Service value co-creation model considering experience based on service field concept

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***Abstract*— Service value, which is related to users' satisfaction about provided services, depends on the situation, user characteristics, and user objectives in seeking the service. This is a "value in use" concept, and it emphasizes the importance of the relationship between the service itself and its situation. We developed the service field concept in order to create service value; the concept is based on an analogy to the electro-magnetic field in physics. By applying this concept to B-to-B collaborations, a model of service value co-creation in the collaboration is formulated. The collaboration can be described in four steps of the KIKI model (Knowledge sharing related to service system, Identification of service field, Knowledge creation for new service idea, Implementation of service idea). In this paper, we describe KIKI model and the effect of the collaborator's experience in the model. We demonstrated the validity of the collaboration model by applying it to a B-to-B collaboration in the energy saving services business. This model can be applied to various B-to-B collaborations in order to make service value co-creation more effective.**

Keywords—service field; experience; service dominant logic; energy saving service;

I. INTRODUCTION

In general, the value of a provided service depends on the situation (human characteristics, place, time, cost, etc.). Even if identical services are provided, the service values may differ because of the human characteristics involved and the particular situation. The "value-in-use" concept in SDL (service dominant logic) field [1], for example, depends on the situation. Moreover, our concept of the service field in service systems to create service value depends on the situation [2]. This concept is analogous to the mechanics of electromagnetic fields, where the force on a moving charged particle is determined by the relation between electric charge and the field. By using the concept of the service field, a new framework for the service innovation process was proposed [3][4]. We consider that the service innovation process involves continuous service-value co-creation and exploit the concept of service fields within this framework to enable services to be designed as more effective behaviors. The framework for the value co-creation process in service innovation is built by repeating steps that identify the service field to clarify the necessary services (information and/or support actions). This process involves service providers and receivers collaborating together to create knowledge, services, and technologies to achieve the objectives of service innovation. Moreover, when "value in use" is considered in each step of this process, the users' experience becomes a very important factor in the service value.

In this paper, we apply the above considerations to B-to-B collaborations and propose the KIKI model. KIKI stands for *Knowledge sharing related to the service system, Identification of the service field, Knowledge creation for the new service idea, and Implementation of the service idea*, and the model considers the users' experience for the purpose of creating "value in use". We demonstrate the effectiveness of this new framework through a case analysis of an energy saving service business.

II. SERVICE FIELD AND SERVICE VALUE CO-CREATION

A. Definition of the Service Field

The value of services provided to customers generally depends on the efficiency of services to achieve customer objectives. Even though services are identical, their values differ in terms of how customers value the services, due to different customer characteristics in different situations (place, time, or cost). That is to say, service values depend on the contexts of the situation where a service is provided. We use the concept of the service field in co-creation systems and exploit situation-dependent characteristics of service values. We consider that a service value depends on the relationship between the service itself and its service field where the service is provided.

This service field concept is based on an analogy to the electromagnetic field where electro-magnetic power is determined by the relationship between the electric charge and the electro-magnetic field. Electro-magnetic power F in electro-magnetic field theory is given by

$$\boldsymbol{F} = \boldsymbol{q} \cdot (\boldsymbol{E} + \boldsymbol{v} \times \boldsymbol{B}) \qquad (1)$$

$\boldsymbol{F}$: electromagnetic force, $\boldsymbol{q}$: charge

E: electronic field ***B***: magnetic field ***v***: velocity.

Regardless of the charge ***q***, no force will act on it without an electromagnetic field being present around it. Similarly, even a good service will have no service value, if there are no service fields related to it. In other words, service value is created from the relationship between the service itself and its service field. This is expressed as

(service value) = (service) x (service field) (2)

where x means the relationship between the service itself and its service field. This indicates that service value depends on the service itself and its service field. This concept is outlined in Figure 1, where a high service value A is generated when a service is provided on the basis of high potential values in the service field. A high potential means the requirements for the service are high. Without this, the provided service cannot obtain a high service value.

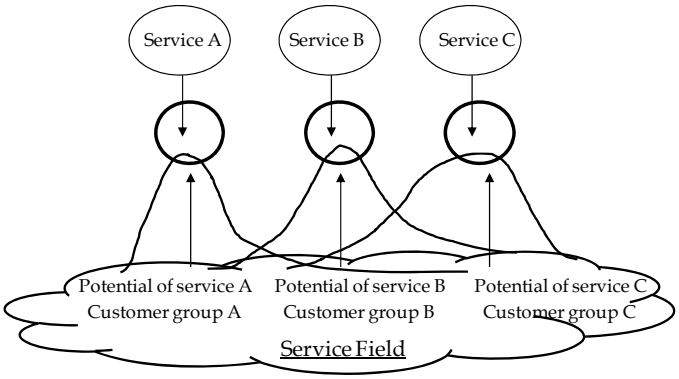

Fig. 1 Concept of Service Field

B. Service Value Creation Process based on Service Field

It is important to identify the service field in order to understand the customer characteristics and/or requirements to maximize service values and provide suitable services that correspond to each situation. Figure 2 shows the basic idea of identifying a service field in order to create a high service value. Once the service field is identified, it is easy to determine what kinds of service would be preferred by the target customer. The service field is determined by the relationship between customers and target services, and it expresses the intensity of the service requirements.

The service field should be identified in order to clarify what services are required by customers in various environments and situations. The idea to create and improve service values based on service fields can be applied to various services where service providers and receivers co-create service values. Our research demonstrates that the service system and the concept of service fields can be used to model the service innovation process.

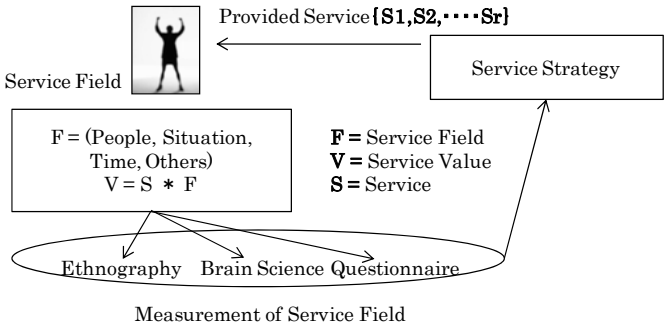

Fig. 2 Identification of Service Fields

C. Service Value Co-Creation Process based on Service Field in B-to-B Collaboration

Service value depends on the relationship between the service and its situation, and a more suitable service can be provided if the service field is identified. From such considerations, We devised the following four steps for service value co-creation in B-to-B collaborations.

Step 1 (K1). Knowledge sharing in collaboration: The collaborators in the service value co-creation process understand and share the objectives of the B-to-B collaboration and its service field, as shown in Fig. 1, which consists of service providers, customers, and the environment around the service. Therefore, the collaborators share knowledge and information related to their purpose.

Step 2 (I1). Identification of the service field: The service field is identified using various technologies such as data mining and questionnaire analysis or collaborations between providers and recipients of the service. What kind of service support is needed for the recipients is investigated and what services or products are needed to be together is clarified.

Step 3 (K2). Knowledge creation for the new service idea: The knowledge creation for the identified service of the service field in Step 2 is done and suitable service behaviors are designed after understanding the service field. Through participants collaborating in the service value co-creation process, new knowledge for service is created by combining various service ideas and technologies.

Step 4 (I4). Implementation of the new service idea: The created new service idea in Step 3 is implemented by considering business model, pricing of services or required information systems. Collaborators in service value co-creation process evaluate the results of knowledge creation step for the required service and take them into account in the following process for enhancing services.

The service that results from this service value creation process can be further enhanced by repeating these four steps of service value co-creation in a spiral of development. As the value co-creation process is repeated, collaborators come to understand the service field much more fully. The result is that

the participants eventually understand the service field more deeply and generate more suitable service ideas.

III. CHARACTERISTICS OF THE KIKI MODEL

A. KIKI Model

The above four steps in the service value co-creation process can be described on a two-dimensional plane, as shown in Figure 3.

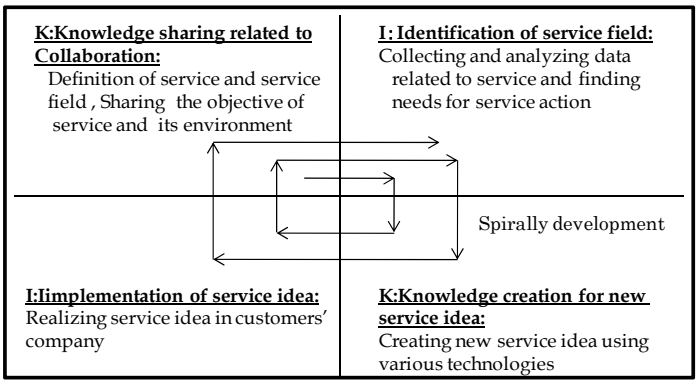

Fig. 3 KIKI model

We call this two-dimensional plane model for service value co-creation the KIKI model. It is a process consisting of Knowledge sharing related to the service system, Identification of the service field, Knowledge creation for the new service idea, and Implementation of the service idea. The KIKI model has a structure similar to that of the well-known SECI model [5] of the knowledge creation process. The knowledge creation process in the SECI model has four modes, i.e., socialization (S), externalization (E), combination (C), and internalization (I). The SECI model is a typical model of the knowledge creation process, and service value creation activity is similar to knowledge creation activity. Hence, the characteristics of the SECI model, such as its spiral of knowledge creation, are shared by the KIKI model.

B. Merits of the KIKI Model in B-to-B Collaborations

There are four important viewpoints in B-to-B collaborations: the customers' viewpoint, service providers' viewpoint, their business viewpoint, and the technology and service viewpoint.

As shown in Figure 4, these four viewpoints can be considered simultaneously in the KIKI model. This is a very important aspect because collaborators share their issues, services, technologies, and business, and discuss them within the same framework. To the best of our knowledge, there is no other framework for simultaneously discussing common objectives or common values from various viewpoints with customers and service providers. Only the KIKI model provides such a framework for discussing service co-creation for achieving common objectives.

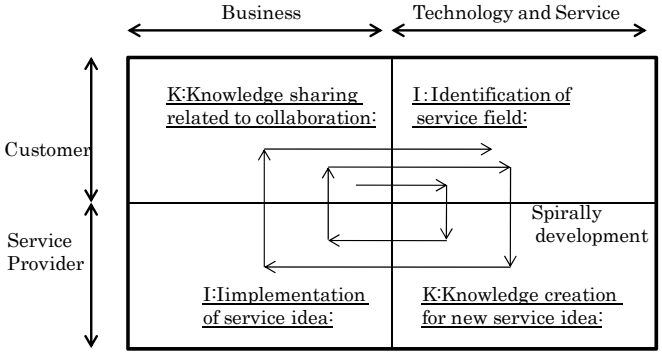

Fig. 4 Four viewpoints in the KIKI model

C. Technologies related to KIKI Model

Various technologies are required for executing steps K1, I1, K2, and I2 of the KIKI model. The systematization of technologies for the KIKI model is a future issue, but the candidates for technologies in the KIKI model are as follows:

Knowledge sharing related to collaboration: Methodologies for describing the service system, service environment, methodologies and tools for analyzing users' requirements.

Identification of the service field: Data mining technology, ethnography, questionnaire analysis, word-of-mouth data analysis, measurement of human characteristics such as brain activity measurements and eye tracking, persona marketing by clustering customers' characteristics and so on.

Knowledge creation for the new service idea: Knowledge creation methodology such as the KJ method, knowledge of new technologies related to the service, IT technologies, successful examples using new technologies, and so on.

Implementation of the new service idea: Methodologies for business creation such as the business model, pricing, risk management, IT system, and so on.

D. Spiral Improvement based on Experience in Collaboration

Having experience in collaborations is very important for the spiral improvements of this service value co-creation process, because customers' expectations and service values change based on their experiences. This means that the situation of the service field depends on their experiences. Figure 5 illustrates this idea.

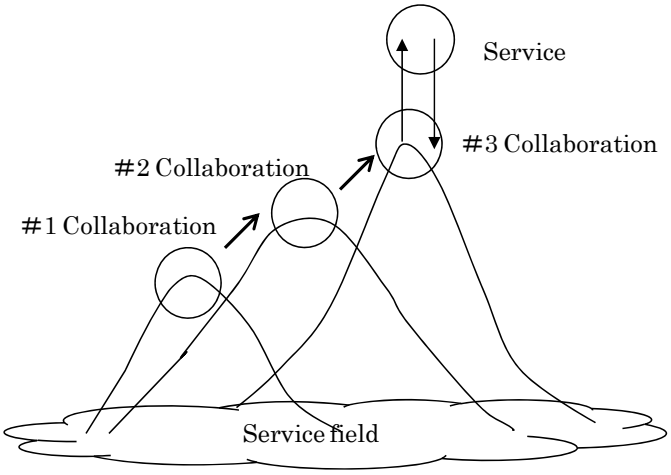

Fig. 5 The service field evolves on the basis of experience

The KIKI model for service value co-creation should consider the effect of experience. In Figure 3, service value co-creation process develops spirally and the service field changes as a result of considering customers' experiences in each step. This consideration is indispensable for good service co-creation and sustainable business. The KIKI model should be spirally developed according to the collaboration experience.

The combination of service value co-creation based on SDL (Service dominant logic) and a changing "value in use" due to experience leads to the new concept of "ESVC: Experience based Service Value Co-creation" (see Figure 6).

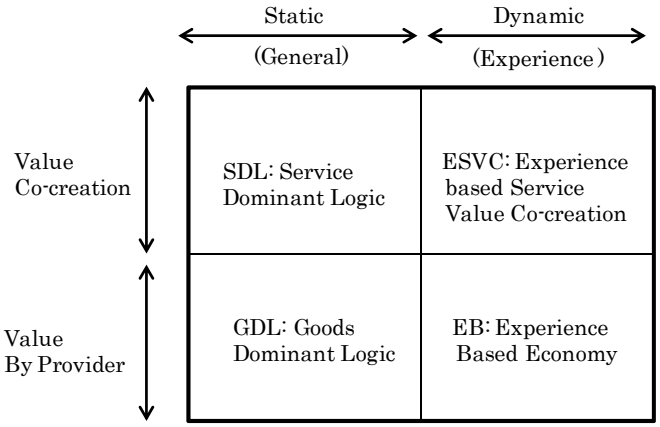

Fig. 6 Experience based Service Value Co-creation

Figure 6 shows the relationship among SDL, GDL, EB (Experience based Business) [6], and ESVC. The vertical axis shows value co-creation and value added by the provider, and the horizontal axis represents static value creation and dynamic value creation based on experience. The KIKI model, which considers experiences in collaboration, should thus be categorized as a kind of ESVC.

IV. Case Study- Energy Saving Service using Inverter

A. *Principle of Energy Saving Business using Inverters*

HDRIVE [7][8] is a successful service business model of servitization in the manufacturing industry. We used it for evaluating the effectiveness of the KIKI model. There are various heavy industries, e.g., the steel industry and oil industry, that use many motors, and energy consumption is an important issue affecting their costs and CO2 emissions. The energy consumed by motors can be reduced by using inverters, as shown in Figure 7.

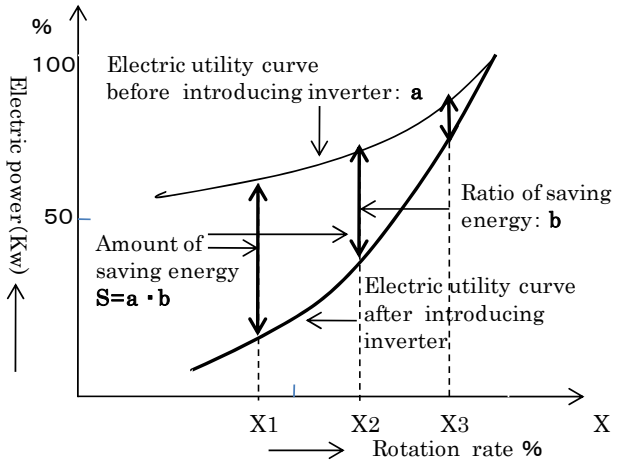

Fig. 7 Energy saving using inverter

The amount of saved energy **S** in the figure is calculated by referring to the electric utility curve of motor **a** and the ratio of saved energy **b**, which depends on the operation ratio, X_1, X_2, and X_3. Saving energy makes a profit and the profit can be shared by the customers, service providers, and financial companies who make the initial investments on the inverters, as shown in Figure 8.

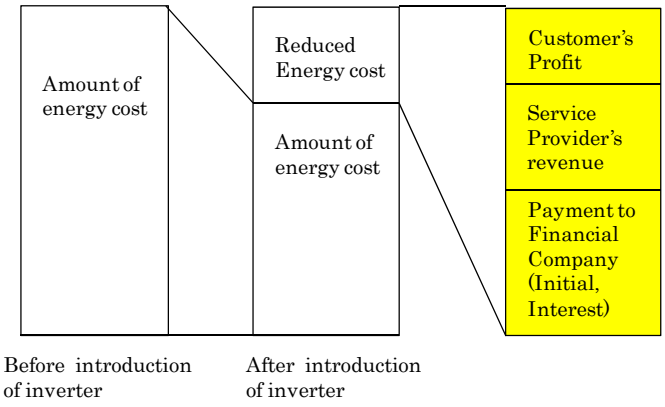

Fig. 8 Profit sharing model in HDRIVE

By using this business model, customers need no initial investment to buy inverters because it is borne by the financial company, and payments back to the financial company are based on profits from the reduced energy costs.

In this service business, service providers set up inverters and monitoring systems for collecting operation data and calculating the profit due to energy savings, as shown in Figure 9.

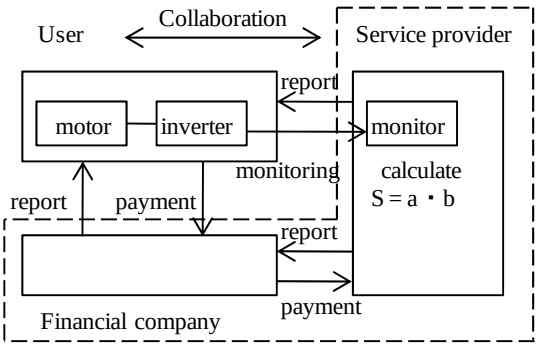

Fig. 9 Energy saving service system

B. KIKI Model for Energy Saving Service System

Why is service value co-creation needed in this energy saving service? The answer is that the evaluation of the effectiveness of provided services needs the service provider's knowledge (technology, business model, risk sharing model, simulation tools, and so on) and customers' knowledge (actual operational data, energy costs, risk, profitability, and so on). In particular, customers' actual operational data is usually confidential. Therefore, in order to evaluate the service value (profit and risk) provided by the service, customers and service providers must collaborate. The KIKI model for this energy saving service is as follows (see Figure 10).

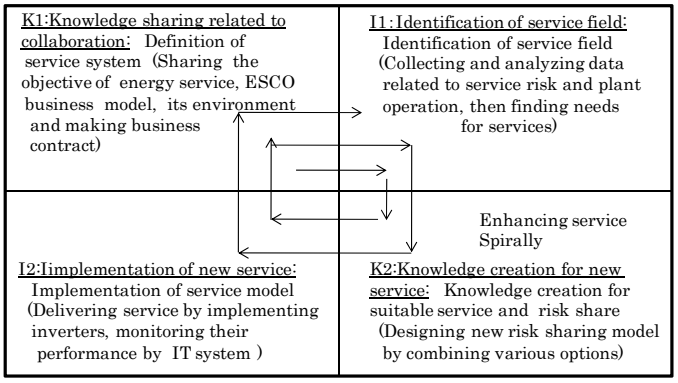

Fig. 10 KIKI model for energy saving service

K1 (Knowledge sharing related to the service system) : Customers and service providers recognize the objectives of the collaboration and the business environment. They share knowledge, including data or information related to the service field, in this case, the motors' operation ratio in the customers' business situation and so on.

I1 (Identification of the service field) : The service field is identified by evaluating the service value: $\boldsymbol{S=a \cdot b}$. The effectiveness of the service and its risk are evaluated in the customers' business situation. For example, the service values **S** of X_1, X_2, and X_3 in Fig. 7 are shown in Figure 11. The energy saving service has high potential for the case of X1.

K2 (Knowledge creation for the new service) : Knowledge for making the new service (the suitable service system and risk sharing model) is created by combining various technologies and know-how.

I2 (Implementation of the new service) : The service model (Delivering a service by installing inverters and monitoring their performance with an IT system) is implemented; in the case study, the energy saving service system shown in Figure 9 was set up and started.

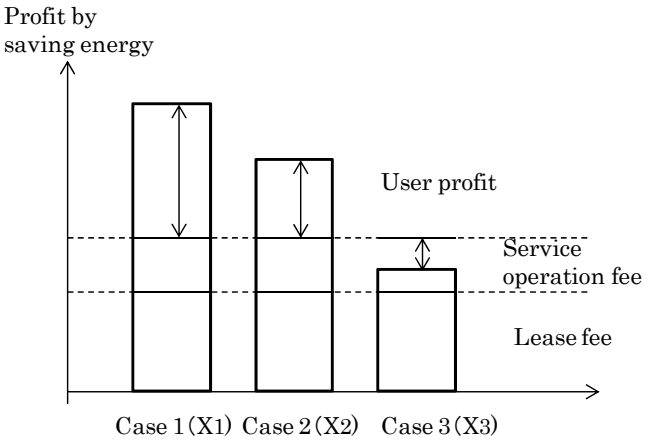

Fig. 11 Service value for X_1, X_2, and X_3

C. Spiral Improvement based on Experience

This energy saving service business was successfully developed and over 100 services have been implemented. It was based on collaboration between customers and service providers. Our case study found that the relationship between customers and service providers is close, and the understanding of the service field associated with various data including actual operation data and business model has become better. These facts show that the ability to make a spiral of improvements based on experience depends on the following factors:

(1) Human relationships: All participants in the project had informal get-togethers during the contract. They organized a beer-performance funfest where they engaged in small talk. Persons in charge of the project knew and contracted entertainers to play at the funfest, and one of the customers had a hobby making beer. The participants drank beer while they enjoyed the performances of the entertainers. All participants had fun during the funfest. People brought up various topics during these conversations in the enjoyable atmosphere of the funfest. People became familiar with each other or grew to know each other and strengthen their relationship. They shared ideas and solved problems together as partners after the funfest. In expanding the service field from private to public, participants in the project cooperated better than before, and that helped smooth the co-creation

process and speed up the knowledge creation to achieve their objectives.

(2) Successful experience: Thanks to the successful energy savings, repeat orders were received. Participants in the project maintained a long term relationship, and they remained friends after the project. The customer informed service providers of their needs and were happy to listen to the service providers detailed explanations. This case study demonstrates that trusting relationships grew up on the basis of successful, enjoyable experiences.

(3) Actual operation data: In the initial phase, customers provided their actual operational data to service providers. After inverters or monitoring systems were set up, the service providers obtained real-time operational data from the monitoring system. In this way, the service provider gained a more precise understanding of the situation of the target system.

From the above factors, the service field became to be better understood over time and customer satisfaction and the relationship of trust spirally improved.

V. CONCLUSION

The KIKI model is a service value co-creation model considering experience and based on the concept of the service field. The effectiveness of the KIKI model was demonstrated in a case study on an energy saving service system.

Various organizations cooperate to actively create values such as those through open innovation, sustainability, and collaboration between universities and businesses in the 21st century. Therefore, the new proposal presented in this paper, which is of the possibility of spiraling growth of service value co-creation, will be a significant point of a reference, especially in collaborations between organizations. In addition, the service-field concept we propose has been demonstrated to be effective for co-creating service value. It is a growth system for value co-creation. This co-creation system where service value is continually created is a new approach in the era of service science and is a 3rd generation systems theory.

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