

VALUE CO -CREATION MODEL OF SERVICE INNOVATION: SYMBIOTIC HYPERGAME ANALYSIS

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ABSTRACT

From service science perspective, value co-creation based on mutual understanding between customer and provider is one of fundamental importance. *Service-dominant (S-D) logic* is tied to the value-in-use meaning of value. The roles of providers and consumers are not distinct, meaning that value is co-created, jointly and reciprocally, also mutually beneficial relationship. However, at crucial points of interaction between customer and provider, where the co-creation experience occurs and where value is co-created, misunderstandings and service breakdowns can destroy the relationship. In this paper, we analyze formally how customer and provider are sharing internal model in the first phase of value co-creation model of service innovation, i.e., co-experience and co-definition. In co-experience, customer and provider perceived the value of each value proposition differently. Customer have an own internal model and so provider is, therefore co-experience is the most crucial feature of service system. Symbiotic hypergame analysis, in general explicitly assumes that the players involved possess subjective internal model of the environment including the counterparts. These assumptions convince us that it is the most adequate and convenient for describing value co-creation process by customer and provider. First, we categorizing customer and provider into the several types based on customer expectation and provider ability. Then, analyze formally using symbiotic hypergame analysis, how mutual understanding can be achieved between customer and provider. From the analysis, mutual understanding can be achieved as long as customer and provider have same interpretation, customer who has high expectation believes that provider is innovative and vice versa. It has been proven by analyzing Hyper Nash equilibrium in each scenario for pair of each type based on symbiotic hypergame analysis.

Keywords: *Co-experience, Co- definition, Value Co-creation, Symbiotic Hypergame*

INTRODUCTION

Services represent the main economic activities and an increasing percentage of the GDPs of developed countries around the world. However, what kinds of innovative services customers can accept and how to deliver services to customer are complicated.

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Therefore, understanding customer expectation and how provider can fulfill the variables needs for customer satisfaction are becoming important issues in service science (Yen Hao Hsieh).

We define customer expectation is the needs, wants, and preconceived ideas of a customer about service (Bnet Business Dictionary, 2010). It will be influenced by a customers' perception of service and can be created by previous experience, advertising, hearsay, awareness of competitors, and brand image. To be successful today, provider must go beyond just meeting customer expectations and work to exceed expectations (Vicki T, 2005). If provider just meets those expectations, there's nothing memorable in which to build a partnership. But if it exceeds the customer's expectations, the service becomes positively memorable and the customer is likely to continue with provider.

Kijima's model "I like it very much", defines co-creation model of service innovation which consists of two phases, i.e., the first phase is co-experience and co-definition, and the second phase is co-elevation and co-development. We focus on the first phase of co-creation model, i.e., co-experience. Customer and provider perceived the value of each value proposition differently. Customer have own internal model and so provider is, therefore co-experience is the most crucial feature of service system. If there are no misperceptions between them, then the next step will be easily to be designed.

In this paper, we analyze formally how customer and provider are sharing internal model in the first phase of value co-creation model of service innovation, i.e., co-experience and co-definition (Kijima, 2009). First, we review service system theory and their associated meanings to value co-creation also hypergame analysis which describing value co-creation process by customer and provider who has own internal model. Second, we describe the process of value co creation through value co-creation model of service innovation (Kijima, 2009). Third, we describe how customer and provider share their internal model in the first phase of value co-creation model of service innovation by using symbiotic hypergame analysis. Finally, we analyze value co creation model of service innovation to research opportunities in understanding the process how mutual understanding can be achieved in rigid way.

THEORY ON SERVICE SYSTEM

Service is defined as value co-creation interaction among entities, then the result in value being created (or destroyed) for one, both and sometimes all entities. Many activities can count as service, including automobile repair, hair styling, information technology outsourcing, and business consulting. From S-D Logic, service is the application of competence for the benefit of another. So service involves at least two entities, one applying competence and another receiving the benefit (*value co-creation*). We call these interacting entities service systems.

Informally, service systems are collections of resources that can create value with other service systems through shared information (Spohrer, Maglio, Bailey and Gruhl 2007). Service systems (Spohrer, 2007) are dynamic value co-creation configurations of resources (of the four logical types mentioned previously, i.e., people, organizations, shared information, and technology), where at least one resource is an operant resource, specifically a person with rights, and capable of interacting and judging outcomes. Service systems are connected to other service systems via value propositions. Value

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proposition help establish mutually agreed to expectations about realizable value co-creation potential (Anderson, J.C, 2006).

Many sorts of things can be viewed as service systems; for example, people, corporations, foundations, non-governmental organizations, non-profits, government agencies, departments in an organization, cities, nations, and even families can reasonably be viewed as service systems. A key condition is that service systems interact to co-create value. For example, viewed as service systems, a package delivery company transports objects from other companies or individuals; value is co-created in that results depend on both transportation contributed by the delivery service and objects and locations contributed by the clients.

HYPERGAME ANALYSIS

The fundamental idea of hypergame analysis is better to make model interactive decision situations not as a single game, but as a collection of subjective games. The basic model assumes, among others, the decision makers may conceptualize problems in a similar manner to that of game theory, but they see different games.

The basic hypergame framework has been extended mainly in two ways; one is to allow for more radical differences in players perceptions, while the other is to consider systems of linked interactions, rather than just isolated hypergames (Bennet, e.al, 1989). We call the later symbiotic hypergame (Kijima, 1996). In this paper we follow the line basically similar to the symbiotic hypergame analysis (Kijima, 2006).

First we model using simple hypergame, played by p and q is formally defined by

Definition 1 A simple hypergame of player p and q is a pair of (G_p, G_q) where $G_p = (S_p, S_{qp}, \geq_p, \geq_{qp})$ is a game that p believes both sides perceive while $G_q = (S_{pq}, S_q, \geq_{pq}, \geq_q)$ is a game that q believes both sides perceive.

In G_p , S_p denotes a set of strategies for p while S_{qp} denotes a set of strategies which the player p assumes that q can prepare. That is, p perceives that q 's strategy set is S_{qp} . \geq_p denotes p 's preference ordering on $S_p \times S_{qp}$, while \geq_{qp} is a preference ordering on $S_p \times S_{qp}$ which p assumes that q holds. We similarly define G_q .

It is quite natural ways to assumes that $S_{ii} = S_i$ and $\geq_{ii} = \geq_i$ for $i = p$ and q . We assume all the preference orderings are linear orderings and can be represented by some ordinal utility functions. One of the most natural ways to describe rational behavior of p and q in a simple hypergame is obtained by modifying the concept of Nash equilibrium for G_p and G_q in the following manner.

Definition 2

For $G_p = (S_p, S_{qp}, \geq_p, \geq_{qp})$ (s_p^*, s_{qp}^*) is Called Nash equilibrium of G_p iff we have $(\forall s_p \in S_p) ((s_p^*, s_{qp}^*) \geq_p (s_p, s_{qp}^*))$ and $(\forall s_{qp} \in S_{qp}) ((s_p^*, s_{qp}^*) \geq_{qp} (s_p^*, s_{qp}))$ hold.

The definition claims the following: If (s_p^*, s_{qp}^*) is Nash equilibrium of G_p , then p believes that there is no incentive for either of the players to change their strategy as long as the other does not change its strategy.

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As the time goes on, p and q may begin to interpret other's identification of the situation after several exchanges of messages. We describe this as symbiotic hypergame. In the symbiotic hypergame, the players understand that they are concerned with a common situation but they allow for different ways of identifying situation. The symbiotic hypergame consists of a simple hypergame and interpretation functions between them. Interpretation functions represent how each player interprets the other's game. A formal definition of symbiotic hypergame is given by:

Definition 3 A symbiotic hypergame with 2 players, p and q is a pair $((G_p, f), (G_q, g))$, where we have $G_p = (S_p, S_{qp}, \geq_p, \geq_{qp})$ and $f : S_q \rightarrow S_{qp}$, while $G_q = (S_{pq}, S_q, \geq_{pq}, \geq_q)$ and $g : S_p \rightarrow S_{pq}$ hold.

In this case (G_p, f) and (G_q, g) are internal models of p and q , respectively. Function f represents how p interprets the set S_q of strategies of q . Similarly, g formulates how q interprets the set S_p of strategies p has a symmetric interpretation. We refer to f and g as interpretation function of p and q , respectively.

We may consider several ways of defining overall rationality for dealing with (G_p, f) and (G_q, g) , all of which should depend on f and g as well as on G_p and G_q .

VALUE CO-CREATION MODEL OF SERVICE INNOVATION

Co-creation is an active, creative and social process based on collaboration between provider and customer that is initiated by the provider to generate value for customers. Co-creation is a form of collaborative creativity that's initiated by firms to enable innovation with, rather than simply for their customers (Coates, 2009). The aim of co-creation is to enhance organizational knowledge processes by involving the customer in the creation of meaning and value. Co-creation transforms the customer into an active partner for the creation of future value. The mutual relationship affects both customer and provider. It reshapes the way in which we think, interact and innovate (Coates, 2009).

Co-creation adds a new dynamic to provider or customer relationship by engaging customers directly in the production of value (Ajit Kambil, et.al., 1999). Clearly, involving customers directly in the creation of value involves risks for both customer and provider. Again, no one said co-creation is easy. Provider and customer also have to overcome a number of challenges to effectively co-create value. Co-creation is a continuous process of discovering both unique sources of differentiation and efficiencies at the same time. Co-creation is a "win more – win more" approach to value creation (in contrast to "win-win" collaboration) that opens up new sustainable growth, business advantage and innovation opportunities (Ramaswamy, 2010).

Customer and provider traditionally bring opposing objectives to the marketplace, one hopes to minimize cost, the other to maximize profit. This imparts a win-lose dynamic to the relationship, what one loses, the other gains. Co-creation requires both to rethink their relationship; each must be prepared to switch to a win-win relationship instead. This means setting manually defined shared goals and learning to exchange often sensitive information.

Co-creation often requires greater effort on the part of both customer and provider than a traditional market interaction. People on both sides must think about what they

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want to get out of a cooperative relationship. The most critical step in co-creation is being clear and expectations. Customers need to trust provider not to misuse the information they provide or unfairly exploit the relationship. Provider need to actively manage customer expectations about the relationship will evolve. Provider must provide capabilities for co creation and also provide with the right tools and training to co-create efficiently.

As part of a conceptual framework for understanding the dynamics of service innovation, we introduce four concepts, in order to adequately describe the complex service innovation process involved in this service innovation system, as portrayed in the figure 1.

1. Co experience and share internal model with result in co-definition
2. Co development (relation focused) and co elevation (entity focused)

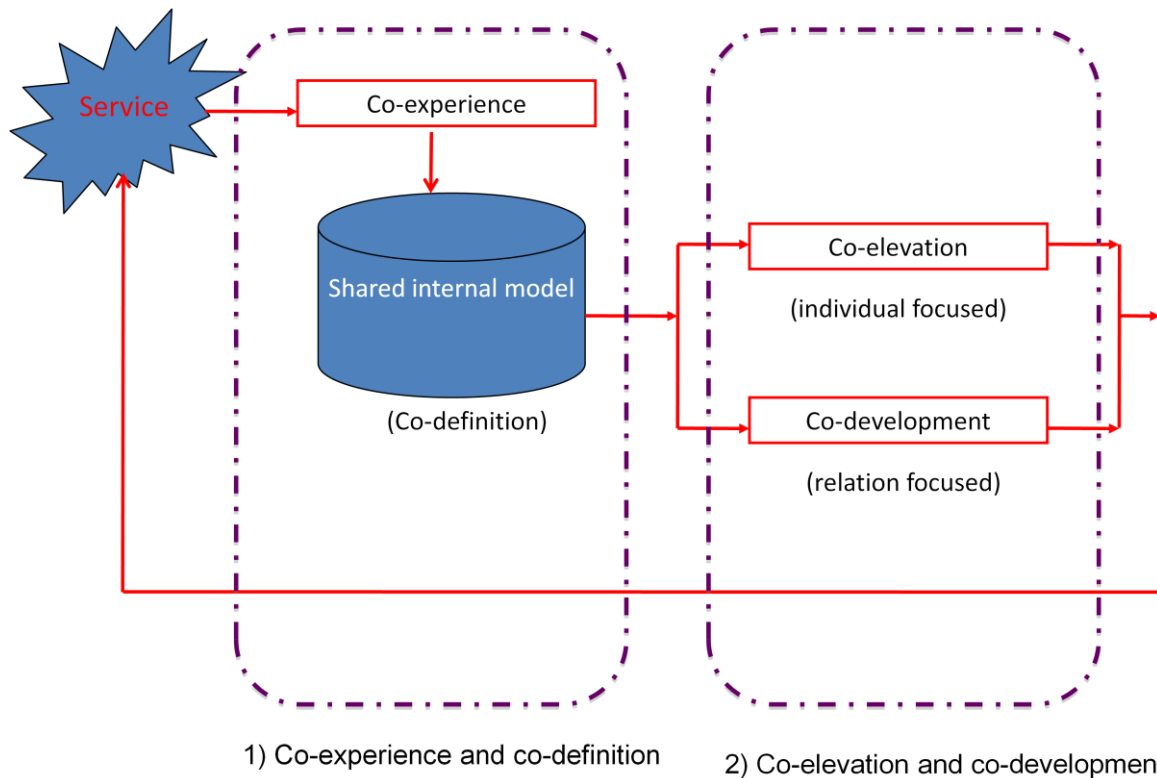


Figure 1. Value Co-Creation Model of Service Innovation (Kijima, 2009)

We briefly define and describe each underlying concept used to describe the service innovation process.

1. *Co-experience*

The intent of experience innovation is not to improve a product or service, per se, but to enable the co-creation of an environment in which personalized, evolvable experiences are the goal, and products and services are a means to that end.

2. *Co-definition*

Despite the potential value of user-generated innovation, it can be difficult for firms to access and integrate user-based knowledge. User based knowledge is tacit, based on experience and thus difficult to transfer (Von Hippel 1988). Consequently,

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“spill-over” of such knowledge and their artifacts, patents and licenses, are therefore limited to allow knowledge transfer between customer and provider.

We argue that this collaboration with users requires a co-definition process by which a shared knowledge model is built by provider lead customer where learning from each other is pivotal (Metcalf et al. 2005, Lusch et al. 2009). Satisfaction is generated by co experiencing and co defining a shared internal model by provider and customer.

3. *Co-elevation*

In the effort to further develop the service innovation process, it is relevant to relate it explicitly to ‘general systems theory’ (Bertalanffy, 1968), which has been used much more in the natural sciences than in the social sciences. In generic terms, by ‘system’ we mean that a set of two kinds of constituents. On the one hand, the components or entities of the system and on the other hand, the relations among them form a coherent whole. The former, we call it co-elevation, focuses more on co-innovation led by some particular entities among the system. Co elevation is first described as spiral up elevation of the expectation from customer or abilities of provider.

4. *Co-development*

Alternatively, the later, namely co-development, drives our attention to co-innovation generated by the relations among the various entities. The cognitive gap among entities is the driver of a collaborative process where entities exchange heterogeneous knowledge bases to contribute to a co-development of solutions. In this case, intensity and variety of interactions matter, described by some scholars as network dynamics or value network (Christensen and Rosenbloom 1995, Lusch et al. 2009, Prahalad and Ramaswamy, 2004).

Paraphrasing Rosenberg (Rosenberg, 1994), our model explores the black box of innovation; it describes how firms benefit from the operating experience of advanced users in the form of information flows and skills. This results in the identification of possible modifications, improvements (co-development), and sometimes radical innovations (co-elevation). Firms then accumulate this knowledge to match advances in new equipment design with user requirements. In this context, the main task of technology strategy for firms relies on learning from advanced users and on integrating technological advances (even from competitive firms) incrementally.

SYMBIOTIC HYPERGAME IN VALUE CO-CREATION MODEL OF SERVICE INNOVATION

In Value co-creation model of service innovation (Kijima K, 2009), to improve a service system, customer and provider have to share the common internal model by co-experience. Customer as entities in service system has strategy or action that will take at any stage and provider too. We define there are three strategies of customer and two strategies of provider. The strategies of customer based on its expectations are (Voltaire, 2003):

1. Take (T), expectation are very simple and take it for granted. For example, I expect the airline to be able to take off, fly to my destination and land safely.

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2. Take more (TM), expectation that require some form of satisfaction through meeting the requirement. For example, I expect to be treated courteously by all airline personnel.
3. Take most (TS), expectation requires some kind of delightfulness or a service that is so good that it attracts me to it. For example, an airlines gives passengers traveling coach class the same superior food service that other airlines provides only for first class passengers.

We presume that customer believes provider has alternative 2 strategies, that is:

1. Do (D), denotes provider do the fulfillment of customer expectation (a strategy of provider met customer expectation).
2. Work hard (WH), denotes provider work hard fulfilling the needs to exceed customer expectation (a strategy of provider exceed customer expectation).

The strategies of provider based on its abilities are (Vicki T, 2005):

1. Response (R), it means provider give response after customer send the idea, i.e., the ability of provider only expects idea to be sent and react to those it consider good ideas.
2. Quick Response (QR) it means provider immediately response the customer expectation, i.e., the ability of provider seeks to find great ideas and to create new services based on the challenges.

We presume that provider believes customer has alternative 2 strategies, that is :

1. Accept (A), denotes customer accept the service from provider, i.e., the actual performance of providers capability can met customer expectation.
2. Delight Accept (DA), denotes customer impressed with the service, i.e., when the actual performance of provider capability exceeds customer expectation.

In the symbiotic hypergame (Kijima K, 1996), customer and provider understand that they are concerned with a common situation, in this case to achieve mutual understanding. But they allow for different ways of identifying situation. Furthermore, it supposes that as times goes on, customer and provider may update their internal model by learning. These assumptions convince us that it is the most middle and convenient for describing value co-creation process by customer and provider.

First, let $S_c = \{T, TM, TS\}$ and $S_p = \{R, QR\}$ be sets of strategies of customer and provider, and let $S_{pc} = \{D, WH\}$ be sets of strategies of provider, which customer perceives, respectively, let $S_{cp} = \{A, DA\}$ be sets of strategies of customer which provider perceives. A formal definition of symbiotic hypergame (Kijima K, 2001) is given by

Definition 4 (Symbiotic Hypergame) A symbiotic hypergame with 2 players, customer (c) and provider (p) is a pair $((G_c, f), (G_p, g))$, where we have $G_c = (S_c, S_{pc}, \geq_c, \geq_{pc})$ and $f : s_p \rightarrow s_{pc}$, while $G_p = (S_{cp}, S_p, \geq_{cp}, \geq_p)$ and $g : S_c \rightarrow S_{cp}$ hold.

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In this case (G_c, f) and (G_p, g) are internal models of customer and provider, respectively. Function f represents how customer interprets the set $S_p = \{R, QR\}$ of strategies of provider. That is, though customer has no idea about what strategy provider takes, customer believes it should be a particular strategy in $S_{pc} = \{D, WH\}$ by using f . In our situation, we define f_1 and f_2 as meaningful candidates of the interpretation functions for customer while g_1 and g_2 as those for provider.

Definition 5 (Hyper Nash Equilibrium) Let $((G_c, f), (G_p, g))$ be a symbiotic hypergame where $G_c = (S_c, S_{pc}, \geq_c, \geq_{pc})$ and $G_p = (S_{cp}, S_p, \geq_{cp}, \geq_p)$, while $f : S_p \rightarrow S_{pc}$ and $g : S_c \rightarrow S_{cp}$. The symbiotic Nash criterion is a function L which maps $((G_c, f), (G_p, g))$ into $P(S_c \times S_p)$ in such a way that $(s_c^*, s_p^*) \in S_c \times S_p$ is in $L((G_c, f), (G_p, g))$ iff

$$(s_c^*, f(s_p^*)) \in N_c(G_c) \text{ and } (g(s_c^*), s_p^*) \in N_p(G_p)$$

Function f_1 shows customers believe that *quick response* means provider seeks to find great ideas that can *exceed* the customer expectation (*work hard*). Function f_2 implies customer assume that find a great idea is understood as effort from provider to *exceed* the customer expectation. Function g_1 indicates provider assumes that expectation which require some form of satisfaction (*middle expected*) and delightfulness of service (*high expected*) can be high satisfied for customer, and function g_2 is representing that provider believe only *expectation which require some form of delightfulness (high expected)* from customer is high satisfied, with the following conditions hold:

$$\begin{aligned} f_1(QR) &= WH & ; & & f_1(R) &= D \\ f_2(QR) &= WH & ; & & f_2(R) &= D \end{aligned} \quad \text{and}$$

$$\begin{aligned} & (1) \\ g_1(TS) &= DA; & g_1(TM) &= DA; & g_1(T) &= A \\ g_2(TS) &= DA; & g_2(TM) &= A; & g_2(T) &= A \end{aligned}$$

We may consider several ways of defining overall rationality for dealing with (G_c, f) and (G_p, g) , all of which should depend on f and g as well as on G_c and G_p . The following concept of hyper Nash equilibrium is natural and straightforward to define such rationality. Based on definition 5, if there is Hyper Nash Equilibrium, then mutual understanding between customer and provider will be achieved.

Proposition In scenario 1 and 3, if customer has high or middle expectation and provider is innovative, then there is have Hyper Nash equilibrium. It means mutual understanding between customer and provider can be achieved.

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ANALYSIS OF VALUE CO-CREATION OF SERVICE INNOVATION MODEL

In this section, we use symbiotic hypergame developed theoretically so far to simple situation, namely mutual understanding between customer and provider. In symbiotic hypergame, we define interpretation function for customer and provider. We compare several scenarios about types of customer and provider which can bring into mutual understanding and can lead high satisfaction for customer. From this scenario, we will prove proposition that under what condition, mutual understanding between customer and provider leads to high satisfaction. We assume that when a customer begins a relationship with provider, he or she already has specific set of expectation.

We define three types of customer, namely the first one is *high expectation customer*, i.e., they have some requires some kind of delightfulness or service that is so good and it attract for them. The second one is *middle expectation customer*, i.e., they require some form of satisfaction through meeting the requirement. The third one is *low expectation customer*; i.e., they just take it for granted.

The following tables are symbiotic game of each type of customer:

Table 1. Payoff Matrix of High Expectation Customer (G_{c_1})

$S_c \backslash S_{pc}$	D	WH
T	3 1	4 4
TM	2 2	5 5
TS	1 3	6 6

Table 2. Payoff Matrix of Middle Expectation Customer (G_{c_2})

$S_c \backslash S_{pc}$	D	WH
T	3 1	5 4
TM	2 2	6 5
TS	1 3	4 6

Table 3. Payoff Matrix of Low Expectation Customer (G_{c_3})

$S_c \backslash S_{pc}$	D	WH
T	3 1	64
TM	2 2	5 5
TS	1 3	4 6

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Matrix G_{c_1} in table 1 indicates as high expectation customer, since customer has the highest preference towards TS and WH . (TS, WH) is Nash equilibrium in own payoff matrix of high expectation customer. Matrix G_{c_2} in table 2 indicates as middle expectation customer, since customer has the highest preference towards TM and WH . (TM, WH) is Nash equilibrium in own payoff matrix of middle expectation customer and matrix G_{c_3} in table 3 indicates as low expectation customer, since customer has the highest preference towards T and WH , so for (T, WH) is Nash equilibrium in own payoff matrix of low expectation customer.

The following tables are symbiotic game of each type of provider:

Table 4. Payoff Matrix of Innovative Provider (G_{P_1})

$S_p \backslash S_{cp}$	R	QR
A	11	23
DA	3 2	4 4

Table 5. Payoff Matrix of Reactive Provider (G_{P_2})

$S_p \backslash S_{cp}$	R	QR
A	44	32
DA	23	11

Typical of provider in G_{P_1} is provider who was proactive enhancing the value, innovative and connected with customer. We call this typical is *innovative* provider, since provider define new opportunities and challenges to create new services based on those challenges. Matrix G_{P_1} in table 4 indicates that provider has highest preference towards DA and QR . (DA, QR) is Nash equilibrium in own payoff matrix of innovative provider.

The second typical provider is who was expecting the idea from customer if they satisfied and then react to those. We call this typical is *reactive* provider. Matrix G_{P_2} in table 5 indicates that provider has the highest preference towards D and R . (D, R) is Nash equilibrium in own matrix payoff of reactive provider.

We compare all combination of each scenario between customer and provider, and then examine which one who produces mutual understanding which leads to high satisfaction. The first scenario is relationship between high expectation customer and innovative provider. In order to investigate this problem, we denote them by I_c and I_p consist of interpretation function between them *i.e.*, $I_c = \{f_1, f_2\}$ and $I_p = \{g_1, g_2\}$ respectively. The second scenario is relationship between high expectation customer and reactive provider, third scenario is between middle expectation customer and innovative provider. The fourth scenario is relationship between middle expectation customer and reactive provider, the fifth scenario is between low expectation and innovative provider and the last is between low expectation and reactive provider.

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To find Hyper Nash Equilibrium for scenario 1 (*high expectation customer and innovative provider*), we use interpretation function from equation 1, as following:

$$\begin{aligned}
 f_1(QR) &= WH & ; & & f_1(R) &= D \\
 f_2(QR) &= WH & ; & & f_2(R) &= D \\
 & & & & \text{and} & \\
 g_1(TS) &= DA; & g_1(TM) &= DA & ; & g_1(T) = A \\
 g_2(TS) &= DA; & g_2(TM) &= A; & & g_2(T) = A
 \end{aligned}$$

Then we have four types of symbiotic hypergame. One of them is $((G_{c_1}, f_1), (G_{p_1}, g_1))$. In this game (TS, QR) is *Hyper Nash Equilibrium*. This equilibrium is a pair of strategies that is interpreted as Nash Equilibrium by customer and provider through function f and g .

$$((G_{c_1}, f_1), (G_{p_1}, g_1)) = (TS, f_1(QR)) = (TS, WH) = (g_1(TS), QR) = (DA, QR)$$

(TS, WH) is Nash equilibrium in own payoff matrix of high expectation customer and (DA, QR) is Nash equilibrium in own payoff matrix of innovative provider. So (TS, QR) is Hyper Nash equilibrium for high expectation customer and innovative provider, since this equilibrium is interpreted as Nash equilibrium by both of them.

We can apply similar arguments to other three cases, i.e., $((G_{c_1}, f_1), (G_{p_1}, g_2))$, $((G_{c_1}, f_2), (G_{p_1}, g_1))$ and $((G_{c_1}, f_2), (G_{p_1}, g_2))$. For the other scenario is similar. The result of each scenario will be described in following table.

Table 6. Hyper Nash Equilibrium in Scenario 1
(*High expectation customer and Innovative Provider*)

$I_c \ I_p$	g_1	g_2
f_1	$\{(TS, QR)\}$	$\{(TS, QR)\}$
f_2	$\{(TS, QR)\}$	$\{(TS, QR)\}$

In scenario 1, mutual understanding will be achieved if customer believe and assume provider is innovative, and provider also believe and assume that customer has expectation which require some form of delightfulness. Typical example for this scenario is between Porsche Customer who has high expectation and Porsche, The German car manufacturer. Customers expect extensive care and attention, even long after the sales agreement has been signed. Model kits of Porsche's famous cars help customer fill the time until their real sports car is ready for delivery. Four weeks before the delivery date, customers receive the manual for their future car. And even after they get their keys, customers regularly receive personalized emails and a glossy customer magazine. As a luxury sports car manufacturer, Porsche understand that their customer have exceptionally high expectations.

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Table 7. Hyper Nash Equilibrium in Scenario 2
(High expectation customer and Reactive Provider)

I_c I_p	g_1	g_2
f_1	\emptyset	\emptyset
f_2	\emptyset	\emptyset

In scenario 2, there isn't mutual understanding between them. Typical example for this scenario is Fortune 500 Food Company gathers continual customer and employee feedback from e-mails, submitted survey forms and other documents. This feedback is collected from thousands of disparate sources on a real time basis. This feedback is then analyzed using sophisticated tools, and thereafter strategies and process improvements are designed based upon the observations. This is an example of an effective reactive strategy used to improve customer satisfaction.

It includes understanding and meeting customer's expressed needs. Although this is very important and companies must use this strategy to gain insight and feedback on their services, sometimes companies tend to rely too much on this data and hence innovation takes a backseat. Most critics argue that reactive companies tend to lag behind when it comes to high speed innovation and satisfying the high expectation customers.

Table 8. Hyper Nash Equilibrium in Scenario 3
(Middle expectation customer and Innovative Provider)

I_c I_p	g_1	g_2
f_1	(TM, QR)	$\emptyset\emptyset$
f_2	(TM, QR)	$\emptyset\emptyset$

In scenario 3, there isn't mutual understanding between customer and provider. Provider play critical role for determining stability of the game. As long as provider assume that customer expectation which require some form of satisfaction, then innovative provider can find great idea to fulfill it. Typical example of this scenario is in service delivery, customer has expectation that not only the delivery arrived but they demand consistent service delivery without exception. FedEx as provider operate IBM's system infrastructure. With this system can help FedEx not only meet, but exceed them by enabling FedEx to speed up develop new solutions for their customer.

FedEx provide the expectation of perfect delivery performance, combined with timely, accurate tracking data has become ingrained in their business practices, as has the need for reliable information to support their decision making. Moreover, with competition fierce in the ground transportation business, FedEx ground has actively sought to differentiate itself by introducing several value added services, such as scheduled home delivery of packages. FedEx Ground now has seven IBM system *i servers* that touch almost every aspect of its business. FedEx worked in concert with IBM Global Technology Services to architect, configure and deploy the systems. So, in this case FedEx has an innovative strategy just not to meet the customer expectation but also exceed the customer expectation.

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Table 9. Hyper Nash Equilibrium in Scenario 4
(Middle expectation customer and Reactive Provider)

$I_c \ I_p$	g_1	g_2
f_1	$\emptyset\emptyset$	$\emptyset\emptyset$
f_2	$\emptyset\emptyset$	$\emptyset\emptyset$

In scenario 4, there isn't mutual understanding between customer who has middle expectation and reactive provider. The typical example of this scenario is Starbuck and their customer. Starbuck fears they are losing customers when they do not have all varieties available. To meet the customer expectation, Starbuck begin to make some changes they hope will bring customers back to their shops. Along with changing their coffee grinding schedule, Starbuck will also change how they utilize their coffee brewers. In this case customers expect not only drink coffee, but also to rotate the varieties through the brewers and get the atmosphere of the aroma in the stores. If just only meet customer expectation, then customer satisfied, but according to their data, Starbuck not always meeting the customer's expectation in the area of customer satisfaction. Therefore, Starbuck must provide innovative strategy to create new idea, and then the customer will back to their shop. In this case, Starbuck expect the idea from customer and react after losing his customer.

Table 10. Hyper Nash Equilibrium in Scenario 5
(Low expectation customer and Innovative Provider)

$I_c \ I_p$	g_1	g_2
f_1	$\emptyset\emptyset$	$\emptyset\emptyset$
f_2	$\emptyset\emptyset$	$\emptyset\emptyset$

In scenario 5, there isn't mutual understanding between low expectation customer and innovative provider. Typical example of this scenario is University of Waikato discovered very low customer expectation of "reader education" classes (or bibliographic instruction as they might be called in North America) so set out to raise expectations in order that more students would take advantage of the classes offered. Marketing is also important in changing those customer expectations that management believes are below a desirable level.

Table 11. Hyper Nash Equilibrium in Scenario 6
(Low expectation customer and Reactive Provider)

$I_c \ I_p$	g_1	g_2
f_1	$\emptyset\emptyset$	$\emptyset\emptyset$
f_2	$\emptyset\emptyset$	$\emptyset\emptyset$

In scenario 6, there isn't mutual understanding between customer who has low expectation and reactive provider. Typical example of this scenario is Air Asia, Malaysian Airlines Company; it operates scheduled domestic and international flights and is Asia's largest low fare, no frills airline. Air Asia pioneered low cost travelling in Asia. It is also the first airline in the region to implement fully ticketless travel and unassigned seats. The

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expectation of customer of airplane travel have always been pretty low, just can take off and land safely – to be fair, their lateness and poor time keeping was second only to mine and not good seat. But the price is low, so it meet requirement of customer.

MAIN CONTRIBUTION

This paper explores and analyzes how customer and provider are sharing their internal models at the first phase of value co-creation model of service innovation, i.e., co-experience and co-definition in rigid way. This is the first way how to make formal model in value co-creation of service innovation. By co-experience, the customer and provider share internal model to co-define a common understanding about the service. Symbiotic hypergame analysis, in general explicitly assumes that the players involved possess subjective internal model of the environment including the counterparts. These assumptions convince us that it is the most adequate and convenient for describing value co-creation process by customer and provider. Furthermore, it supposes that as times goes on, the players may update their internal model by learning. Mutual understanding between customer and provider had been analyzed by Hyper Nash Equilibrium in Symbiotic hypergame analysis.

In the real situation, to achieve mutual understanding between customer and provider is quite difficult. For example, in order to provide the right services to their customers, management accounting service section in a company needs to understand whether their perspectives on accounting services differ from the user's perspective. In this case, provider can improve management accounting services and achieve number of benefit, by improving communication between customer and provider. With good relationship between them, the customer can have confidence and trust the provider to look out for their interests and satisfied with the service.

CONCLUSION AND FUTURE WORK

By co-experience, provider and customer share internal model to co-define a mutual understanding about the service. Mutual understanding between customer and provider can be achieved as long as customer and provider have same interpretation. It has been proven by analyzing Hyper Nash equilibrium in each scenario based on symbiotic hypergame analysis. Customer with high expectation believes that provider is innovative and respectively innovative provider also believes that customer was requiring some delightfulness. If provider was innovative and customer has high expectation, then mutual understanding can be achieved. People on both sides must think about what they want to get out of a cooperative relationship.

If one of them was not have cooperation relationship, then mutual understanding couldn't be achieved by them. Customer can create their idea through their expectation and continuously increasing. Provider also must go beyond just meeting customer expectation and work to exceed expectations from customer. Therefore if it works, then value co-creation will be achieved between customer and provider. If provider just meets those expectations, there's nothing memorable on which to build a partnership. But if it exceeds the customer's expectations, the service becomes positively memorable and the customer is likely to continue with provider. So, if it works, then value co-creation between them will be occurred.

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However, the research was presented here was just a first step toward misunderstanding problem between customer and provider by analyzing Hyper Nash Equilibrium. The payoff matrix of customer and provider was constructed subjectively and static. In spite of the basic assumptions of the gap model of service quality, customer may not know about his/her own expectation in the reality. When it comes to service, expectations can get a little fuzzy. Therefore, customer may have several internal model was not based on the type of customer expectation. Furthermore, customer may change his/her type according to the payoff obtained from the interaction with provider and provider may change the strategy, too. To overcome this problem, we need to investigate some kind of learning procedure. These observations require more dynamic analysis of co-creation process of service innovation. There still remain quite a lot of topics as targets of future research.

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