards' appearance. From Question F2, 53% of participants answered "when looking for a card" regarding the most memorable moment. Nine participants provided a free-form descriptions in Question G2.

Six people answered in Group d (Table 4). Four patients were men and two were women. Their ages ranged from their twenties to their fifties, with an average of 30 years. For Question A2, six respondents provided different answers regarding memorable values. For Question B2, the average understanding of the value types was 3.8, and the average difficulty of Question D2 was 3.5.

From Question E2, 67% answered "Pretty" regarding the appearance of the card. From Question F2, 67% answered "when looking for a card" regarding memorable moments. Everyone provided free-form descriptions for Question G2.

Table 3: Questionnaire Results for Group c

Question	Evaluation	Number of people	Men	Women	No Response	Comment
A2	Link Value	3	3	0	0	
	Dominant Value	2	2	0	0	
	Cultural Value	2	2	0	0	
	Environmental Value	1	1	0	0	
	Social Value	1	1	0	0	
	Transaction Value	1	0	0	0	
	Social Value	1	0	0	0	
	Firm Value	1	0	0	0	
	Terminal Value	1	0	0	0	
	Convenience Value	1	0	0	0	
	Intangible Value	1	0	0	0	
	Context Value	1	0	0	0	
	Perceived Value	1	0	0	0	
	Self-Expression Value	1	0	0	0	
	Idea Value	1	0	0	0	
B2	1 (Not Understood)	0	0	0	0	−
	2	3	1	2	0	*1
	3	3	1	2	0	*2
	4	6	4	0	0	*3
	5 (Well Understood)	3	2	0	0	*4
D2	1 (Difficult)	0	0	0	0	
	2	2	1	0	1	
	3	6	3	2	1	
	4	3	2	1	0	
	5 (Easy)	2	1	0	1	
E2	Pretty	7	6	0	1	
	Pleasant	5	3	1	1	
	Bright	7	4	2	1	
	Cool	6	3	1	2	
	Sober	2	2	0	0	
	Quiet	1	0	1	0	
	Other	2	1	0	1	*5
F2	When Taking a Card	4	1	0	3	
	When Looking for a Card	9	4	4	1	
	When Deciding the Winner	2	1	0	1	
	Other	1	1	0	0	*6
G2	With Comments	9	5	1	3	*7
	No Comments	6	3	3	0	

<Answers to Question C2>

*1: The value is a bit hard to understand. / Some values are hard to understand. / Because my English is not good. So interesting is better.

*2: New value for me. / I could not hear the reader clearly. / I am not familiar with each value.

*3: New topic to me - Enjoyed learning while playing Karuta. / I can understand more types of value. / Visual link between theory and images is practical. / It affects us. / I do not have knowledge on this topic, but the game helps.

*4: It was easy with the image and hints in the description. / I can understand most meanings with the cards.

<Other comments of Question E2>

*5: Lose! / Fun / Entertainment

<Other comment of Question F2>

*6: Listening intently.

<Comments on Question G2>

*7: I think it would be better to first let the player familiarize themselves with the intention of the concept before they play. / This is a good game. / Sometimes, it is not clear what the reader read. -> It's a fun game. / Thank you. It was a good idea to use this game. / Thank you.

Table 4: Questionnaire Results for Group d

| Question | Evaluation | Number of people | Gender | | Comment |
			Man	Women	
A2	Customer Value	1	1	0	
	Cultural Value	1	0	1	
	Perceived Value	1	0	1	
	Consumption Value	1	1	0	
	Other	2	2	0	*1
B2	1 (Not Understood)	0	0	0	—
	2	0	0	0	
	3	2	1	1	*2
	4	3	2	1	*3
	5 (Well Understood)	1	1	0	*4
D2	1 (Difficult)	0	0	0	
	2	0	0	0	
	3	2	0	2	
	4	2	2	0	
	5 (Easy)	1	1	0	
E2	Pretty	7	1	2	
	Pleasant	5	4	1	
	Bright	1	1	0	
	Cool	3	3	0	
	Sober	0	0	0	
	Quiet	0	0	0	
	Other	1	1	0	*5
F2	When Taking a Card	2	1	1	
	When Looking for a Card	3	2	1	
	When Deciding the Winner	1	1	0	
	Other	0	0	0	
G2	With Comments	6	4	2	*6
	No Comments	0	0	0	

<Answer to Question A2>

*1: Friendship / Selecting the correct answer was not easy.

<Comments on Question C2>

*2: Previous experience with research. / Value is sub stateless.

*3: Value is a spoof topic and needs further discovery. / This game made me understand different types of value. / Because of my past research on value.

*4: Experience

<Comment on Question E2>

*5: Paper^^

<Comments on Question G2>

*6: Great Game! I had a lot of fun! Thanks! / Thank you, was cursed. / Thank you! / Very pleasant way to learn about value. / Great game to engage with. Fun game, great way to teach and clarify different concepts. Great! / It is a very nice game.

The questionnaire results showed that the game has mostly been well received in the international environment. To be clear, some comments could be interpreted as lip service.

For Question E2 on the appearance of the card itself, "Pretty" was the most common impression for both groups. This demonstrates a similar tendency to what was observed in the first survey. Players, therefore, have positive experiences of the game, regardless of nationality.

Questions D2, F2, and some comments suggested that the game was not difficult or incomprehensible, and the participants were able to concentrate on it. In particular, many participants selected "When looking for a card" in Question F2.

Descriptions of everyday life written on *torifuda* cards are easy for Japanese people to understand and are important hints for finding cards. However, some players commented that the game was too Japanese and difficult for them to understand without cultural context. It is therefore debatable whether the purpose of the game is to understand Japanese culture or types of value.

In both groups, participants found conversations about types of value worthwhile. Even if they chose the wrong card, their mistakes increased their fun as players of the game. This was rarely seen when the game was played in Japan. This difference may provide cross-cultural insights.

From the results of Question A2, as in Japan, there was little overlap in the types of value that made an impression on participants. This result shows that, even if people live in the same environment, they resonate with different value types. In other words, it demonstrates the need to sincerely perceive values other than one's own. This finding implies that the first principle of lean management is important.

4.3. Discussion of Both Surveys' Results

Lean management requires dialogue to understand customer value. Customers are entirely unknown to value chain functions. It is even difficult to understand one's own family and friends. However, value chain functions must understand their customers' needs. Moreover, this understanding includes economic considerations that skew the true value. To address this challenge, this study proposed a new card game. Two surveys were conducted to confirm that the card game is useful for generating dialogue on value. The corresponding results are summarized as follows:

First, the proposed card game utilizes the fun characteristics of card games. In addition, the card game players accepted pictures of each value drawn on each card. Furthermore, the card game is enjoyable for both Japanese people and foreigners. Japanese people can enjoy the card game as a nostalgic experience echoing childhood memories, and non-Japanese people can gain a good experience of Japanese culture. The material and cultural aspects of the card game create a shared platform for producing dialogue between card game players.

Second, each card has one meaning. However, each player has a slightly different interpretation of each card and its meaning. This situation promotes dialogue while playing games. In the original *karuta*, players compete on the number of cards they take, so taking the wrong card leads to a loss. However, in the proposed

karuta, they may experience more enjoyment sharing their understanding of a value when taking the wrong card.

5. Concluding Remarks

In this study, new tools were developed for learning about and applying value. Its utility mainly lies in the ingenuity of providing knowledge about value types using *karuta* with a game-like nature.

In general, acquiring academic knowledge is difficult. *Karuta* was used to ease this difficulty, and simple sentences and pop pictures were found to be effective. This multiplayer game generated substantial conversations among groups in the UK. This phenomenon promoted an understanding of value.

This new tool for directly thinking about value brings benefits to both industry and academia. For industry, by combining a game-like experience with indirect analysis tools such as VSM, VP, and VE, their functions are expanded. This leads to a richer analytical perspective with clearer recognition of the original purpose of VSM, VP, and VE, which is to improve value. For academia, the proposed tool combines a conceptual approach with a practical methodology for value studies. In doing so, it will contribute to promoting the application of understandings of value throughout society.

There are two possible future studies on this topic. The first aims to improve the game to further promote the understanding of value, and the second adjusts the design of this game to help businesspeople. The first strengthens the motivation to understand value. Card games, including *karuta*, have a completion principle: they promote motivation to win. The rules of the game can be improved using this principle. The second study addresses how to utilize the learnings from the game. This relates to the first principle of lean management and supports the understanding that various values exist. Customers of this tool will be predominantly businesspeople. They strive to reduce waste and increase profits. To contribute to their goals, this study must specifically define the role of the game in their activities.

A limitation of this study is that it was based on a simple questionnaire, and because the survey samples were small, the sample size should be increased for statistical analysis in future studies. A more elaborate experimental design will aim to verify earlier results. It is also hoped that more people will experience and understand VK and that the system will be developed to enrich their daily lives. This ought to contribute to the acquisition of new words and awareness of concepts that can be freely expressed in the real world. VK also focuses on understanding the types of value. Therefore, one limitation is how these values can be applied to actual problems. In future, the development of a methodology to address this challenge of application should be considered.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] T. Kobayashi, Y. Ishizaki, H. Tukamoto, M. Sugi, M. Nakane, K. Murata, "A Study on Utility Factors of Value Karuta-Application to College Student and Business Person Groups," in 2023 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), 0865-0869, 2023, doi: 10.1109/IEEM58616.2023.10406441.

[2] J. P. Womack, D. T. Jones, Lean thinking: Banish waste and create wealth in your corporation, Revised and updated, Free Press, 2003.

[3] T. Ōno, Toyota production system: Beyond large-scale production, Productivity Press, 2019.

[4] K. Marx, trans. B. Fowkes, Capital vol. 1: A critique of political economy, Penguin Classics, 1992.

[5] K.B. Monroe, Pricing: Making profitable decisions, McGraw-Hill, 1990.

[6] P.G. Berger, E. Ofekb, "Diversification's effect on firm value," Journal of Financial Economics, **37**(1), 39-65, 1995, doi.org/10.1016/0304-405X(94)00798-6.

[7] L.A. Eisfeldt, E. Kim, D. Papanikolaou, "Intangible value," **28056**, National Bureau of Economic Research, 2020, doi:10.3386/w28056.

[8] M. Rokeach, The nature of human values, Free Press, 1973.

[9] B. Cova, "Community and consumption: Towards a definition of the "linking value" of product or services," European Journal of Marketing, **31**(3/4), 297-316, 1997, doi.org/10.1108/03090569710162380.

[10] C. Marzilli, "Concept analysis of value," International Journal of Recent Advances in Multidisciplinary Research, **3**(11), 1919-1921, 2016, hdl.handle.net/10950/1197.

[11] E. Nesmeyanov, Y. Petrova, R. Bachieva, O. Vasichkina, "The concept of value in modern youth subcultures of K-pop and brony in the period of globalization," SHS Web of Conferences, **72**, 1-6, 2019, doi.org/10.1051/shsconf/20197203025.

[12] B.H. Schmitt, Experiential marketing: How to get customers to sense, feel, think, act, relate, Free Press, 1999.

[13] B.H. Schmitt, A. Simonson, Marketing aesthetics, Prentice Hall, 1997.

[14] M. Wada, Brand Planning and Brand building (Burando kachi kyouso) (in Japanese), Dobunkan Publisher, 2002.

[15] B. Dodds, Managing customer value: Essentials of product quality, customer service, and price decisions, University Press of America, 2003.

[16] J.E. Finch, "The impact of personal consumption values and beliefs on organic food purchase behavior," Journal of Food Products Marketing, **11**(4), 63-76, 2006, doi.org/10.1300/J038v11n04_05.

[17] L.S. Vargo, R. F. Lush, "Evolving to a new dominant logic for marketing," Journal of Marketing, **68**(1), 1-17, 2004, doi.org/10.1509/jmkg.68.1.1.24036.

[18] K. Nobeoka, "Creation of premium value in new product development to avoid commoditization," Journal of Economics and Business Administration, **194**(6), 1-14, 2006, doi: 10.24546/00056119 (in Japanese).

[19] E. Fraj, E. Martinez, "Environmental values and lifestyles as determining factors of ecological consumer behavior: An empirical analysis," Journal of Consumer Marketing, **23**(3), 133-144, 2006, doi.org/10.1108/07363760610663295.

[20] S. Ghosh, K. Lever, "A lean proposal: development of value stream mapping for L'Oreal's artwork process," Business Process Management Journal, **26**(7), 1925-1947, 2020, doi.org/10.1108/BPMJ-02-2020-0075.

[21] B. Singh, S.K. Garg, S.K. Sharma, "Value stream mapping: Literature review and implications for Indian industry," Advanced Manufacturing Technology, **53**(5-8), 799–809, 2011, doi: 10.1007/s00170-010-2860-7.

[22] A. Dadashneiad, C. Valmohammadi, "Investigating the effect of value stream mapping on operational losses: A case study," Journal of Engineering, Design and Technology, **16**(3), 478-500, 2018, doi.org/10.1108/JEDT-11-2017-0123.

[23] F. Jacobs, R.B. Chase, Operations and supply chain management, McGraw-Hill Education, 2017.

[24] I. Alsyouf, R. Al-Aomar, H. Al-Hamed, X. Qiu, "A framework for assessing the cost effectiveness of lean tools," European Journal of Industrial Engineering, **5**(2), 170-197, 2011, doi.org/10.1504/EJIE.2011.039871.

[25] E.D. Ouden, Innovation design: Creating value for people, organizations, and society, Springer, 2012.

[26] H. S. Kristensen, A. Remmen, "A framework for sustainable value propositions in product-service systems," Journal of Cleaner Production, **223**,

25-35, 2019, doi.org/10.1016/j.jclepro.2019.03.074.

[27] P.G. Patterson, R.A. Spreng, "Modelling the relationship between perceived value, satisfaction and repurchase intentions in a business-to-business, services context: An empirical examination," Service Industry Management, **8**(5), 414-434, 1997, doi.org/10.1108/09564239710189835.

[28] C. Homburg, A. Hoppe, R. Schick, "Accounting for preference dependency in target costing - a note," Quantitative Finance and Accounting, **57**, 845-858, 2021, doi.org/10.1007/s11156-021-00962-9.

[29] H. Miyakawa, N. Kuratomo, H. E. B. Salih, K. Zempo, "Auditory Uta-KARUTA: Sonificated card game towards inclusive design," in The 32nd Annual ACM Symposium on User Interface Software and Technology, 90-92, 2019, doi.org/10.1145/3332167.3357125.

[30] S. Yanagihara, H. Koga, "Differences in human and AI memory for memorization, recall, and selective forgetting," Societal Challenges in the Smart Society, 371-384, 2020.

[31] T. Saito, A four-letter idiom karuta that can be learned aloud by Takashi Saito (Saito Takashi no koe ni dashite oboeru yozizyukugo karuta) (in Japanese), Gentosha, 2021.

[32] L.M. Jiang, "A short visual history of abstraction in early modern Japanese Karuta: simplification, reinterpretation, and localization," Journal of Asian Humanities at Kyushu University, **7**, 61-83, 2022, doi.org/10.5109/4843130.

[33] L.M. Jiang, "Sacralizing the playful secular: The deity of Karuta-gambling at the Nose Kannon Hall in Sannohe, Aomori," Arts, **13**(27), 1-16, 2024, doi.org/10.3390/arts13010027.

[34] R. Kitagawa, T. Itoh, "Visualization of swiping motion of competitive Karuta using 3D bone display," in 27th International Conference Information Visualization (IV), 346-351, IEEE, 2023, doi: 10.1109/IV60283.2023.00065.

[35] T. Kamei, W. Itoi, F. Kajii, C. Kawakami, M. Hasegawa, T. Sugimoto, "Six month outcomes of an innovative weekly intergenerational day program with older adults and school‑Aged children in a Japanese urban community," Japanese Journal of Nursing Science, **8**(1), 95-107, 2011, doi.org/10.1111/j.1742-7924.2010.00164.

[36] H. Azimah, "Effect of using Karuta cards on students' ability to comprehend vocabulary (Experimental research for the seventh grade at Sabilul Mukminin Boarding School Binjai)," Jurnal Pendidikan Indonesia, **5**(5), 177-184, 2024, doi.org/10.59141/japendi.v5i5.2772.