A Value Co-Creation Model for Multi-Language Knowledge Communication

Donghui Lin, Toru Ishida, and Masayuki Otani

Abstract This paper aims at investigating the formation process of value co-creation in the real fields by using a case study of multi-language knowledge communication. We use the YMC (Youth Mediated Communication)-Viet project, an agricultural support project for Vietnamese farmers by Japanese experts through children of the farmers, where the end-to-end value co-creation is between the Japanese experts and Vietnamese farmers. On one hand, Japanese experts provide agriculture knowledge to Vietnamese farmers for solving problems in the paddy or increasing their knowledge. On the other hand, Vietnamese farmers send field data to Japanese experts for providing more accurate knowledge and collecting data for further analysis. However, we have to consider several problems due to the complexity of the real fields. First, translation between different languages should be worked out to support the knowledge transfer. Second, since there are different stakeholders in the project, the various incentives from the stakeholders should be considered. Iterative service design approach is applied to address the complexity of such real field problems, where the formation process of value co-creation can be realized by several stages: proposing individual services, modeling value co-creation for individual services, and designing the structure of different value co-creation layers for the overall service. As a result, we propose a hierarchical value co-creation model for multi-language knowledge communication, including language communication, knowledge communication, and organizational communication. Moreover, we investigate the issues and possible solutions for each layer in the model.

Keywords Service design • Value co-creation • Multi-language knowledge communication

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1   Introduction

Service-dominant logic is previously proposed with the concept of shifting from value creation to value co-creation, where service is regarded as the fundamental basis of exchange and value-in-use (or value-in-context) is important [1]. In the research area of service design and service science, value co-creation has been much discussed in recent years, which is a form of marketing strategy for realizing mutual value between firms and customers. However, there are several important issues on value co-creation when we focus on the service design in the real fields, where multiple stakeholders co-exist and unexpected happenings continuously occur [2]. First, services, service providers and service receivers are difficult to be defined at the early stages of service design. With the change of incentives of stakeholders in the real fields, roles of service providers and receivers may change constantly and new services always appear to be designed. Moreover, services and value co-creation among them might be dependent with each other.

In this paper, we attempt to investigate the above issues of value co-creation by using a case study of multi-language knowledge communication. Knowledge communication is important for transferring knowledge within an organization or among organizations. In previous research, several issues have been studied, such as problems of knowledge communication between experts and decision makers, the clarity of knowledge communication, and so on [3, 4]. In recent years, knowledge transfer becomes more and more important among people from different nations with the rapid expansion of globalization [5]. In such circumstances, information and communication technology (ICT) is expected to play an essential role. However, the major problem of supporting multi-language knowledge communication using ICT is the variety of requirements considering different types of communication fields, languages and stakeholders. Therefore, it is important to propose a general value co-creation model for designing multi-language knowledge communication.

To provide a model for value co-creation in multi-language knowledge communication, it is important to work together with the real fields. We use the YMC (Youth Mediated Communication)-Viet project, which is an agricultural support project for Vietnamese famers by Japanese experts through children of the farmers [6]. In this project, Japanese experts provide agriculture knowledge to Vietnamese farmers for solving problems in the paddy or increasing their knowledge, while Vietnamese farmers provide field data to Japanese experts for collecting data for further analysis. However, there are several problems to realize the above knowledge communication. First, translation between different languages should be worked out to support the knowledge transfer. Second, since there are different stakeholders, various incentives from the stakeholders should be considered to provide effective knowledge transfer. Therefore, we try to investigate the issues of service design in the real fields and show the process of formation of value co-creation.

Due to the complexity of such real field problems, iterative service design approach are always applied. Based on the iterative service design approach, the formation process of value co-creation can be realized by several stages from proposing individual services to designing the structure of different value co-creation layers for the overall service. We propose a hierarchical value co-creation model for multi-language knowledge communication, including layers of language communication, knowledge communication, and organizational communication. Language communication deals with the value co-creation for realization and improvement of high-quality language translation. Knowledge communication aims at realizing and improving agricultural knowledge transfer. The purpose of value co-creation in organizational communication is to realize sustainable services by the maintenance of various incentives of different organizations.

The rest of this paper is organized as follows. Section 2 introduces multi-language knowledge communication by using the example of YMC-Viet project. The value co-creation issues are discussed in Sect. 3. Section 4 describes the design of value co-creation model for multi-language knowledge communication. Section 5 is the conclusion of this research.

2 The Field: YMC-Viet Project

We focus on service design in the real fields and use a case study of multi-language knowledge communication which aims at providing agriculture support in rural areas in Vietnam by Japanese experts. The YMC-Viet project was conducted in cooperation with Ministry of Agriculture and Rural Development of Vietnam (MARD) as part of a model project to support developing countries with ICT. Since the literacy rate of farmers is low, youths (children) with high literacy acted as mediators between Japanese experts and Vietnamese farmers, which is called Youth-Mediated Communication (YMC) [6].

Several organizations in Japan and Vietnam are involved in this project including NPO Pangaea, Kyoto University, University of Tokyo, Mie University, Vietnam MARD, DARD of Vinh Long Province, Vietnam National University (VNU), Ho Chi Minh City and so on. Different organizations collaborate with each other while focusing on their own specific roles such as multi-language communication service design, agriculture knowledge support, administrative support, server maintenance, and so on.

To support the communication protocol in this project, a multi-language tool called YMC system is implemented, where Vietnamese youths can ask questions while Japanese experts can answer questions. This project has been conducted for four seasons (from the year 2011 to 2014) in Tra On District and Binh Minh District of Vinh Long Province, Vietnam with 15–30 participants each time. Figure 1 shows the activities of Vietnamese youths in this project. More detailed information about this project can be found in our previous work [7–9]. In this paper, we deal with the

Fig. 1 Participation of Vietnamese youths in the YMC-Viet project: measuring the size and color of rice leaf (*left*), using the YMC system for asking questions to Japanese experts (*right*)

issue of designing value co-creation for multi-language knowledge communication service based on our experiences in the YMC-Viet project.

3 Value Co-Creation of Service Design in the Real Fields

Vargo et al. propose the service-dominant logic with several foundational premises, which regard service as the fundamental basis of exchange and move from value-in-exchange to value-in-use or value-in-context [1, 10, 11]. In other words, traditional value creation process in marketing will not only be conducted by firms but also continued by customers through use, which is known as the value co-creation process [1]. The purpose of value has also changed from increasing wealth for the firm to increasing adaptability, survivability, and system wellbeing through service of others [10].

Ueda et al. propose the classification of value creation and summarize into three types of value creation models based on the relations among service providers, service receivers, services, and the environments: providing value model (Class I Value), adaptive value model (Class II Value), and co-creation value model (Class III Value), where the co-creation value model is regarded as a promising concept to integrate values of industries and those of consumers, and is described to be necessary when the objective of service receiver is uncertain and therefore the service provider and receiver cannot be separable [12, 13].

Since the field is a complex area with continuous unexpected happenings where multiple stakeholders co-exist with different motivations [2], there are several issues of designing value co-creation model. First, it is always difficult to define services, identify service providers and service receivers in the early stages of service design. Second, different types of services might be required to solve the real problem in the fields which are dependent with each other. In such cases, the same stakeholder might be involved in multiple services, either as a service
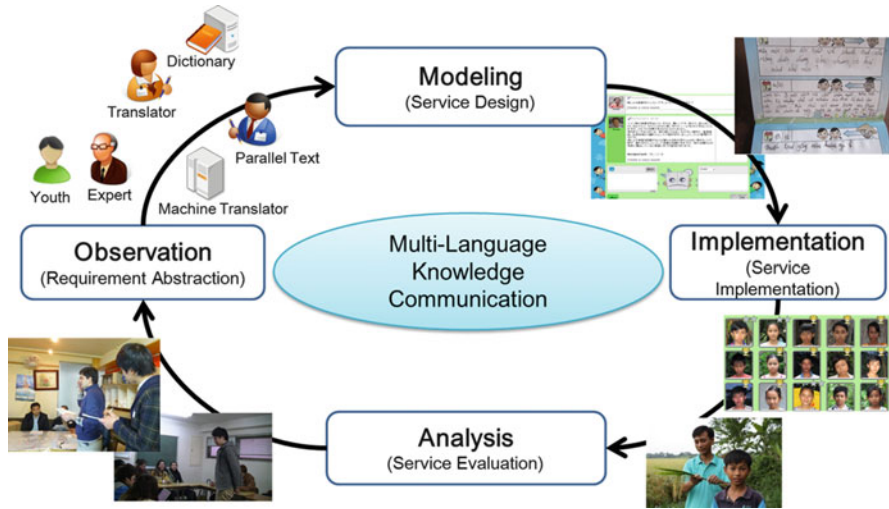
Fig. 2 Iterative service design process for multi-language knowledge communication

provider or a service receiver. Moreover, sustainable services should be designed to deal with the dynamic changes in the field.

Therefore, it is difficult to create a value co-creation model at the very early stages of the field activities. The formation of a value co-creation model is an iterative process. During such a process, definition of services, service providers and service receivers become more and more clear, and changes become predictable in a certain degree. Figure 2 shows a design process for the multi-language knowledge communication in the YMC-Viet project [8, 9].

In other words, value co-creation model is gradually converged during the iterative process in the real fields with multiple stakeholders and complex service requirements, which may include the following stages.

(1) Stage 1: values are proposed by the involved stakeholders. In this stage, individual services are proposed which are linked with potential service providers and service receivers.
(2) Stage 2: values are clearly described including the definition of different services, definition of service providers and service receivers for each service, mutual effects of service providers and service receivers, and the measurement criteria.
(3) Stage 3: the structure of the value co-creation for the overall service is formed. In this stage, the relationships of different services are established. The service for the filed can be designed and realized based on the formed structure of the value co-creation in this stage.

4 Case Study

In the YMC-Viet project, we need to consider the end-to-end value co-creation in the multi-language knowledge communication. However, as has been described in the previous section, it is difficult to design a value co-creation model for the real fields at the early stages. The formation of value co-creation is a gradual process based on the iterative service design.

In the initial stage, several individual services were proposed based on field investigation by different stakeholders including translation service (by the translation process designer), and knowledge service (by the Japanese agriculture experts). Then, the value co-creation model for each individual service is gradually created in the next stage based on iterative service design. It was not until the third season of the experiment could we define the whole value co-creation model for the multi-language knowledge communication, which includes three layers as shown in Fig. 3: language communication, knowledge communication and organizational communication.

In the proposed hierarchical value co-creation model, language communication exists as a channel for knowledge communication, which provides the availability of knowledge in both languages. Knowledge communication deals with the end-to-end value co-creation between Japanese experts and Vietnamese farmers/youths. Organizational communication is indispensable for maintaining the sustainability of the multi-language knowledge communication.

Table 1 shows the proposed three layers in multi-language knowledge communication for the YMC-Viet project. Since we focus on describing the value co-creation of the multi-language knowledge communication, we do not introduce the evaluation results for each layer in details in this paper.
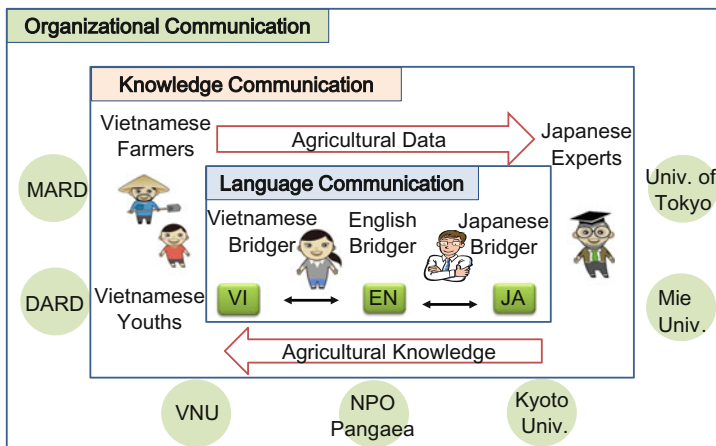

Fig. 3 Hierarchical value co-creation model for multi-language knowledge communication with three layers

Table 1 Description of three layers in multi-language knowledge communication

Value co-creation layer	Creator of value	Purpose of value	Measurement of value
Language communication	Translation process designer, English Bridger, Japanese Bridger, Vietnamese Bridger	Realization and improvement of high-quality language translation between text senders and text receivers	Language translation quality (accuracy), cost
Knowledge communication	Japanese agriculture experts, Vietnamese youths/farmers	Realization and improvement of agricultural knowledge transfer between knowledge senders and knowledge receivers	Effectiveness of knowledge transfer (short term), influence to rice productivity (long term)
Organizational communication	Involved organizations (agriculture, ICT, education, local community, etc.)	Realization of sustainable services for agriculture support in rural areas by the maintenance of various incentives of different organizations	Adaptability, sustainability of the overall service system

4.1 Language Communication

The layer of language communication aims at realizing and improving high-quality language translation between text senders and text receivers. We design the language communication by modeling it as a QoS-aware service composition and optimization problem, which is an important issue in the research area of service-oriented computing [14]. Criteria for measuring the value of language communication like translation quality and cost are defined as QoS attributes.

To realize the language communication, we have been working on technologies and methodologies to support intercultural collaboration through service-based infrastructures since 2006. We have developed the Language Grid,[1] which is a service-oriented language infrastructure that allows users to deploy and combine various language resources as language services [15, 16]. The Language Grid has been operated by Department of Social Informatics of Kyoto University since December 2007; it provides necessary language resources for the language communication in the YMC-Viet project, including machine translators among English, Japanese and Vietnamese, agriculture dictionaries, morphological analyzers, and parallel texts for agriculture.

Although the Language Grid provides many language services, it is difficult to ensure the quality of Japanese-Vietnamese translation by combining language

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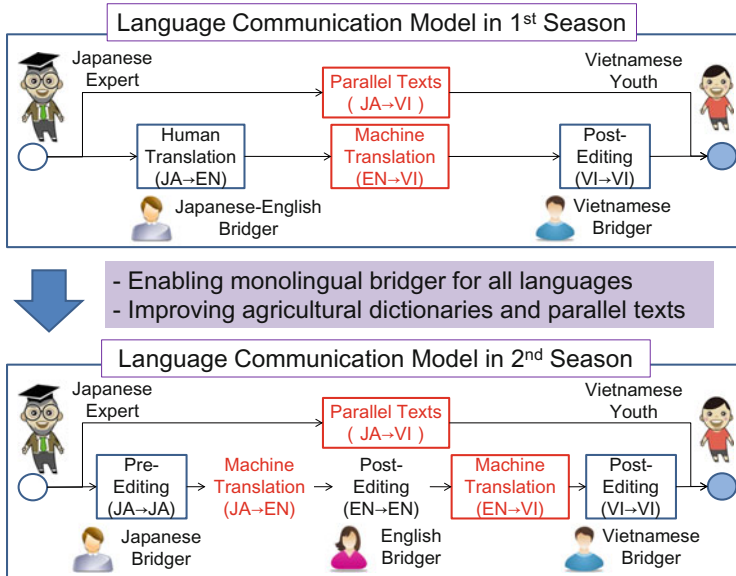[1] The Language Grid: http://langrid.org

Fig. 4 Service refinement of language communication

services (e.g., machine translators, dictionaries, and parallel texts) for supporting communication between Japanese experts and Vietnamese youths. Therefore, it is necessary to consider combining human activities and language services for language communication. Human activities include pre-editing, post-editing, and human translation, which are named as Bridger in the YMC-Viet Project. Since the quality of machine translators and human activities is difficult to estimate, we use a user-centered service design approach for testing the language communication models, considering the balance of translation quality and translation cost.

During the design process, the language communication model can be improved gradually based on evaluation and refinement of service composition. Therefore, value co-creation of language communication is realized by Bridger of different languages. Figure 4 shows the improvement of the language communication model during the experiments. The refinement process of service composition and evaluation result of the language communication improvement for different seasons of experiments are reported in our previous work [8, 9].

4.2 Knowledge Communication

Language communication is a channel for knowledge transfer, and therefore it is supposed to be transparent to knowledge communication. The layer of knowledge communication aims at realizing and improving agricultural knowledge transfer between the service sender (Japanese experts) and the service receiver (Vietnamese

Fig. 5 Participatory service simulation for knowledge communication with human participants

Table 2 Examples of two types of knowledge

Types	Examples
Textbook knowledge	Question from the youths:
	Are there any diseases caused by bacteria?
	Answer from the experts:
	Bacteria are fungi. Various types of bacteria cause a disease on rice plants. Rice blast and rice blight are such diseases.
Situation-dependent knowledge	Question from the youths:
	A rice root doesn't come out. Is it because the water depth of paddy field is too deep?
	Answer from the experts:
	Doesn't root come out from planted seed? Deep flooding could be its cause. If possible, please send me its picture. There may be some different problems.

youths/farmers). We try to design effective protocols for the knowledge communication, which are simulated and evaluated using a participatory design approach with human participation before conducting the experiments in the real fields as shown in Fig. 5.

In the YMC-Viet project, there are two types of knowledge that is transferred between Japanese experts and Vietnamese youths. One type is *textbook knowledge,* which deals with some general common knowledge for agriculture. The other type is *situation-dependent knowledge*, which deals with the real problems occurred in the rice paddy and might affect behaviors of rice cultivation. Table 2 shows examples of the two types of knowledge.

We collect all the log data of knowledge communication between Vietnamese youths and Japanese experts in the YMC systems for experiments from the year 2011 to 2014 in Vinh Long Province, conduct interviews with Vietnamese youths,
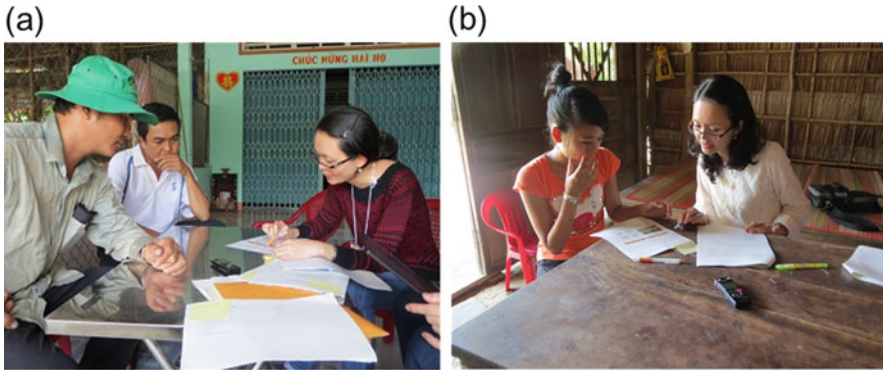
Fig. 6 Interview for knowledge communication in Vietnam: (**a**) Interview with farmers, (**b**) Interview with youths

farmers, and Japanese experts (see Fig. 6) to analyze the knowledge communication. From the analysis of season 2012, we found that 74 % of the knowledge communication deals with textbook knowledge while 26 % of that deals with situation-dependent knowledge.

For different types of knowledge, we use different approaches for measuring the value of knowledge communication. For textbook knowledge, it is necessary to evaluate the effectiveness of knowledge transfer between Japanese experts and Vietnamese youths/farmers in the short term by tests or interviews. On the other hand, we need to evaluate how the situation-dependent knowledge communication affects the rice productivity by conducting agricultural investigations in the long term.

4.3   Organizational Communication

The role of organizations is important for realizing language communication and knowledge communication. Due to the complexity of the real fields, it is always difficult to design the overall service system since there are various types of stakeholders. Therefore, service design in the real fields should focus on how to provide a sustainable mechanism for designing services rather than how to design perfect services.

More than seven organizations are involved in the YMC-Viet project as we described in Sect. 2 for different purposes. Different organizations have their own different incentives in the project. For example, different organizations from Japan are involved in this project in different ways: NPO Pangaea organizes and manages

the whole project for youth education; University of Tokyo and Mie University participates for agricultural knowledge support and field data analysis; Kyoto University focuses on designing and providing the multi-language communication services. Therefore, it is necessary to consider how to match different incentives of different organization to improve and optimize the communication design. We try to observe and analyze the formation of the community in the YMC-Viet Project, and deal with the mechanism design of incentive matching of organizations for maintaining the sustainability of the service design of multi-language knowledge communication.

4.4 Discussion

The proposed value co-creation model in this paper is not only useful in the YMC-Viet project; it deals with the general research issues in multi-language knowledge communication of similar situations in the real fields. However, there are several topics that we should consider in our future work.

First, although we designed three layers of value co-creation and defined the purpose of value, value creators and measurement of value separately, the layers of language communication, knowledge communication, and organizational communication are not totally independent. For example, language communication is supposed to be only focused on the value co-creation of text messages but it changes the content of knowledge in an unexpected way when translation is conducted from one language to the other language, which is invisible for the knowledge communication layer. Such interdependencies between value co-creation layers are expected to be considered in our future study.

Second, the value co-creation model proposed for multi-language knowledge communication in this paper can be regarded as a hierarchical model. However, other types of value co-creation network may be possible if the complexity of the fields differs. Therefore, it is necessary to conduct a series of systematic case studies to discover various patterns of the value co-creation in the real fields.

Moreover, although we reported the experiences of designing a value co-creation model for multi-language knowledge communication in the YMC-Viet project, we need to abstract the process to propose a methodology for forming value co-creation models of filed-oriented service design in the future.

5 Conclusion

This paper deals with how to design value co-creation model for services in the real fields. We use a case study of multi-language knowledge communication in the YMC-Viet project which aims at providing agriculture support in rural areas of Vietnam. We aimed to propose a value co-creation model for multi-language

knowledge communication where three issues are to be solved: how to overcome the language barriers between different nations, how to ensure the effectiveness of knowledge transfer, and how to map various incentives of different stakeholders. The formation process of value co-creation can be realized by several stages based on the iterative service design approach: proposing individual services, modeling value co-creation for individual services, and designing the structure of different value co-creation layers for the overall service.

As a result, we proposed a hierarchical value co-creation model for multi-language knowledge communication to address the above issues, which includes three layers: language communication, knowledge communication and organizational communication. Language communication deals with the value co-creation for realization and improvement of high-quality language translation. Knowledge communication aims at realizing and improving agricultural knowledge transfer between knowledge senders and knowledge receivers. The purpose of value co-creation in organizational communication is to realize sustainable services for agriculture support in rural areas by the maintenance of various incentives of different organizations. Based on the proposed model, we conducted four seasons of experiment of the YMC-Viet project in Vinh Long province, Vietnam from the year 2011 to 2014.

Currently, we are mainly focusing on the layers of language communication and knowledge communication. In the future, we will also study how to design the mechanisms for incentive coordination among different organization to cover the whole model. It is also important to analyze how the three layers affect each other in the process of end-to-end value co-creation. Since the above problems do not only exist in the YMC-Viet project, we will deal with how to provide a general methodology for designing value co-creation model for similar situations in the real fields.

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