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服務系統實體互動樣式基礎下之服務創新

Service Innovation Based on Interaction Patterns of Service System Entities

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Claude in AeSL

2012/7/23

Abstract

Research to date discovered two gaps restricts the existing service innovation theories from full support for SMEs - who also require good service innovation theory to innovate and to survive in the fast-pacing market - which are: goods-thinking-based service innovation logic and incomprehensible service innovation theory for SMEs. In this research, we share and enhance the vision of system thinking researchers - interaction plays the very basis and important role in service value creating and delivering - as our theory foundation. Founding on this interaction-centric notion, we propose an easy-to-adapt service innovation methodology which suggests that SMEs could do service innovation by adjusting business interactions, and justify it with a comprehensive model evaluated by simulation techniques and a prototype supporting information system mechanism to provide support for SME users. Last but not the least, at the end of this research, we re-examine the system thinking framework with our discoveries, and signaled a possible adjusting direction of the framework for more value-oriented purposes. From the practical view, we identify a way to extend the current system thinking theory to a practical model for real world SME's service innovation purposes. For the academic research, our interaction-centric service innovation methodology is believed to enhance the to-date system thinking theories. In addition, we also identify several future possibilities for academic researchers in this field to discover.

Keywords: System Thinking, Service Innovation, Interaction Patterns, Service Dominant Logic, SME

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CHAPTER 1. INTRODUCTION

1.1. Background and Motivations

"The business enterprise has two – and only two – basic functions: marketing and innovation." (Peter Drucker, 1973).The importance of service innovation has been highly recognized by business for years. Yet in past decades, "When top management is surveyed, their priorities in order are: finance, sales, production, management, legal and people. Missing from the list: marketing and innovation. " (Jack Trout, 2006).

While business are marking itself an innovative company, and campus courses are teaching students the importance of innovation throughout their entire university life, it might be unfair to say that innovation is "missing" from business. However, not only Jack Trout make such a comment, but some academic research also stated that business are doing service innovation in terms like holding the stores open for more hours, or starting an e-commerce campaign(Berry et al., 2006),which might hard to say is "innovative". A gap lies between the actualities and the theoretically of innovation.

This inconsistency seems weird, but actually is not surprising for some people. A fundamental change of business environment – from goods dominant market to service oriented customers, had taken place for two decades(Peers Insight LLC,2007) ; the major industrialized economies, including the United States and the European Union, experienced a dramatic economic shift from goods to services; and also, the traditional ways of competition in goods market had come to an end in service era for many reasons, examples like customer bargains power rising, information technology boost, global competition and regional alliance. Researchers stated that the alternated competing foundation is resulting the inconsistency, while business are still applying

the notion of innovation well-established during the manufacturing epoch but service innovation are requiring something different, discrepancy occurs (Hipp & Grupp, 2005).

The difference in goods and service innovation occurs from their very essences, while the value of a goods is decided only by the producers, the value of a service is determined by different parties – the producer and the customer. (Vargo & Lusch, 2004). While doing goods innovation, the efficiency and the appearance of the products are the core, and enterprise paid high for products invention and marketing. But in terms of doing service innovation, how the user use the service is the heart of the service; service provider only provide their value proposition to the customers, and the value actually created from the service is co-decided by both the service provider and user. So both the provider and consumer plays important role in the value creation process of a service, but the value is leaved for manufacturer to decide only in terms of goods. The divergence form a great gap between service and goods innovation since the designing method are contradictory, and making most company messed up the two.

Aside from the discrepancy of the fundamental thinking of goods innovation and service innovation, another issue about the user the service innovation theory is developed for also emerges along with the proceeding service innovation researches. While service innovation is an important issue for companies to tackle with, the needs of service innovations are not limit to the FORTUNE 500 only, it also greatly influences the small and medium enterprises (SME) which are companies that are limited-resource, cannot compete in cost and efficiency (Boly et. al,2000).

However, even though plenty of service innovation supporting theories and models exists, due to the divergence between wealthy big companies and SMEs - difference in capital resource and know-how to do innovation - makes most of the theories and

models not appropriate for SME's situation (Kaufmann & Todtling, 2002). Considering the great share of GDP that SMEs are holding, supporting SMEs develop their own innovation compatibility has become critical (Hoffman et al, 1998).

We've briefly introduced the current situation of existing service innovation's theories in this section and two statements are given: (1) service innovations are different from goods innovations, while most theories and businesses are still using the old-fashioned goods point of view still, improvement is needed (2) service innovations are different for big companies and SMEs, since existing theories are putting more emphasis on innovation for big companies, supports for SMEs are still way to go. Combining the two becomes our intended contribution for this research - provide a service innovation theory that can avoid the shortcomings of preceding goods dominate logic, and support SMEs use with ease.

1.2. Research Question & Objectives

A notion called service system proposed by Aronson (1997) - a service was created during interactions between actors under a governing mechanism - was giving a good point to start on understanding the difference between goods and service innovation. In service system researches, researchers focus on the interactions between multiple actors that creates values for interacting parties, the notion was closed to the concept of the service dominant logic (Vargo & Lusch, 2004) which states that – in service, resources like alliance partners and end customers are operant resources, can be influenced by and influencing other resources to co-create value; while in goods, alliance partners and end customers are operand resources, passively influenced by other resources, like the manufacturer – thus service system provides a concrete theory architecture for successor to take hands on.

In a service system, the final outcome is produced and decided by the interactions

between entities, like a barber interacts with its customers to deliver the hair-cutting service. The final hair style is not only based on barber skills, but also must take the customer's hair's status and the entire circumstances into account. In different salon and with different customer, the outcome hair style could vary, and while customer has different tastes, a same style might have totally different customer satisfaction. It is important to have this in mind before doing any further studies of service innovations.

Another excellent example is given by Aronson(1997) to show how could system thinking be useful in service innovation. In a given agricultural case, Aronson described that when a special species of harmful insects appears, it is easily for farmers to seek for new pesticides to eliminate the new incomers. However, if the new insects (insect A) are very resistant to pesticides, then the farmer needs to use a stronger pesticide to achieve the desired result. The problem in using the new pesticide arouses – it might kill other insects (insect B) that could kill insect A. If the number of insect B decreases more than insect A, than the new pesticide could possibly cause a totally negative effect to the crops. Hence, the farmer shall consider not only about harmful insect A, but shall also think about any other factors or entities that are involved within the system (the farm).

The following Figure 1.1 from Demirkan (2011) can explain the concept of the service system more clearly. An entity in a service system could consider as an actor, who can have actions influencing others, and the interaction is how multiple entities working together, the outcomes are created during the interaction. Following this concept, we could consider that any service innovation is an attempt to change the service outcome of a system to a more innovative aspect; accordingly, it will be useful and important to understand the whole system to see the big picture of the service innovation. To examine the system thoroughly, one must figure out not only who

those entities are and what's their outcome, but more importantly how they interact. By understanding the way they interact, we could knew the system better, and come up with solutions to change their interactions, and thus alternates the final service outcome of a same set of entities.

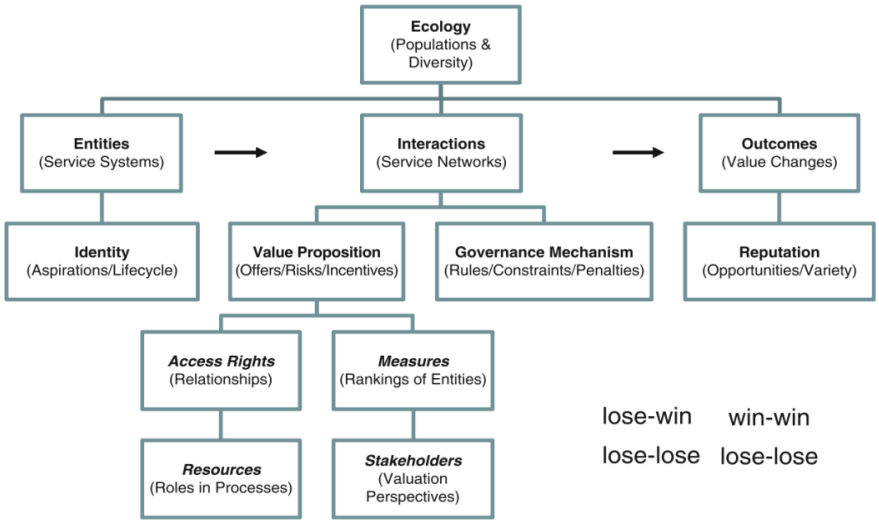


Figure 1.1 Ten core concepts of service science
(Demirkan, 2011)

However, while we are saying service innovation as an innovative change in the outcome value of a service within two entities: provider and consumer, and interaction is how the outcome created, we are actually indicating an even more important notion: interaction is the key of service innovation. Reasons are that if all the values are created by the interactions of entities, then it is suggesting that any service innovation in the system is actually derived from the change in interaction, since innovation is a type of value changing. For example like Apple's Ipod, it is changing the way how a mp3 manufacturer interacts with its customers - from product provider to a music service facilitator; another example is like Dell's up-to-build service is actually altering the density and purposes of customers interactions with the company, and also it changes the interaction of Dell and equipment manufacturer. Accordingly,

when the interaction is changed, and changed to a more innovation-friendly state, we could possibly expect the innovation within the system will be more likely to happen, and it breeds the concept of the possibility to do service innovation by interaction manipulating.

After understanding the way how service is provided by business and why system thinking provides good support in studying it, we could embrace the concept of the importance of interaction and use it as our theory foundation to find possible service innovations. The next question to solve is how to generate adequate service innovation recommendations from system thinking without incomprehensible mechanism, and how SMEs could follow the recommendations by themselves with ease.

Concluding, the issues this research aims to solve lies under:

1. To discover the possibility and effectiveness of using interaction as a foundation to create a service innovation theory.
2. To develop a service innovation theory which is based on the interaction-centric notion while remains an easy-to-adopt feature and good guidance for SMEs.
3. To implement a prototype system to demonstrate the feasibility and practicability of the .

1.3. Research Methods

In this research, the main topic we would like to discuss is how to use interaction to create a method to analyze SMEs and its environment, and provide innovation direction and implementing guidelines from the mechanism.

However, business interaction is alike human interactions, includes numerous actions, exchanges, episodes that influence the interaction, and requires a long period

of time to form (Håkansson, 1982). This characteristic of interaction makes it difficult to be analyzed, especially for SMB. The following Figure 1.2 could see the study results of business interaction analyze done by IMP group.

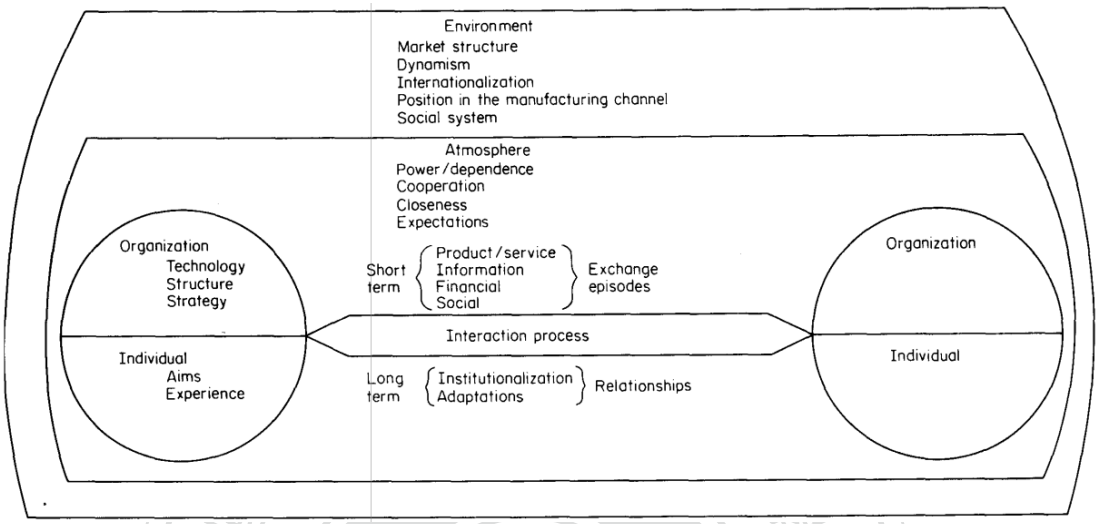


Figure 1.2 Illustration of the interaction model
(Adapted from Håkansson, 1982)

Although complexity is the nature of interaction just like many other complicated questions, there are still mechanisms exists to solve this predicament. For example, pattern recognition. Pattern Recognition is an interdisciplinary subject, covering developments in the areas of statistics, engineering, artificial intelligence, computer science, psychology and physiology, which is well-used since 1960 (Fukunaga, 1990). With patterns, the limitless contents of an interaction can be classified into limited categories, provided a chance to break down for further understandings.

Concluding, to study business interactions, we intent to use the interaction patterns between different entities as our analysis method and innovation insights creating source, we defined three problems that are required to be solved for this purpose:

1. How to define business interaction patterns that are fitting to our purpose.
2. How to analyze the business situation and fit into interaction patterns we

defined.

3. How to provide innovation insights from interaction patterns.

1.4. Purpose and Contributions

The purpose of this research is to propose a methodology for SME to use in order to find the possibilities to do service innovation. In doing so, there shall be two following contribution of this research:

(a) From the theoretical perspective, we provide a brand new method to assess SMEs with the use of interaction patterns which originates from system thinking and service dominant logic theory. This new attempt will provide a new model for other researchers to study or to apply in different areas; moreover, it will likely to enlighten new perspectives of system thinking usages since its theory foundation is embodying system thinking's core concepts and further extends them.

(b) From the practical perspective, we provide SME owners with a useful approach for discovering innovation directions and the way to implement it, fulfilling the gap that SME have difficulty in using innovation supporting theory to generate a path to follow.

1.5. Content Organizations

The research framework of this research is presented below in Figure 1.3, which is from ***Design Science in Information Systems Research*** (Hevner et al., 2004). The following will briefly describe how each chapter corresponds to the framework (we will use "IS research framework" as a shorter name for information system research framework in the following paragraphs).

In the first chapter, we firstly described the environment of our research topic to

provide a clear understanding of the situations: Based on our observation and opinions from previous researches, we could see a current problem for SMEs (people) is that they are not granted with enough service innovation methods and tools (technology) to compete with other companies within the industry (organization) and survive (business needs). To answer their needs, we intend to integrate concepts from system thinking and service science with information technologies enabling tools to support SMEs in facing their difficulties by boosting their innovation capability (application).

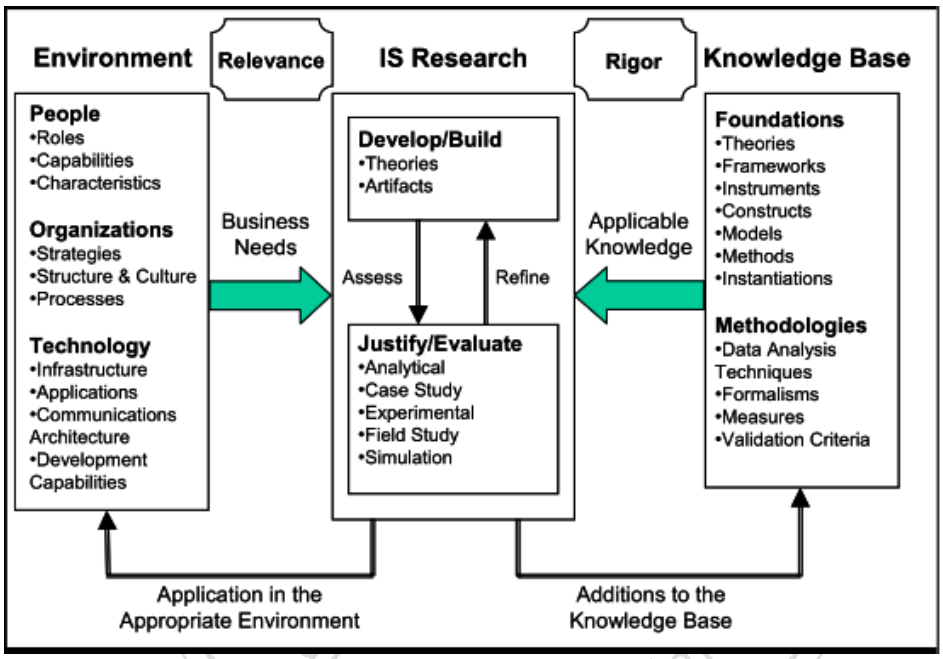


Figure 1.3 Information systems research framework
(Adapted from Hevner et al., 2004)

Chapter 2 will then present the relating research done by others who have also seen the same problem, serving as a footstone of this research. Relating research are interaction, alliance, and service innovation. These fundamental knowledge will show the state of the art in service innovation theory, and also serve as the basic of the theory construction and as a comparison to position this research. The knowledge base section of the IS research framework will also be included in this chapter.

Chapter 3 shall describe the research results of previous related works, and the

position of the to-be-proposed mechanism in the whole research project. Corresponding to the IS research framework, Chapter 3, alike Chapter 2, are serving for the knowledge base section of the framework, but rather from a wider and higher point of view.

Chapter 4 will then explain the proposed mechanism in details, and work as the conceptual map of this entire research; in other words, Chapter 4 will become the theories and artifacts within the Develop / Build section in the IS research framework.

Chapter 5, following the theory section of this research, will give the evaluation details of our mechanism, which serves as the justification section of the framework in Figure 1.3. Conclusions, limitations and future research of this research will then be given in Chapter 6 to summarize this IS research.

CHAPTER 2.LITERATURE REVIEW

This chapter will illustrate the current conditions of the relevant researches to give a whole picture of the state of the art. There will be three sections within this chapter: service innovation, alliance, and interaction patterns respectively. Firstly, we will describe the current knowledge of service innovation and the importance it is to SMEs; a comparison of the existing theory will be given to state the possible problems of current research too. The second section will depict the linkage between service innovations and alliance, and the corresponding researches about the benefit and managing issues of alliance. The last section within this chapter is the introduction of interaction and interaction patterns, and an explanation between alliance and interaction and how interaction works for SME's service innovation will be stated.

Relating to the information system research framework in Figure 1.3, section 2.1 (service innovation current researches) will depicts the current status of service innovation of SMEs, to reinforce the environment part of the IS research framework of this research in more theoretical way; section 2.2 and 2.3 will serve as the knowledge foundation and the supporting theory base of the framework.

2.1 Service Innovation in SME Sector

Due to the changing trend of the world, service sector are getting higher portfolios in the economic, relating researches thus populated to follow this tide of changing. Service innovation is one of the major topics of these popping researches (Djellal et. al., 2003 ; Tidd and Hull, 2003); innovation brings competency to business, and is especially important in the world of servicisation (Toivonen & Tuominen, 2009). Ten types of service innovation was proposed by Doblin group (Insight, 1999), are

depicted in following Figure2.1.

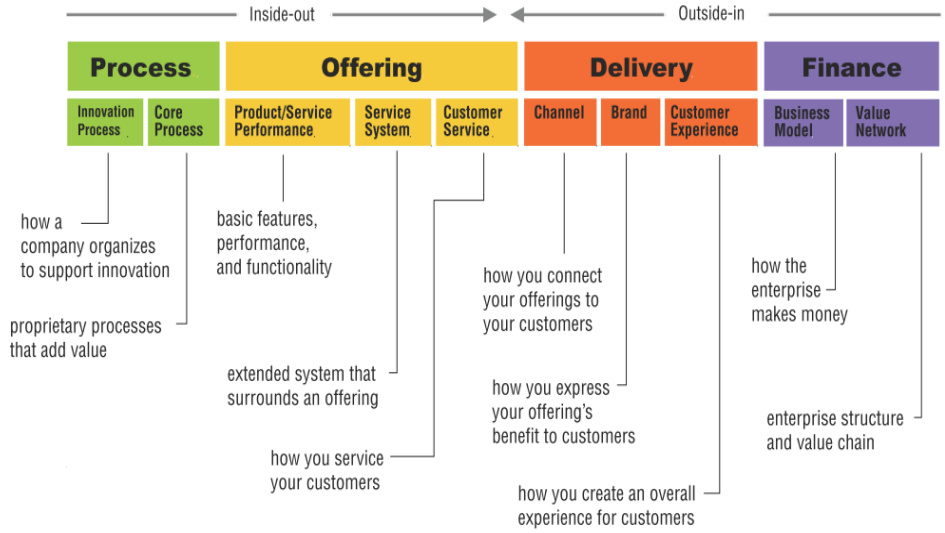


Figure 2.1 10 types of Innovation (Adapted from Insight, 2007)

However, these researches of service innovation do little help to the business, and much service company's service innovations are still limited to types like holding the stores open for more hours, or starting an e-commerce campaign (Berry et al, 2006).

One of the reasons for the limited help of these innovation related research is because the innovation in service and in products is different from the very basic; that is, the value is created by manufacturer in products, but co-created by both consumer and provider in service (Vargo & Lusch, 2004). Compared to the highly developed innovation methodology in manufacturing, the notion of service innovation is not yet integrated well with other existing theories (Johnson et al, 2000). A very important concept was proposed by Tatikonda and Zeithaml (2001) which said that service innovations requires more interaction between development and the delivery process than product innovations. However, existing famous service design/innovation methodology rarely views from the lens of interaction, or some only takes little into account, the following table2.1 listed the comparison.

Table 2.1 Comparison of existing service design/innovation tools

Service design and innovation tools	Concept/ Design Principle	Focus & Features
Service Blue Printing (Flies & Kleinaltenkamp, 2004)	Embed blueprint technique into service designing, differentiating the customer-induced and customer-independent activities to design corresponding service process	Process base
Design Thinking (Brown, 2008)	Use intensive brainstorming observation techniques and iterative process, rapid prototyping to capture the customer's needs.	True demand of the customers
TRIZ (Altshuller, 1999)	Formalized and intensive guidance tool that uses 40 inventive principle to compose a service innovation	Problem formulation
SEE (IDEAS, 2008)	A mixed method of above mentioned three service innovation tools	Problem Formulation Customer Observation

Moreover, two features were not listed in above table 2.1. The first is that these service innovation tools require intensive training to use; TRIZ requires discipline of problem formulation, SEE method requires the same training too; service blueprinting needs the user be very familiar with the process and process modeling; design thinking as the most un-structured method requires people that are innovative and good at observation. For big companies, training lessons can be arranged; high quality human resource can be hunted, but not for SMEs (Kaufmann & Todtling, 2002), due to their company size and resources.

Secondly, while SMEs are easily affected by the environment, it will be helpful if the service innovation theory could take the environment more into consideration; in

other words, the service innovation theory shall see both in micro perspective while not neglecting the big picture. For example, if a producer decides to open an online store to contact its customer directly, their website could be developed well by using the blueprinting skills, but might not notice the possibility that creating a direct connection with customers could ignite its retailer's anger, and cause the total sales decreases. Big companies with abundant analyst might be aware of this due to their training in business knowledge and are in no need of support, but SMEs could possibly incautious about this issue without proper reminding. By using system thinking theory, and considers in the way of interacting with other entities, it will be more easily for them to avoid the pitfall.

However, SME sector plays an important role in economy all over the world. In the Greater China region, 95% of employed people are in SME's section in Taiwan according to Ministry of Economic Affairs in 2010[1]; in China, 60% of the GDP are contributed to SMEs, and 80% of employed people in the city are in SME's section according to Ministry of Industry and Information Technology of the People's Republic of China[2] reports in 2009. SMEs portfolio in United States are not lesser than SMEs in Greater China region, according to U.S. Small Business Administration and the Office of International Trade [3], SME sector employs 99.5% of all employer firms in 2008; and in EU, 99.8% of employed firms are SMEs (Eurostat, 2008). This makes a clear notion: SME sector plays a very important role in the economy, and shall not be ignored. However, base on our previous arguments, aforementioned service innovation tools might not cover every aspect of SMEs service innovation needs.

[1] Ministry of Economic Affairs, 2010, http://www.moeasmea.gov.tw/ct.asp?xItem=9504&ctNode=689&mp=1

[2] Ministry of Industry and Information Technology of the People's Republic of China, 2009 http://www.miit.gov.cn/

[3] U.S. Small Business Administration and the Office of International Trade, 2008 http://www.sba.gov/

Concluding this section, we state two problems of current researches in previous paragraphs, which are: (1) service innovation tools needs to be based on interaction because the nature of service, (2) based on the importance of SME sector in economic and their difficulties, an easier and guidance free service innovation tool is necessary to fulfill this existing gap. This section supports the environment part as the current technology of the IS research framework by indicating the current available service innovation techniques for SMEs and its insufficiency, and the following two subsections - alliance and interaction patterns - will illustrate the fundamental theory of this research's knowledge base.

2.2 Alliance

Alliance was always considered as a solution for SMEs to compete and survive (Miles et al, 1999). Through alliance, SME are supposed to be able to develop new competence, obtain crucial resources, improve access to market, achieve scale economies and strengthen firm reputation (Varadarajan & Cunningham, 1995). Innovation is also benefiting from alliance, the importance of inter-firm alliances in innovative activates were also widely recognized by the industry (Hagedoorn, 2002), for the reason that alliance with firms in unfamiliar domain can lower the risk and cost for the innovation (Linnarsson & Werr, 2004), or can obtain key resources and knowledge the newly innovated service requires (Dickson et al, 2006). To conclude, alliance enables the implementation and enhances the performance of the innovation; for companies building alliance to do innovation, it was called "joint innovation" (Cowan & Jonard, 2008).

Innovation could be done in two different ways: one is to decide the expected outcome of the innovation first and then gather the resource it needs to accomplish the goal; the other one is to start from gathering resource and then consider what

innovation can be done by these resources. So a company can start innovation from deciding the final result, or can figure out the resource it owned first and then decide what to do next. As for alliance, it means a company can start an innovation campaign first and then find partners for support, or make sure who is partner and what resource it can obtain before starting the innovating activities. The two directions form two different views to the innovation-alliance relationship. The first is a top-down approach; ideas are generated first and then try to use alliance to meet the bottom line of the resources needed. The second one is a bottom-up approach; SMEs make sure the alliance partners first and thus understand what resource can obtain before brainstorming for an innovative idea.

Innovation is inherently a risk taking thing (Rothwell, 1992); one of the major possible failure factors is resource and capability constraints of the innovation (Hadjimanolis, 1999). While this is similar for both large companies and SMEs, SMEs still face a more significant influence of the resource constraint in innovation (Hewitt-Dundas, 2006). Relating this argument with the top-down and bottom-up approach of innovation, for SMEs the bottom-up approach defines the accessible resource first, which means it moves the pain point of SME's innovation to the front stage of innovation process because it makes unfeasible innovation ideas closed at early stage and it decreases the time cost of the innovation failure. So the bottom-up approach of innovation-alliance is better for SMEs innovation, since it lowers the entire risk of innovation.

Another issue in the innovation-alliance relationship is the performance of the alliance. The management of the alliance is a main topic within that field (Ireland et al, 2002; Rothaermel & Deeds, 2006; Duysters et al., 1999); for all the benefit it could be achieved by an alliance, poor managing will make the positive result of alliance goes to negative results (Hamel, 1991), and other research already proposed contrary,

opposite opinion of the innovation-alliance relationship due to the risk and uncertainty of alliance (Miles et al., 1999; Chi, 1994).

However, despite the negative result of alliance, SMEs are not given choices to choose in innovation, with respect to the poor resource it usually has (Hewitt-Dundas, 2006). This means the selection and managing of the partners will count greatly on the SMEs innovation process. Research argues that there are five factors to consider in the partnership building (Whipple & Frankel, 2000): trust, management, ability of partners, clear goals, compatibility.

Nevertheless, from the point of view of system thinking, the value created from an alliance is from the interactions between entities (Spohrer et al, 2011), we argued that good interaction is the true key of a successful alliance. Also, as a service innovation, Tatikonda and Zeithaml argued that it requires intensively interaction between the innovation creator and the result deliver (Tatikonda & Zeithaml, 2001). Accordingly, to create a successful alliance that can boost innovation, we could choose interaction between the partners as the focal issue as a replacement of the aforementioned five factors.

Extends the notion of using interaction to manage alliance to service innovation creating, since we argued that interaction is a more service oriented perspective, we probably could anticipate this perspective will provide an alliance structure that is more likely to be service-innovation-targeted. Furthermore, the interaction based alliance managing could inherent the benefit of innovating through system thinking: consider things in a broader view.

Concluding, alliance could provide the important resource SMEs required in service innovation building, also it lowers the risk of failure or the destructive force of unsuccessful innovation project. To guarantee the alliance to provide proper service innovation insights, or to assure the alliance is service innovation dedicated, chances

are we could use interaction as a method of alliance managing. The discovery of this notion not only enhanced our foundations in the knowledge section of the IS research framework, but also enables us to forward our research to discover how to use interaction to manage the alliances between SMEs.

2.3 Interaction

From the SD-logic view (Vargo & Lusch, 2004), service is different from product because the actor of the value creation is different; while a product's value is determined by the manufacturer, the value of a service is co-created by the provider and consumer. This feature makes service a more complicated concept than product because service involves more actors that are needed to be taking into consideration.

To understand the complicated nature of service, we can use the science of system thinking to analysis service more systematically (Spohrer & Maglio, 2010). A service system is a bunch of actors, which called entities here, like individuals, groups, business, even nations, interacting under a specific scope to co-create value for each other entities. In a service system, entities provide their own value proposition and interact with other entities under a governance mechanism to create value outcomes (Spohrer et al, 2011)(also see Figure 1.1) . Deem to the work of system thinking, we can analyze a service by separating it into three parts to have better understanding: entities, interaction, and outcome. In this research, we aim at the interaction part.

Long before the interaction concept was proposed in service science or system thinking, the industrial and market (IMP) group have perform intensive interaction-related researches for years. According to the IMP perspectives, they argued that interaction is the core of the research of the relationship and network perspective of business markets, because it is the basis of the business transaction and basically the smallest analytical unit (Håkansson, 1982; Snehota & Håkansson, 1995;

Naude & Turnbull, 1998; Turnbull & Valla, 1986). One of the key researches of IMP group about interaction was proposed by Håkansson (1982), in the research, Håkansson stated that interaction of business shall be considered in a more macro scope; he separated interactions into four types of elements to study: interaction process, interaction parties, interaction environment, and interaction atmosphere (Figure 2.2).

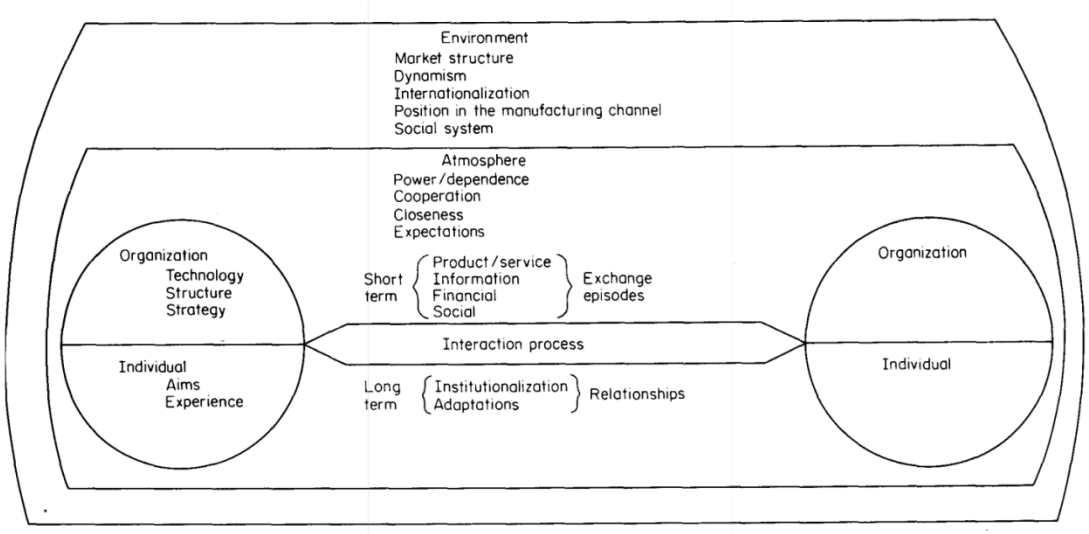


Figure 2.2 Illustration of interaction model
(Adapted from Håkansson, 1982)

The interaction process can be divided into short term and long term; the short term process is the actual exchanging process that happens between businesses, and the long term process is the aggregation of the relationship which builds within the exchanging process.

The interaction parties are the businesses that involving in the interaction, which are separated into organization and individual, by which organization is the company itself, and the individual usually refers to the person that interacts with another company's representative.

The environment is the business environment in which the interaction is taking

place, which considers the structure of the market and the dynamism, internationalization, position, social system. The environment is the outcome of businesses within the same industry, the society, and government's brawling.

The last one is the interaction atmosphere surrounding every interaction that the businesses are having. The atmosphere can be considered in terms of power dependence, cooperation, closeness, and expectations. All the factors within the atmosphere are affected by the environment, parties, process of the interaction, and are affecting them vice versa. Atmosphere is built through times, and is a dynamic factor that is changing and influencing the entire interaction condition all the time.

However, even though the IMP interaction model expatiated the interaction well, there are some statements against their research. One of the arguments is about the level of complexity of IMP interaction model. An IMP group research done by O'Farrell & Moffat (1991) applied the IMP interaction model as the basis of their research, but mentioned about its considerations of the complexity of the IMP interaction model. Håkansson (2002) indicated that interaction patterns are important and in some business marketing strategy businesses tend to aggregate interactive choices into specific interaction patterns. Wynstra et al (2006) also stated that no large scale efforts of investigating the interaction patterns around service, which they considered as a gap that needs to be fulfilled in their research.

An interaction pattern is the outcome of pattern recognition, which is a process that a specific individual trying to understand complicated and unrelated-like events as an identifiable patterns of behavior (Matlin, 2002). The pattern approach was widely used in many fields, like computer science, human interaction, psychology and physiology, business, artificial intelligence, and social science (Hannemann & Kiczales, 2001; Stark et al, 1962; Fehr, 2004; Hemelrijk, 1990; Barros et al, 2005; Fukunaga, 1990). However, not much interaction pattern related research can be

found, and most of the research only states that interaction have patterns (Halinen, 1997; Turnbull & Ford & Cunningham, 1996; Håkansson, 2002; Woo & Ennew, 2004). One of the researches with handful content of interaction patterns was given by Wynstra et al (2006).

In Wynstra et al's research (2006), they defined interaction patterns in terms of different service types, which are component, semi-manufactured, instrumental, and consumption. Each interaction pattern stands for a specific type of service that a supplier provides to its customer. For example, a supplier might not actually make components for its customers; however, the way they serve their customer fits the component service type's interaction pattern; so the supplier and customer are having the component type of interaction pattern between them.

Different patterns have different objectives, capability requirements of supplier and customer, representatives of supplier and customer, and the following Figure 2.3 can highlight their works. For managerial persons, one can apply to these different groups of patterns after clearly assessing how their customers use their service for further improvement direction and key point of the service. And for academic research contribution, previous research stressed intensively on ongoing production and delivery of service, this research rather aims on the supporting activities and resources of these processes. Also, this research adds in customer perspective, which enables to identify the similarities in the business interaction between services in different industry while most previous research mostly focusing on a specific industry (Wynstra et al, 2006).

This research of Wynstra et al's (2006) provides a good example of how interaction patterns works for business and how to study them. However, we argue about two things: service system not only has a buyer and a supplier entity, but also other related entities; and also shall interpret more on how each interaction patterns was occurred.

We do more explanations in the following paragraphs.

In a service system, the final outcome of value is co-developed by entities (Spohrer, et al, 2011), applying this concept to alliance, this means the value of the alliance is created by both sides. Take the supply chain perspective into alliance, there exists more than supplier and customer entities these vertical entities, but also exists other organizations like competitors and non-competitors that need to collaborate with to create value (Simatupang et al, 2002).

Type of service	Objectives	Critical supplier capabilities	Critical customer capabilities	Supplier representatives	Customer representatives
Component services	The service should fit with the customer's final offering	Production capacity and quality Development capabilities (in case of specialized services)	Translating/communicating final customer demands (on ongoing basis) Synchronizing the supply of various service components	Marketing representatives regarding the supplier's own service "downstream" specialists (knowledgeable of the customer's final offering)	Buyer specialists regarding the service bought, and marketing representatives knowing the needs of the buyer's customer
Semi-manufactured services	The buying company should be able to transform the service in the desired way	Production capacity and capability to maintain a stable quality Innovative capabilities (when used as an external expert and for strategic services)	Translating final customer demands Optimizing fit between internal and supplier's operations Synchronizing suitable contact interfaces between internal and the supplier's operations	"Production planning" and marketing representatives	Production and quality representatives
Instrumental services	The service should affect the customer's primary processes in the desired way The service should fit with important characteristics of these primary processes	Business development and innovation Business and service production design services	"Implementation" skills: understanding what fits when, how and for whom	Product representatives, often including a team of consultants or process engineers	Business development representatives and affected internal customers
Consumption services	The service should support various core processes	Ability to supply the desired service and (if needed) adapt it to the specific situation of customer	Translating/communicating internal customer demands (on ongoing basis) Follow up on performance and user satisfaction	Marketing representatives	Buyers and internal customers

Figure 2.3 Propositions on objectives, capabilities and interfaces for the different service types
(Adapted from Wynstra et al's, 2004).

At the meanwhile, alliance might not only occur only in a one-to-one type, a concept of alliance constellation was proposed, that is a company will form alliance with multiple companies to compete with other alike groups of companies (Gomes-Casseres, 1997). The advantages of alliance is obvious, so does the advantage of alliance with more than one company The benefit of alliance constellation was

classified into five items(Gomes-Casseres, 2003): linking to market, combining skills, building market momentum, reducing costs, sharing risks. The mentioned "combing skills" advantage was said to be able to create a new business or compatibility for the alliance. According to Juttner et. al (2007), they stated that to become a market winner a company shall have advantages on both marketing and supply chain, which we can refer to the concept that constellations build strong supply chain through multiple companies, and have strong linkage with the downstream market-closer companies shall be able to bring them victory in the industry. Leenders and Wierenga (2001) stated that integrating marketing forces and R&D capability is a major concern of companies that wish to have excellent new product development, also can adhere to the concept that for companies that have strong supply chain for the product or service, alliance with proper marketer and R&D facilities is a great choice. Concluding, SMEs have much more alliance choices and combinations that need to be considered than the four service types regarding only customer-supplier relationship of interaction patterns that Wynstra et al's (2006) have mentioned.

A second consideration of Wynstra et al's (2006) research is that the content of the interaction patterns they defined did take little from the IMP interaction model actually. One of the reasons that the IMP interaction model involves less in their research is because most of the four elements of the IMP interaction model (process, parties, and environment) was closely related to the specialty of a specific industry, involving too much IMP interaction model might jeopardize their researchs without loss of generalities. However, the IMP interaction model was still a great analysis framework for interaction researching, and we argued that it shall be concerned more in interaction patterns constructing.

The last element within the IMP interaction model that was not excluded because of industry dependent is the interaction atmosphere (Spencer & Sutton-Brady 1996). The

atmosphere is a long-term variability of interaction which is influencing and influenced by the interaction; the atmosphere is surrounding the interacting entities and affecting the process that the interacting entities are taking, and also the outcome of the process will influence the atmosphere of the interaction (Håkansson,1982). Due to the long-term feature the atmosphere is having, we argue that using atmosphere in the interaction patterns can reflect the condition of the interaction.

Although the IMP group have did much research on interaction, according to another IMP researchers (Woo & Ennew, 2004), they have argued that constructs of the interaction atmosphere are not unshakeable. Young and Wilkinson (1997) have argued that the construct of atmosphere is including a great diversity of research related to the business relationship managing, but the heart of the atmosphere actually is the competitiveness and cooperativeness of the business, and also the trust between the alliance partners. Hence, our next step is to make sure every constructs within the atmosphere, which are power dependency, cooperation, closeness and expectations are appropriate to embed.

The power dependency is about the degree that one company is able to influence its partner, and also whether one company is able to survive with or without another company's existence (Håkansson, 1982). The measurement of the power dependence is customer preference, completeness of line, sales, human resource, brand image, accessibility to market information (El-Ansary & Stern, 1972), which we argue to be related with the competitiveness of a business. While highly related with the competitiveness of business, power dependency seems appropriate to be a construct of interaction atmosphere.

The closeness of companies is another construct of the atmosphere, however, mentioned by Håkansson(1982), in which closeness is a construct that a company must manage well in the interaction, while too close or indifferent are both not a good

interacting condition, which is quite different to the power dependence construct that is the higher(or lower) the better. On the other hand, the high closeness of company with another company often result in high power dependence (Turnbull et al, 1996) which Håkansson (1982) had agreed that the closeness of two partners will reflect on company's power dependence degree. Another argument of closeness coming from Laing and Lian (2005), they stated that closeness of companies is the basic of trust - while companies are high in closeness, the level of trust or the easiness of forming trust is usually higher than other companies. Since closeness is crossing both trust and power dependence, which is referring to the competitiveness of the atmosphere, we argue that instead of keeping closeness, it is better to keep the power dependence construct, and add the trust construct into atmosphere measuring.

The rest of the constructs are cooperation and expectations. While the construct of the cooperation is referring to the compatibility of two companies' ability and the willingness to cooperate (Håkansson, 1982), it is naturally same to what Young and Wilkinson (1997) had argued; so it is fitting to the revised atmosphere constructs without questions. Meanwhile, the importance of expectations is agreed in many business related researches, research had stated that ability expectations and outcome expectations of the company are decisive factors of starting a new venture or not, (Townsend et al., 2008), marketing researches had put emphasis on managing customer's expectations for years(Gronroos, 2008; Parasuraman et al, 1988), and business alliance related research also devoted efforts on discovering how to manage expectations (Arino & Ring, 2010; Barney, 1986; Royer & Roland, 2009). Moreover, a value proposition of another company could be also considered as forming expectation for the exchanger; accordingly, expectations serve as an important factor as well as any other constructs. Concluding, we suggest that all the constructs of the interaction's atmosphere shall be taken into consideration in the

interaction between two companies.

Summarizing the previous paragraphs, we are stating two arguments against Wynstra et al's (2006) research. The first one is that interaction patterns in alliance relationship shall be more than only one-to-one, customer-supplier relation; instead it shall be patterns that involving lateral companies, and is multiple-to-multiple relation. The second one is that the IMP interaction model shall be more involved with proper revising, which we have the four construct involving in the interaction patterns: power dependence, cooperation, trust and expectation.

However, while Wynstra et al's (2006) interaction patterns categories are based on the different service types of a supplier to the customer, adding lateral companies into the interaction patterns will create countless service types belongs to lateral-supplier and lateral-customer interactions, which are considered not feasible for this research. Instead, we argue that the interaction patterns shall be categorized by the roles of entities it is partnering with, which are customer, supplier, and lateral entities.

Moreover, within this research, the customer and supplier entity are defined in a broader definition to cover wider diversity of different industries. The customer entity will be defined as both customers and all the entities that could help linking the SME with its current customer or bridge connection with new customer. The supplier entity will be defined as both material suppliers and all the entities that hold the key resource or knowledge which can improve the SME's current products or services quality. (We will still use customer and supplier to call these entities in the following paragraphs to maintain the readability of this thesis)

On the other hand, the original interaction patterns (Wynstra et al, 2006) only provide the best interaction pattern of a specific service type that can achieve a direction for managers to refer to. However, we consider that it will be more useful for manager if there are more different level patterns to compare and assess their

company's status. By taking more patterns into the framework, the usability of this model could be expanded greatly from a directing-only function to more an analysis tool that are able to evaluate current condition and provide guidance to SMEs.

Thankfully, the four constructs we have identified: power dependence, cooperation, trust, and expectation are originally having levels (Laing and Lian, 2005; Johnson et al, 1996; Chatman, Barsade, 1995); thus the interaction patterns using this four constructs are able to be classified into different levels of patterns. While low in power dependence, cooperation, trust, expectation are referring to a worse interaction with an alliance partner, indicating a need of improvement; high in power dependence, cooperation, trust, and expectation corresponds to a better condition of interaction. In consideration that lacking of levels will cause SME hard to assess their current pattern, but an excessive number of levels will also cause diffusion, we here roughly define 3 levels of interaction patterns: worst, average, and best, performed by different performance of the four construct (in Figure 2.4).

Regarding to the concerns, we re-invent the interaction patterns of Wynstra et al's (2006) research. First, the service types categorize method will be replaced by the roles of the alliance entities, which the role are supplier, customer and lateral entities. Secondly, the interaction pattern which a SME belongs to could be measured by the four constructs from the interaction atmosphere of IMP's interaction model: power dependency, cooperation, trust and expectations. Lastly, the "only best" interaction patterns classification will be expanded into three levels of interaction patterns. Thus a SME company can have three levels of interaction patterns: worst, average, and best with three roles of alliance partners: customer, supplier, and lateral.

Concluding, by the categorizing method we just mentioned, we defined proper business interaction patterns that are fitting to our purpose, responding to the first problem we mentioned in section 1.3 that we need to solved in order to fulfill this

research's intentions. This adjusted interaction pattern framework could support us in alliance managing for service innovation, and further provides us foundations to forward to model-creating process for interaction pattern based service innovation theory. In Chapter 4, we will further describe how interaction pattern could be manage by different constructs, and how could interaction pattern manipulating leads to service innovation. To reiterate, this section, alike the previous section 2.2, is corresponding to the knowledge base part of in the formation system research framework.

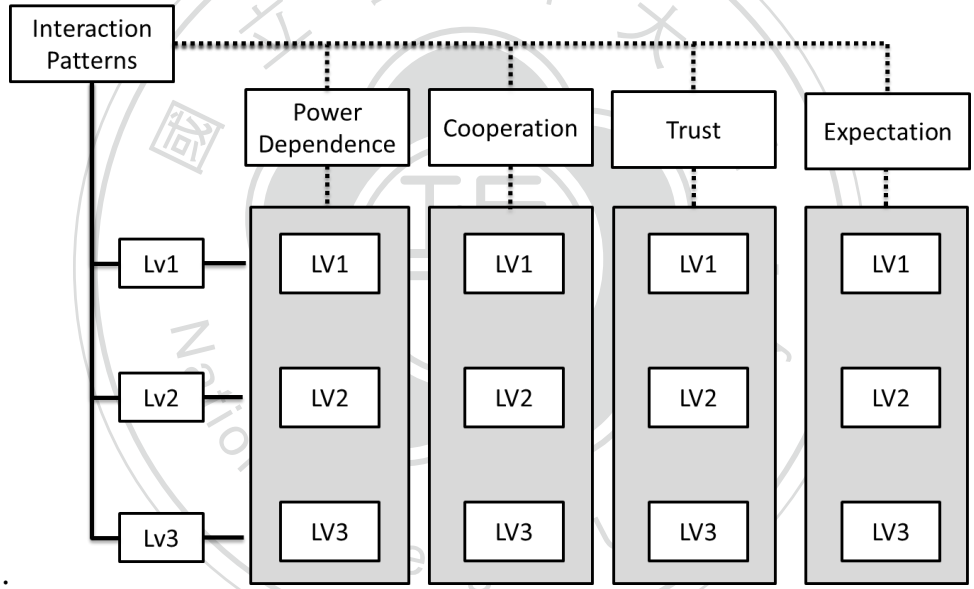


Figure 2.4 Interaction patterns and constructs mapping diagram

This chapter had reviewed research from the following fields: service innovation, alliance, and interaction that are relating with the intention and foundation of this research. We have summarized ideas proposed in the previous sections into 5 five points in the following:

(1) Existing service innovation tools shall consider interaction of the entities within the service system more to gain a stronger theory foundation.

(2) Existing service innovation tools are not mainly designed for SMEs while these tools require people well-trained of using these models, which SMEs usually lacks of, to exploit its value.

(3) Alliance with other companies is one of the best ways for SMEs to do innovation since SMEs are scarce in innovation-necessary resources

(4) The key of innovating through alliance is managing the interactions well.

(5) Interactions can be classified into patterns to become more analyzable, and different patterns could possibly serve as measurements and guidance for SMEs to follow and use to gain higher service value.

These concepts provide the knowledge foundation of this research, and by linking these concepts, we can form our theory base to solve the problem we have perceived. By creating a service innovation supporting tool for SMEs to use, which are focusing on concepts ignored in previous research but important (i.e., the interaction patterns within alliance partners), we can provide SME managers with a way to create their own compatibility through innovation and survive in the competing market.

CHAPTER 3. MOTIVATION APPLICATION

This research about interaction oriented service innovation is actually based upon a bigger research project – the ImageCons system, and serves as one of its components. The ImageCons system was also another component of an even bigger research project aimed at using sign value based approach to do service system design. This chapter will explain the Sign-Value-Based Approach research and ImageCons system project in details, and serve as the knowledge base corresponds to the IS research framework of this thesis.

3.1 Service System Design: A Sign-Value-Based Approach

Service system, as its definition, was a value co-production process, connecting agreed value propositions and shared information of different parties of service entities under a configuration of people, technology, internal and external service systems (Spohrer et al, 2007). Service providers who wish to deliver superior value to its end customers has to rely on its competency, which are based on service provider's ability on service designing, engineering, performing, and managing the dynamic configurations of resources within the service system that can create value when arranged into systems working with other service systems (Spohrer & Maglio, 2010).

However, an important intrinsic aspect of customer-centric values is the sign value approach addressing that the value arises from socio-cultural-environmental contexts and is subjective with the socially assigned meaning as the service outcome (Yuan, 2011). On the other hand, service system design refers to applying the design principles for dynamically configuring service system entities to co-create value specified by a given value proposition. Thus far, there are no systematic ways of

developing sign values based service systems. To this end, this project is a research agenda aims for sign value based service design, and using methodology of ICT-enabled sign value approach for service system design, which uses the sign value as a means for "concretizing" the essence of a service in terms of the sign value driving the "what" and "how" of service system design.

The sign value approach project is composed of two parts: goal imagery creation and goal imagery delivery (Yuan, 2011). The first part aims to provide the methods that can effectively assist a SME to create its goal imagery. The second part contains a set of models that can enable SMEs within a geographical cluster that can locate appropriate partners, manage cooperation, and communicate with customers to provide the service solution featuring the goal imagery delivered to meet various customers' demands. The ImageCons system is designed to fulfill the first part of the project.

3.2 ImageCons Project

The ImageCons system is an user-centered goal imagery creation process, a goal imagery is to be co-created through a dynamic co-creation network model drawing upon the materials from a knowledge base of imagery bank, the user's understanding of its context, and the user's selection of service innovation FPOD form focus, followed by the testing of the prototyped stories demonstrating the meaning of the created goal imagery, Figure 3.1 provides a better understanding.

Figure 3.2 is the information technology enabling method's architecture that we have devised to exercise the model in Figure 3.1 in order to create goal imageries that could motivate SMEs to change their behavior. The step by step explanations of each part could be found in the following paragraphs:

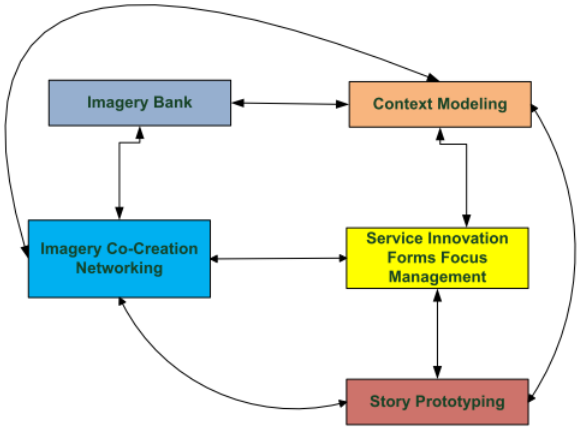


Figure 3.1 The main mechanism components behind imagery creation
(Adapted from Yuan, 2011)

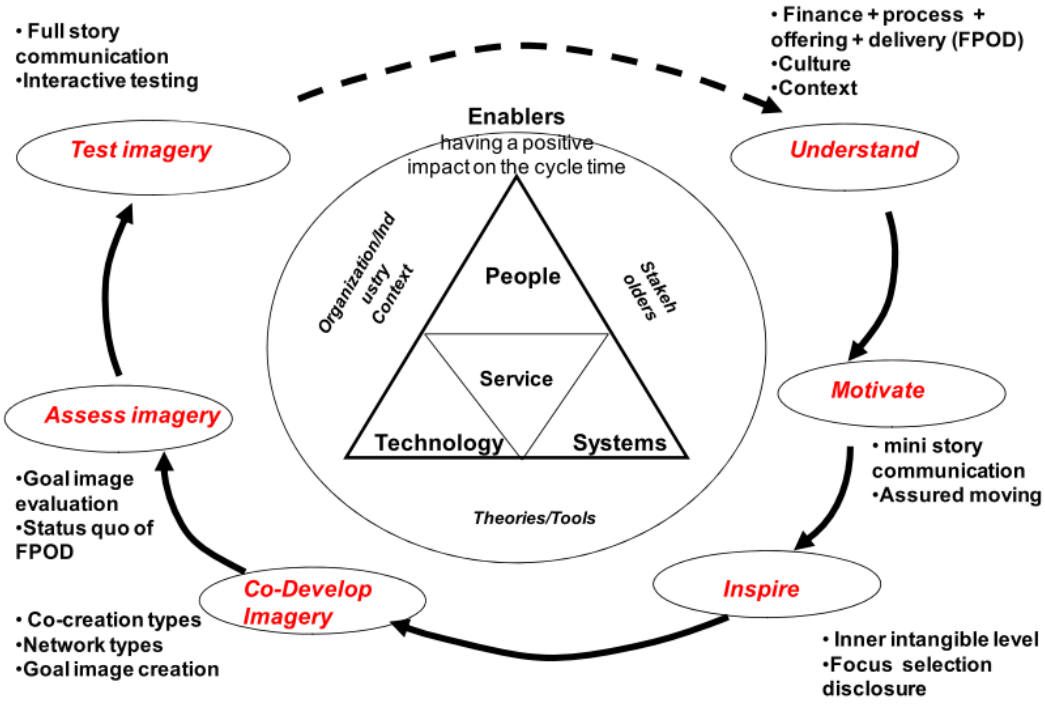


Figure 3.2 Architecture of Goal Imagery Creation
(Adapted from Yuan, 2011)

(1) Understanding the context aims to provide the service innovation typology models that can represent and compare the capabilities, socio-cultural and environmental context.

(2) Motivating story creation attempts to provide a short communication story

framework that can appropriately connect the elements of story with the content of the context in order to automatically generate communication stories that could move SMEs to engage the subsequent development of their goal imageries toward innovation.

(3) Inspiring means the inner intangible level rehearsal of the selected focus of innovation.

(4) Co-developing the goal imagery aims to provide the imagery model and the co-creation network model that can assist and facilitate the creation of the goal imagery with their customers and appropriate collaborators.

(5) Assessing the goal imagery intends to devise the measurement models that can identify and quantify the gap between derived goal imagery and the current status quo of the SME context.

(6) Testing the goal imagery attempts to provide the methods of interactively prototyping the created goal imagery in terms of automatically generated full communication stories, followed by the SME's subjective evaluation.

3.3 ImageCons System Architecture

Responding to the previous sections describing the ImageCons system background, we have defined the following system architecture (Figure 3.3) to accomplish the model. Explanation of the architecture can be found in the following:

(1) The first part of the system refers to the understanding process in Figure 3.2 and was designed to understand SME user's current situation. The understanding process will be conducted through two separated ways: interaction patterns approach and cultural analysis. Interaction patterns approach aims at collecting environment data of SME users, and co-create an innovation direction for SME user to consider. The cultural analysis was focusing on discovering the SME

user's culture features that are applicable to add into its service innovation.

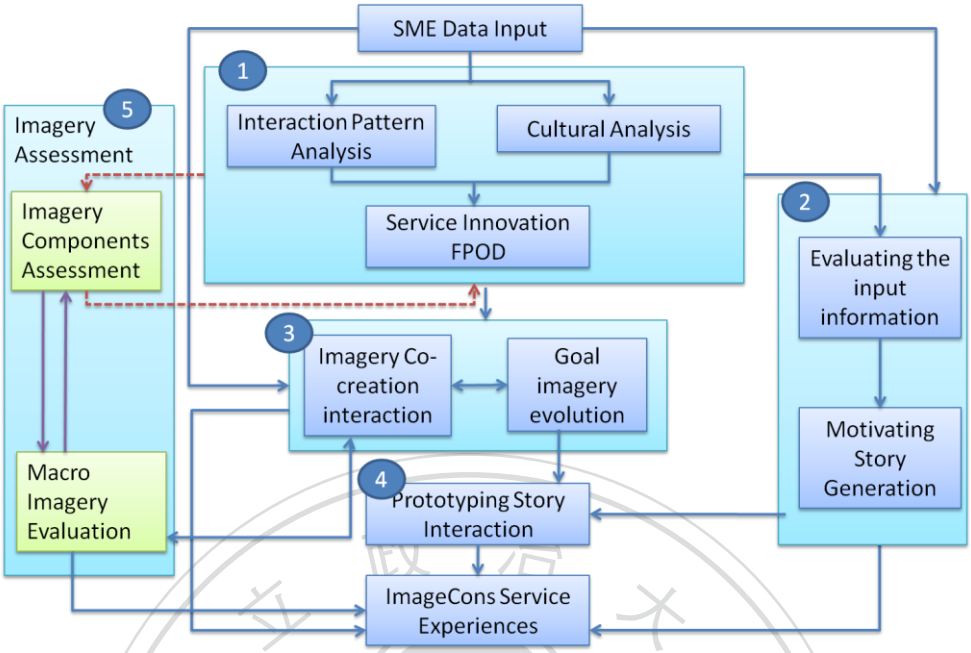


Figure 3.3 ImageComs System Architecture

(2) The second part is to provide a motivating story with the information the system collected. Analysis and evaluation will be done in advance, and will provide a short story based on the input information from previous system. This part serves as a checkpoint for SME users to make sure the type of innovation they want to create before doing further image co-creation process, and also is designed to motivate the SME user to go on with the image co-creation process.

(3) The third part is planning to provide SME users the instrument to co-create image with other SME users. Users are encouraged to try multiple choices of images and through iterative working process to generate a final version of image.

(4) The fourth part of the system is to provide an adjustable story prototype to convince the SME users to use the image, also works as a mechanism to test whether the image is robust and appropriate or not by using a story to give SME users a better imagination.

(5) The last part of the system is the evaluation of the image, and it works all along

with the image-creation process. The system will analyze the current image that the SME user is actually providing to its customers, and the created-image will also be given a score to compare with current image.

This interaction pattern for service innovation research is aiming at the first part of the ImageCons system, which is using interaction patterns to understand SME user's current environment and the desired service innovation they are hoping to achieve. More details about the mechanism of this research will be explained in following chapters.

CHAPTER 4. INTERACTION PATTERN BASED INNOVATION RECOMMENDATION MECHANISM

In Chapter 4, we will elaborate the Interaction Pattern Based Innovation Recommendation System, the artifact we proposed as the solving methodology of the two problems of existing service innovation supporting tools we have been discussing in previous chapter – not-service-centric and guideless.

There are two subjective in this chapter. The first is to present the conceptual model of interaction pattern based innovation recommendation mechanism, which will expatiate on the key concepts and their relationships. The second part is the descriptions of the mechanism's system modules, in order to demonstrate why this system has high caliber in providing support to SMEs in innovating; Section 4.2 will illustrate the entire system architecture, and Section 4.3-4.7 will be the detail of each module knowledge foundations and artifact's implementation.

This chapter also constitutes the Develop/Build section of the IS research framework.

4.1 Conceptual Framework

The conceptual framework of this research is listed below in Figure 4-1. The primary goal of this research is to create a supporting tool for innovation recommendation, which can abstract SMEs situation information, and provide a hint of innovation with clear guidelines combining SMEs opinions. The development of the information system is trying to facilitate this process by leveraging information systems technique. By doing so, the final result of this research could provide SMEs

with a service which they are able to access at any time, and provides plenty of insightful innovation hints with clear guidance.

As we have discussed, for companies who want sustainability, innovation is required. However, comparing to large firms, SMEs have a number of typical problems with regard to their innovation process, SMEs have to face more financial constraints, they have more manpower bottlenecks in terms of too few or unqualified personnel and they often don't have the possibility to substitute for the lack of sales and profits through other products (Kaufmann and Todtling, 2002) which makes it necessary for these companies to cooperate with other organizations. Also, SMEs engaged in technological innovation have used research and development alliances for information exchange, technological transfer, and risk management (Dickson et al, 2006).

Moreover, if we view in another side of alliance for SMEs, according to Michael and Palandjian (2004), SMEs are usually less bureaucratic and generally have greater incentives to be successful than large firms, making them very suitable as network partner. This comes to a conclusion that enterprises create innovation by all kinds of ways, while SMEs tends to find alliance to access resource needed for innovation in most of the times.

Then the importance of interactions appears. Based on the definition of service system with which all possible or existing alliance partners are individual entities, the output of the service system is co-created by these entities. Since SME's are highly relying on the alliance with other entities, the way how they interact becomes a key factor for an innovation to success. For SMEs who want to survive the environment and growth by performing innovated services, the interaction condition with other entities within the service system must be studied clearly.

Nevertheless, interaction is difficult to analyze by its nature, but as we have mentioned before in Chapter 1 and Chapter 2, the methodology of pattern recognition is very appropriate to be used at here (Fukunaga, 1990), which Wynstra et al's (2006) had already applied in their interaction research before. We can use interaction patterns to abstract the details of interaction to do further study for achieving better performance of SMEs. By using interaction pattern as the basis for analysis, we shall be able to come out with suggestions based on interaction for SMEs to follow.

Figure 4-1. Conceptual Model

The following section will explain the conceptual model:

Arrow (1): SMEs have an urge to survive in the competing market, and need to innovate to remain competitive. For the reason that SME holds great share of economic production, to make SME competitive is an issue for every country needs to tackle with. Due to the scarce resource that SMEs owned, alliancing are usually their way to compete (Varadarajan & Cunningham, 1995), which we already mentioned in Chapter 2. So the Arrow (1) represents the idea that SMEs tend to find alliance opportunities for innovation chances, and it also represents the relevance of this research.

Arrow (2) and (3): Existing theory and tools supporting for innovations are many, and some of them are based on alliance building. But in terms of SMEs, two problems emerge. The first problem is most innovation supporting mechanisms are mainly

following the product centric view, which might lead to a pitfall of failure (Vargo & Lusch, 2004), because service innovation are different then product innovation. The second problem is that existing support for service innovation requires qualified person or someone with a specific discipline. While big companies can access these people easily no matter from its employees or find ones from outside, SMEs are lack of these channels to approach these people and it makes them have difficulty in applying these tools. So Arrow (2) represents the need for new service innovation tools which could be based on service dominant logic, which keeps the concept of interaction and system thinking in mind (Aronson, 1997). And Arrow (3) means the lack of guidance for SMEs to apply these existing tools, which needs to be solved in order to provide better support for SMEs in doing service innovation. The problems these two arrows stand for are the main issue that we have observed in existing environment, and it needs to be solved in order to come out with a proper service innovation tool for SMEs to use to outlive the market competition. It also represents the significance of this research, which we have described clearly in Ch1 already.

Arrow (4): The forth arrow here shows the idea of how we're going to solve the problem as we perceived in Arrow (2), which stands for the issue of product centric innovation tools was misused in service innovation. The key solution is to look out from the lens of service. When it comes to service, the value provided will become a proposition of value, which waits to be created during the interactions between service provider and consumer. The idea of interaction also fits in alliance building since the value produced from the alliance is co-created by both sides of the allies, which makes the way interacts are important, too. So by investigating the interaction pattern of the SMEs having with other entities within the service system shall be able to create a better alliance which can brings SMEs innovation sparkles.

Arrow (5): With good guidance, SMEs shall be able to perform the improvements alone without advises, so we can say that guidance for the implementation of a service innovation is crucial. In order to create good and proper guidance for SMEs to cope with, there shall be plenty of guidance for different SMEs situations and conditions; also, examples shall be provided too. In that case, cases of previous successful innovation based on alliance building under the same condition of the service system shall be provided to SMEs, to make the SMEs able to implement the hints provided by service innovation supporting tools. Arrow (5) stands for the aforementioned ideas, and it also means a main issue this research needs to handle. Approaches will be described more detail in Section 4.2.

Arrow 6: The purpose of the interaction pattern based service innovation supporting tool is to help SMEs to do service innovation in terms of alliance, with proper guidance supporting. We anticipated with the help of this tool, SMEs can create a new alliance condition which can results in a good service innovation to remain competitive in the market for survival. Arrow (6) here lays for the desire outcome we wish to create to handle the dilemma we saw in SMEs current situation, and means how this tool is going to be tested.

4.2 System Architecture

This section and the following section will explain the system architecture and the knowledge foundation of the theory we will embed in the system design.

Mentioned already at the very beginning of this thesis, the purpose of this research is to enable SMEs to do high quality service innovation by themselves. In other words, what we wish to provide is a self-service service innovation supporting service, which is able to collect information from the user then analyze and generate corresponding service innovation hints and guidance based on changing the alliancing condition by

adjusting current interaction patterns. The entire system architecture is presented in the following Figure 4.2.

As a service, we shall also consider this information system and the users as another service system which have two entities within – SMEs and information system, of which the desire outcome is a proper service innovation direction and guidance. To achieve great system performance, great outcome if in other words, the users must be intensively involved in the system to adjust system process and results immediately, and provide more detailed information at once whenever the system requires. As we mentioned before, the interaction of the entities within the service system must always be in mind. So in order to generate good and proper service outcome, this information system must be a highly interactive system, the interactions shall be modeled carefully by the designer, and the system must be able to adapt to changes and differences automatically through the service. This serves as the design principle and evaluation measurements of this information system.

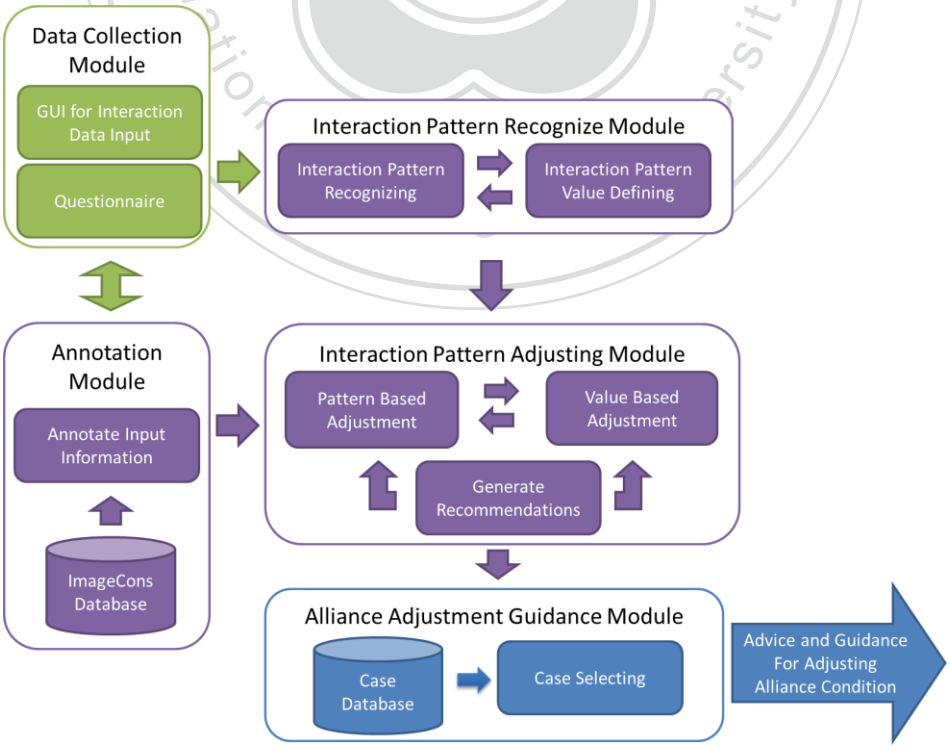


Figure 4.2 System Architecture

At the beginning of the service, the SME users will start from the Data Collection Module, which will abstract data that is required for recognizing the interaction pattern.

Then the system will pass down the interaction information it collected to Interaction Pattern Recognizing Module to analyze user's interaction condition with other entities within its service system, followed by moving to pattern recognition. Users are also involved in here, because after the interaction pattern is recognized, the system will display the explanations and examples of the pattern to make sure the user is really classified into this pattern, if any gap exists between the analyzed results and the real world situation, adjustment will be performed here.

After the interaction pattern is recognized, the next step is the adjusting module. In Interaction Pattern Adjusting Module, the system will provide two ways for users to come up with an improvement goal – bottom-up or top-down. Users can input their desired situation into the system to see what kind of recommendations will come out; or try and test for different kinds of interaction situation from scratch , find out each of which it will leads to and then choose the most appropriate one. There might be some pain points for users in this module, such as confusions about what step should go next and the result a step would bring in. Accordingly the third component within this module is a recommendation system, which will lead user go through the process or provide advice for users to try. The final outcome of the adjusting module is a desired interaction pattern for a good alliance condition to do service innovation, and the implementation route from current situation to desired one.

Through the Interaction Pattern Recognizing Module and Interaction Pattern Adjusting Module, the user will be able to create an interaction pattern based service

innovation direction to work on, which can be related to the Arrow(4) in the conceptual map. The output of the adjusting module will be passed to Alliance Adjusting Guidance Module, which intends to solve the issue mentioned in Arrow (5) in the conceptual map.

The key component of the Alliance Adjusting Guidance Module is the business case database and the guidance system. The business case database will contain several cases of business that are under some particular circumstances by which some efforts on changing its interaction situation with its fellow partners or other entities within its service system can achieve its desire outcome. The guidance module will reference the data it received to the case database, and select the most appropriate one for SME user; also it will display and point out the key success factor of the case for SME user to refer during their own implementation works.

Through this information system, we hope to provide SMEs with a self service to generate a good service innovation hint, which can bring them competence to survive the market. The following sections will elaborate the details of these modules and the foundation theory behind it.

4.3 Data Collection Module

To enable the self-service system and for better output quality, the data collection work must be done in great precision to eliminate the need of human intervene afterwards. But also, it is easy to understand that while the precision of the data input is increased, it will become a heavy burden for user since it will require lengthier data input effort. Based on the easy-to-use design principle of this system, the input method must not be too complicated or skill required, but the data intensity must meet the minimum level for recognizing the interaction pattern. As an interactive system, this is a major problem that needs to be solved. In sum, the Data Collection

Module is designed to collect the interaction condition of the SME users exclusively, and to make the collection process smoothly and facile for the SME users through designed data input method and system interface.

The following paragraphs will introduce the design principle of the module, the implementation of the module, and the background supporting theory for the module in details.

Before simplifying the data input process, the information to-be required in this module must confirmed first. This module in charge of the data collecting work for later modules needs, it is designed to gather the information of how the users interact with other entities within its service system , in order to understand the interaction pattern of the user is having. As mentioned in Chapter 2, we stated that interaction pattern is an one-to-one concept, whenever a new possible interacting entity appears, the user will form a specific interacting pattern with the entity. Hence the data required here is the interaction condition of the user with all its possible interacting entities, and each possible interacting entity have their own interacting condition to be input to the module.

Information can be delivered to an information system in terms of text or multimedia, however, there are some constraints on both information system side and the user side. For text based information, it might be too lengthy for user to describe all the interaction condition the user is having with each entity in the service system. And for multi-media, since interaction condition is an abstract concept, it might be difficult for user to find proper images or sound to present its interaction condition with an entity; also, since everyone might have different explanations on a specific image or sound, there might be a cognitive gap exists between the user and the system on a same multimedia input file, which might leads to misunderstanding

of the interaction condition. Based on these reasons, we decided to use questionnaire as the way we collect data.

The benefit of using questionnaire is as following (Cooper and Pamela, 2008). The first is it requires minimal staff involvement, which means it is a good method for a self-administrated work, for a self-service system this is a major concern. The second reason is it is highly compatible with computer systems, making it an appropriate method for this system design principle. The last feature is questionnaire allows participants time and space to think about the problem, which makes the users can think about their interaction condition more carefully, also it allows the designer of the questionnaire can design more complicated and time-required question for respondents to answer. These features makes questionnaire an ideal data collection method to use in this system design, the next problem is to come up with a structured and testified questionnaire.

As we defined in Chapter 2, there are four main constructs of interaction and it were also serving as the foundation of the interaction pattern, which includes expectation, trust, cooperation, and power dependency, the questionnaire to use in this system shall be able to capture SME user's performance on these constructs. Since there are many researchers like the IMP group have done research on business interactions which the construct of interaction are closed to the definition we defined here, and questionnaires are highly used in those research, it is adequate to adopt the questionnaires they have already used to improve the robustness of this research, and also reduces the work on designing and testing a questionnaire. The questionnaire to-use is presented in Table 4.1, the Cooperation and Trust construct are adopting questionnaires from previous works of other researchers, and the Power Dependency construct questions-to-ask is defined by this study base on the definition of Power Dependency we stated in Chapter 2 (More details of questionnaire is in appendix).

Table 4.1 Questionnaire details

Cooperation (Source: Frear and Metcalf, 1988; Metcalf et al., 1992).	The level of process-cooperation of the entity The level of the entity can response the requirement or solve the complaints The level of cooperation of the actor during conflict
Trust (Johnson et al.,2000)	The level of Credibility trust The level of Benevolent Trust
Power Dependency (Sorted by us)	The level of importance of this entity The level of involvement of this entity in SME's process The level of irreplaceability of the entity

For the expectations part, because there are many different kinds of expectations that could occur within two companies, like the expectations for alliance, service, product quality, and future plans; to measure expectations, we will have to decide what to expect first for interaction. As stated in section 2.3, three more factors other than expectations were defined for measuring interaction patterns – trust, cooperation and power dependency; moreover, since in this module we only wish to ask the interaction details of two companies from one SME, the response could be considered as assumptions of the interaction from our user. In other words, the details of trust, cooperation and power dependency, are in fact the expectations of trust, cooperation and power dependency of one SME having to another SME. Accordingly, we will not ask questions about expectations, but rather involve the idea of expectations into trust, cooperation and power dependency, and merge the idea into each question in the questionnaire..

However, this questionnaire requires SME user to fill for each entity it is interacting with, for example, if there are ten entities the SME user is interacting with, then the questionnaire must be filled for ten times, which might makes this input work be too lengthy and annoying for SME user. Also, it might influence the

precision of the data input since the questionnaire needs to be filled for many times but with different entity, the comparison foundation of the SME user might change during the whole responding process. These side effects might lead to bias in later data analysis, which needs to be avoided.

We can solve this problem by re-designing the input method of the questionnaire; instead of answering eight questions for each interacting entity, we wish to minimize the input work to one data input action for each interacting entity. The following Figure 4.3 can present the idea of the design. The circle means the level of cooperation, that is, the closer to the circle means the user and the entity have high cooperation. The size of the rectangle represents the power dependency of the user and the entity; the bigger the entity means the higher of the dependence of the user to the entity. The last one is the construct of trust, which we use color to represent; if the rectangle is red, it means the trust between user and entity is low, blue for average and green for good. Also, according to the definition we made after comparing previous research on alliance, the entity's role it played in the service system is also important thus must be known to do further analysis. We can design the input method as a map-like graph; the different position of the entity place in the map means the different role it served in the service system.

However, there exists a gap. Each construct have two to three questions in the questionnaire, but the SME user can only fill each construct with one answer as presented in the example. For example, there are three questions in cooperation construct, but we only use the distance of the entity and the SME user to represent the construct, it requires a transformation.

The purpose of the questionnaire is to subtract the interaction condition of the user with other entities, and this information are going to be used in interaction pattern recognizing. Consequently, how the recognizing system does the analysis will

influence the data collection. Before we introduce the transformation, we need to introduce the interaction pattern first.

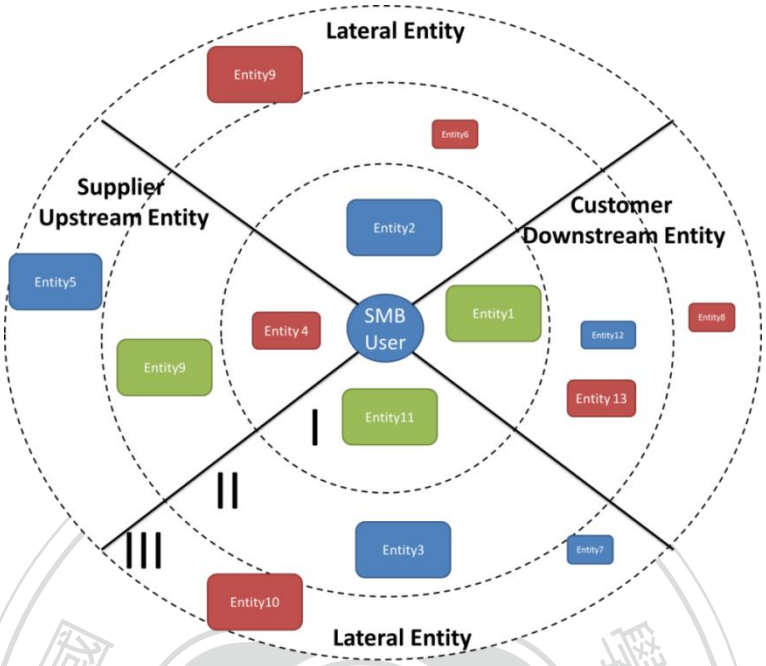


Figure 4.3 Data Collection Module Example

In chapter 2, we have argued that there shall be a dominating interaction pattern with another entity with which for most of the situation the SME users will seek to have the relationship that is well and trustable, and also the SME can have great influence on the entity. On the other hand, there lies an interaction pattern that is least welcome for a SME with another entity within the system, and also an interaction pattern which lies between most unwanted and dominating pattern. We renamed these interaction patterns into numbers, hence we have interaction pattern level 1 for the worst interaction patterns to create value from an alliance, interaction pattern level 2 in the middle as an average, and interaction pattern level 3 for the most welcome .

For interaction pattern level 3, it requires all the three construct have good performance, which means the user have low power dependence of the entity, high trust and good cooperation relationship. If any one of the construct performs bad, it will drop to an inferior level, the following Figure 4.4 will explain the concept in

details. So from another point of view, we argues that if any one of the construct performs bad, such as very high power dependence of the user to the entity, even with high trust and cooperation inside the interaction, the interaction pattern shall be at level 1.

To fit the interaction pattern level classifying method, the construct shall be measured in the same way, since there are three levels of interaction patterns and the construct shall also have three levels corresponding to them, which are high, medium, and low. Hence, the way to evaluate the result of the questionnaire shall be able to respond to the level classifying principle. To do so, we design the questions in the questionnaire as a Likert scale with three levels, respecting to low, medium and low.

Table 4.2 Influence of poor performing construct on interaction patterns

Interaction Pattern Condition	Results and Explanation
Good in power-dependency Good in cooperation Bad in trust	While the two entities are bad in trust, it means that the two entities are not going to put themselves on the alliance. However, to create value from the alliance, it requires both of the entities have commitment to the alliance.
Good in power-dependency Good in trust Bad in cooperation	Cooperation means the two entities have the ability to work together and the two entities competence are compatible to co-create values that are needed. If two entities are low in the cooperation construct, it might mean the two entities can't create bigger value with alliance.
Good in cooperation Good in trust Bad in power-dependency	Power dependency can relate to how much the partner entity can influence the other. If the partner have higher influence on the SME user, it might suggest that any value that is created from the alliance might not going to benefit the SME user, so it won't be a good situation for the SME users.

However, there are two to three questions for each construct, it still lacks of a method to measure the performance on each construct by the questions. Based on the original developer (Frear and Metcalf, 1988; Metcalf et. al., 1992; Johnson et al, 2000) of the questionnaire and the definition of the power-dependency, each of the questions of the construct is indispensible. We argue that if any of the questions of the construct is reported as "low", the construct performance will be low, and more explanations are shown. The following table 4.3 shows an example of the evaluation process and method.

Table 4.3 List of the influence of poor performing questions on the constructs

Questions of constructs	The impact of the questions to the constructs if the questions response is low.
The level of process-cooperation of the entity	Low cooperating ability results in low chance and needs to cooperate.
The level of the entity can respond to the requirement or solve the complaints	Results in the possibility that the partner entity might not be able to meet all the requirements of the SME users, which makes the cooperation performance low.
The level of cooperation of the actor during conflict	Low performing of this questions means the cooperation might not be long-lived
The level of Credibility trust	Low credibility trust means the entity might fail the expectations and it will lower the trust
The level of Benevolent Trust	Low benevolent trust means the entity might take advantage on the SME later, resulting in low trust
The level of importance of this entity	If the entity is too important for the SME users, then the power dependency must be low since it's too important to lose.
The level of involvement of this entity in SME's process	The degree of the entity involve in SME users process, the higher means the entity is more important and heightens the power dependency
The level of irreplaceability of the entity	Even though the entity might not play important part in SME user's process and have little influence to the market, if it is irreplaceable for the SME users, the power-dependency will be high.

The next Figure 4.5 displays the entire process during the data collection module. The user input data through the GUI for Interaction Data Input, and the data will be passed down to the questionnaire system to do the corresponding questionnaire filling. If the user have are confused or want to verify the input more detail after the input process, the user can go into the questionnaire system to do more precise description of the interaction condition. If the user is confident of the final appearance of the interaction condition inputted, the interaction condition data will be passed down to the next module.

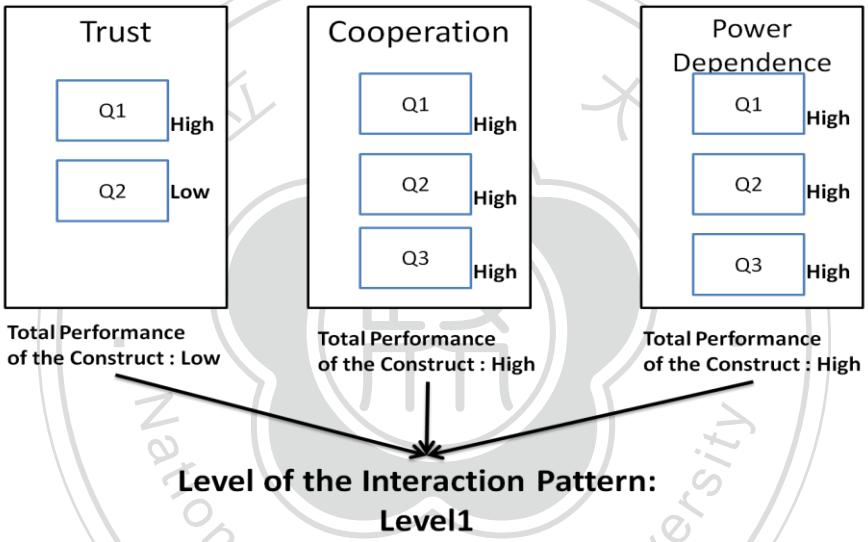


Figure 4.4 Evaluation processes of the interaction patterns
(Construct Performance: Trust: low; Cooperation: high; Power Dependence: high)

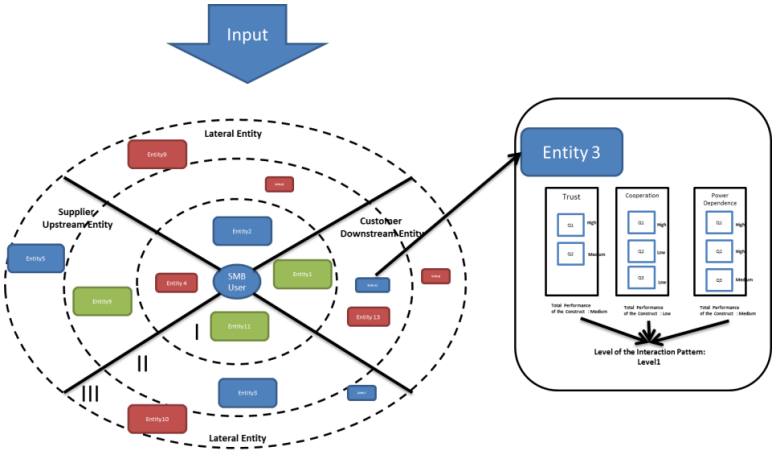


Figure 4.5 Data collection module process

Concluding this section, by the questionnaire and the simplified method we created for SMEs users, we anticipate this mechanism could make the data required for later pattern analysis collected easily and less biased. In addition, in this section we also responds to part of the second problem we mentioned in section 1.3 that needs to be solved - how to analyze the business situation and fit into interaction patterns we defined. By using the data collection module, we could gather the information we required for recognizing the pattern of the businesses interactions, and discover their pattern by further processing in next module.

4.4 Interaction Pattern Recognizing Module

Interaction pattern recognizing is one of the most important part of the system's work, and the intent of the module can be explained in one sentence: Analyze the interaction pattern the SME users are having with each entity and calculate the benefit that it would bring to the SME users.

The recognizing method was described in Figure 4.4 already; the following will explain how to leverage the system to work on the concept of interaction pattern's value which we have described in Section 2. And also, the evaluation method, which we will call measuring the value of the service innovation directions the interaction patterns can bring, will be stated in this section to support the design of the Interaction Pattern Value Defining System.

The success of the alliance relies on the trust between the two partners, the power dependence of their relationship, and the ability of the cooperation of both sides (Whipple & Frankel, 2000), which are very identical to the constructs of the interaction pattern. So we might be able to extend the concept to that, while having high level of interaction pattern with an entity, which means the trust and cooperation

between the two entity is high, and the power-dependency of the SME users towards the entity is low, the alliance performance will rise in accordance to the high interaction pattern level it is having.

However, the value of the alliance, or in other words, the value of the interaction pattern hasn't been defined. The value serves as the measurement of the service innovation directions; for example, the meaning of high interaction pattern is it results to better alliance performance (Gravier et al, 2008), but since there are many benefits that can be achieved by alliance like access to more resources, lower communication cost, better R&D ability(Alvarez and Barney, 2001), how to choose a value definition that is most appropriate to make the SME users understand what kind of service innovation directions the interaction patterns can brings, and the degree of the benefit the innovation can generate. Without a value definition of the interaction patterns, it will not be able to generate service innovation directions for SME users to follow, and it might hard to make SME users understand the advantages of the innovations will bring by interaction pattern adjusting.

Due to the requirements of the value definition we need to meet, we decide to use the different types of possible service innovation listed by Johnson et al.(2000) - major innovation, start-up business, new services for the market presently served, service line extension, service improvements, style changes as our measurement. Higher level of service innovation might not guarantee a higher value for SME, but the possible and maximum value could be created by higher level is greater than that of low level service innovation types. Explanation of each type could be found in Figure 4.6.

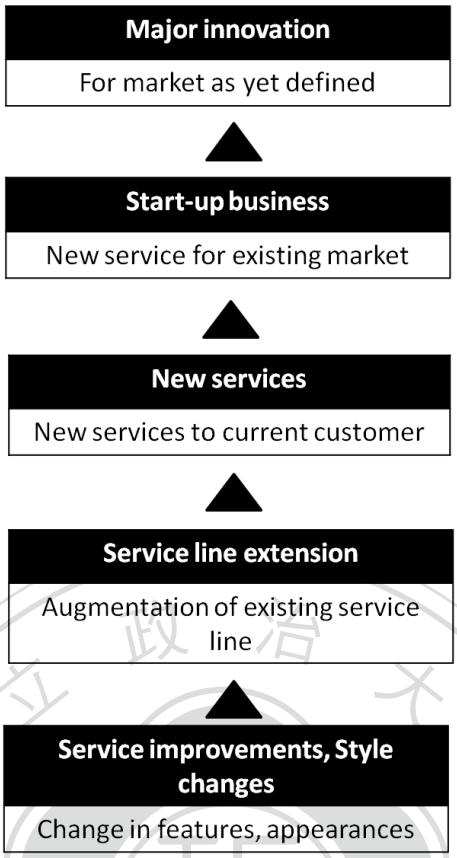


Figure 4.6 The types of possible service innovation

There are three reasons for using this notion as our measurement. For the first, by using the different types of service innovation, we could link interaction with service innovation more directly.

Secondly, these types of service innovation could represent a sequential list of different difficulties and possible value brought by service innovation. The bottom -service improvements and style changing, represents the easiest type of service innovation, but also provides the minimum value for the SME innovation; on the other hand, the top level- major innovation could diffuse the current market and provide great value to the innovator, but it also requires the most resource and efforts and highly risk. By using this measurement, SMEs could capture the whole idea how the interaction pattern might help them, and the connection of different value levels;

in addition, by having this ranking mechanism, SMEs could understand their current status more easily for any future improvements.

The third reason is that these different types of service innovation are highly compatible with each kind of interaction pattern. In our definition, SMEs are lack of resource and knowledge, so it will be difficult for them to do service innovation by themselves. Accordingly, they will have a higher inclination in doing basic service innovation, which are style changing and service improvements. However, while they are able to form a higher interaction pattern with other entities, more innovation insights, required resources will be given to the SME, granting them a higher possibility to do high level service innovation. A total list of mapping can be found in table 4.4, and explanations are listed as following:

Level I - Service improvements, Style changes:

This is the default level for companies without other's help and support. By our definition of our target users (SMEs), they could have some minor insights for service innovation from customer's vague opinions, but not granted with the ability to do them well. For example, if the customer of a hostel considers the room rate is excessively high and the service is bad, the hostel(SME) could possibly cope this problem by providing some small discounts or little gifts as apologize, but might not be able to provide new services that makes the customer feel the worth of his money immediately. In other words, they will they will need the help of other entities to start a better service innovation.

Level II: Service line extension

When a SME has an entity in any type of a second level interaction pattern, then the SME is granted with more possibility to do service innovation for extending its current service line. Following are some examples:

Lateral: SMEs could join the ability of the lateral entity to extend their number of services, or lower the cost of their service to create a lower-price service for their customer (Todeva and Knoke, 2005). For example, in the previous hostel case, the SME could provide the discounted ticket of a nearby amusement park if they had made a deal of co-marketing and discounting. Also, from out interviews, SMEs in Pillow Mountain Leisure Agriculture Area stated that they usually find new insights from other industries SMEs.[4] [5]

Supplier: Supplier entity will enable SMEs to acquire more resources for enhancing the service lines (Stuart, 1993). Insights of innovation could be done more efficiently or at a lower risk; thus when an idea of new service under current service line or style is created, they will have the higher ability to implement it for their customer. A possible instance is that a fruit garden owner(SME) could have better seeds than others from the seeds provider if they have done several contracts already, or maybe have better fertilizers and some free pesticides instructions from its supplier which might enable the garden owner to start providing higher end fruits that he wasn't able to do before.

Customer: Linking with the customer could make their demands clear, which will possibly leads to more ideas about how to serve the customers well; also, it makes the new service could be communicated to the customers better (Bhattacharya & Bolton, 2000). Examples are like fruit garden's customers could provide a good hint to the

[4] "We had an industry visiting tour every year, which take us to other SMEs or organizations in different regions and different industries, these SMEs and organizations gave us lots of service innovation insights and teach us some techniques to implement the insight." (By SME A, 2012)

[5] "I would like to go to other bakeries to see their techniques, but I also like to see how other kinds of SMEs do their job to get different insights" (By SME B, 2012)

SMEs that they would like to have cooled juices after their harvesting experiences, which the SME might not had considered before as an good and easy income sources.

Level III: New services for the market presently served

The synergy of bridging two different types of entities will create more possibilities for the SMEs (Wandersman et al, 1997; Zuckerman et al., 1995), and increase the innovation type from extending current service to a higher level to make new services that the SMEs hadn't done before. However, the difference between major innovation and this level is that the service created in this level could be more easily copied by other SMEs, because a level 2 interaction pattern is not very difficult to form; also the resources obtained from other entities could be lesser than higher interaction pattern levels, makes the innovation less influensive.

Lateral-Customer: By understanding customers better could make the SMEs find out come new insights that they hadn't thought of before, and linkage with lateral entity could help facilitating the new insights, for example like a new food delivery service needs could be discovered from customers, and a delivery company could help the SME to dispatch their foods to customer efficiently, and without the risk of implementing it by itself. Another possibility is that lateral entity could ignite SMEs ideas for new service, and then promoted to SME's customer efficiently through good interaction patterns.

Lateral-Supplier: Serve current customers better by providing new services based on jointing with lateral and supplier entities, lateral entity could probably provide new insights, and the supplier entity could facilitate the insight. On the other hand, some new resources that the supplier entity could provide for new service might need the help of a lateral entity to make it become possible. For example, a hostel could make

their own tour package for their customers by providing transportation service (lateral) and allied with some tourism attractions (supplier).

Customer-Supplier: Provide new services for current customers if the SME discovered some possible needs during their interaction, and implement them by supplier entities help. For example, a bakery could start a bakery-experience for its current customers (customer) by introducing them to their current bread factory (supplier). This could also be considered reversely that the bread factory (supplier) thought of the bakery-experience idea, the bakery (SME) could help promoting it to the customers (customer).

Level IV: Start-up business

Through having higher interaction with an entity, the company is given higher chance to make better innovative service by knowing more of its customer, getting stronger resource from suppliers, and wider ability distribution derived from lateral entities. This results to a higher possibility to create a totally new target segments or type of service based on the foundation of having two entity with interaction pattern level 2 (Having the ability to do a some bigger innovation).Take the tour package example used in service innovation level 3: supplier and lateral, by having a higher interaction pattern with the tourism attraction (supplier), the SME could design a very distinctive journey together with the supplier entity. The newly-designed package could create a new service for the local area, and provide good access for customers to come to by the help of good transportation (lateral). For example, a hostel (SME) located in a remote area where there are hot springs, could make special package for its customers by combining a hot spring (supplier) with paid home pick-up service (lateral), in which the hot spring is free (provided by the SME and supplier's good interaction pattern).

However, the service of this level might not be very influential because it does not have strong producing or marketing ability all together, due to not enough allies. Like in the previous example, the tour could be extremely famous if the pick-up service is free of charge.

Level V: Major innovation

Alike level III's condition, but due to the higher interaction patterns, companies are having very great chances to create very innovative and distinctive services, and it will be hard for competitors to duplicate it, due to the company already build up a high level of horizontal or vertical interaction with its ally, and can link the forces together to create stronger value.

Lateral-Customer: A new type of service that could alternate the area or the industry could be achieved by receiving valuable advice and support from it's customer entity, execute the idea by lateral entity's help, and support with strong marketing ability. For example, a restaurant (SME) in a tourism attraction could provide delivery service of its famous dishes to hotels and hostels in the area by the help of a good delivery company (lateral), and with the support of the ads and promotions from good hotels (customer), it could possibly re-write the food service industry at the area.

Lateral-Supplier: Alliance with strong competitor (lateral) and sources (supplier) could possibly provide the SME with strong bargaining power for better and cheaper materials that could make the SME be very competitive, and cause great impact to the industry. For example, if two greatest surfing equipment providers at Kenting joint forces and ask manufacturer for a better price, they could possibly eliminate all other competitors within the region, and create a total new image of the area.

Customer-Supplier: Link strong service provider (supplier) with good advertiser's (customer) marketing ability together could make the region have a different feature. For example like there's a well-known new tourism attraction - 18o chocolate in

Nantou while chocolate was never a famous product there. For SMEs without the skills like them, could possibly link with good material provider (supplier) and promote them strongly by the help of some advertisers (customer) to achieve the same effect.

Table 4.4 . Interaction patterns mapping with Service innovation level

Possible service innovation level	Corresponding Interaction Patterns
Level I : Service improvements, Style changes	All interaction patterns are at Lv1
Level II: Service line extension	Any one of the interaction patterns are at Lv2
Level III: New services for the market presently served	Interaction pattern with at least two different types of entities has reached Lv2.
Level IV: Start-up business	Based on Lv 3, and have one entity with interaction pattern Lv3.
Level V: Major innovation	Interaction pattern with at least two different types of entities has reached Lv3.

Concluding this section, we define values of interaction patterns to provide a more concrete idea of how the interaction patterns might work for the SME users, which will enable them to capture the idea of how interaction patterns work for them. The value we use here is the types of service innovations. It was chosen for three reasons: make the linkage of interaction pattern with service innovation more directly, the ordinal and sequential nature of the different types of service innovation, the high compatibility of the service innovation types and the interaction patterns. Through different interaction pattern combinations, SME user can be able to create different levels of service innovation.

Moreover, the mapping of different interaction pattern combinations with several service innovation values increases the scope of the interaction result from one-to-one relation to a one-to-more relation, which is one of the opinions we have for previous

researches. We expanded the interaction pattern from customer-supplier or supplier-customer into a broader view which includes customer, lateral, supplier entity. By adding the horizontal entity (lateral), the vertical-only interaction patterns are expanded into both vertical and horizontal enabled interaction patterns.

About the system side of work, two systems will be involved in this module. The interaction pattern recognizing system within this module will recognize the current interaction pattern the SME user is having with other entities within the service system, the recognition process example could be found in Figure 4.4 in the previous section 4.3. The interaction pattern value defining system will then calculate the value of the current interaction patterns; the system will match the current interaction patterns with the service innovation level, the matching rule could be found in table 4.4. For example if the highest interaction pattern with customer, supplier and lateral entity is Level 2, Level 2, Level 1 respectively, according to the matching rule in table 4.5, the current value of the interaction shall be Level 3, the new services.

By the two systems within the Interaction Pattern Recognizing Module and previous Data Collection Module, we can gather and analysis the SME user's data to understand their current situation and the environment they are facing; also, we could answer the second part of the second problem mentioned in section 1.3 - how to analyze the business situation and fit into interaction patterns we defined – by providing this analysis method.

After knowing the SME user's context, we shall go on working their desired service innovation direction.

4.5 Interaction Pattern Adjusting Module

The module previous to adjusting module is designed to capture the current status of the SMB user, and the adjusting module is designed to work with SME users to

generate a possible direction for improvement of interaction patterns and service innovations.

Two systems are within the module: Value Based Adjustment System and Pattern Based Adjustment System, implementation details of which will be explained in order.

From previous sections we understand that value can be created or be able to achieved by some specific interaction patterns combinations. In order to create an adjustment direction for SME users to achieve these values, two different methods can be selected: top-down or bottom-up approach. The top-down method refers to the value based adjustment, and the bottom-up approach is corresponding to pattern based adjustment

The top-down approach , or the value based adjustment, is to let the SME user choose a value from the five level of value, since the interaction patterns required for a higher level of value is fixed, the system can calculate a route from current interaction patterns situation to the desired value's required interaction patterns.

The calculation of the route is based on the concept of finding the shortest route from current interaction situation to service innovation level 5, which stands on an assumption: SMBs will try to achieve the highest level of service innovation when they could. For example, if the SME user currently has interaction pattern Level 2 with customer entity; according to the matching rules, the closet route of service innovation Level 5 is to have higher interaction pattern level with a supplier or lateral entity, and thus the system will provide two choices (supplier or lateral). After SME user chooses an entity, the process will start over again, but from different starting point, and make SME user do the next choice of entity to achieve service innovation level 4. Also, if the SME user desired achieving value is not Level 5 value but a lower

level of value, the calculation will still base on the aforementioned concept to come out with an adjustment route for SME users.

Figure 4.6, 4.7, 4.8, 4.9 illustrate the example just mentioned, and Figure 4.10 provides the algorithm. Figure 4.6 represents the arrow 1 in the algorithm, which is setting the default value based on the data retrieved from data collection module. Figure 4.7 shows the situation of when a user had selected a type of entity to improve which corresponds to the arrow 2 in the algorithm. In Figure 4.8 we show the process of arrow 3 in the algorithm - the user chooses an entity as its current level improving target, and the system sets the attribute "User_choice_entity" as entity 5, and increases the service innovation level based on our defined rules. After the steps of Figure 4.6 ~ 4.8 finish, the system will reset the interface to be alike Figure 4.6, but list the improvements the user had made based on their chosen entities on the right upper corner, and marked up the type of the entity by adding an "+" sign on its left.

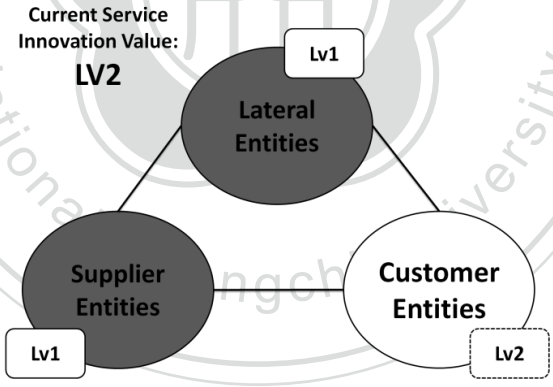


Figure 4.6 Top-down approach (1) – system's suggestion

(System suggest user to choose types of entity to improve from two options: lateral, supplier, because it is the fastest way defined by our rules to achieve service innovation LV3)

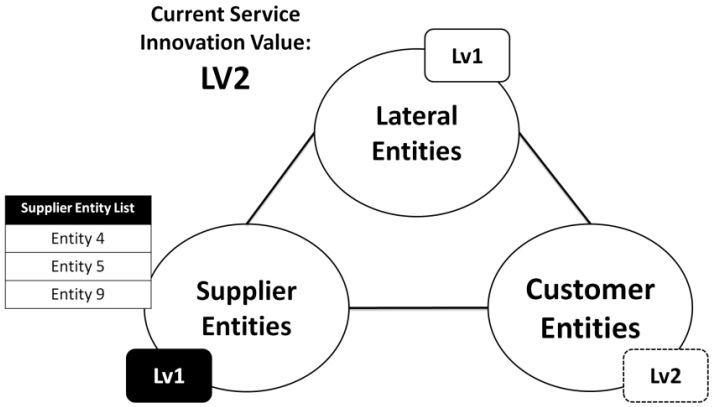


Figure 4.7 Top-down approach (2) - choose the supplier entity

(The black background box with degree number represented that the user choose supplier entity to improve. The system will then list all entity that is belongs to the supplier entity, which is entity 4, 5, 9 in this case, and ask user to choose one from them as the next step of improvement target)

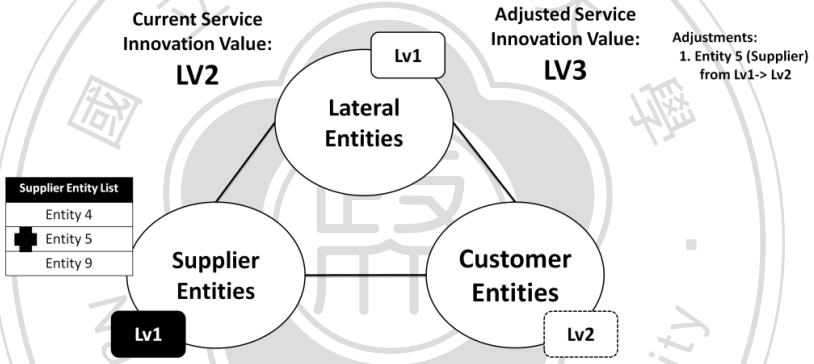


Figure 4.8 Top-down approach (3) – user choose entity 5

(The choice will be marked up on its left, and the level-to-be of after choosing an entity is displayed at right-up corner for quick reminding)

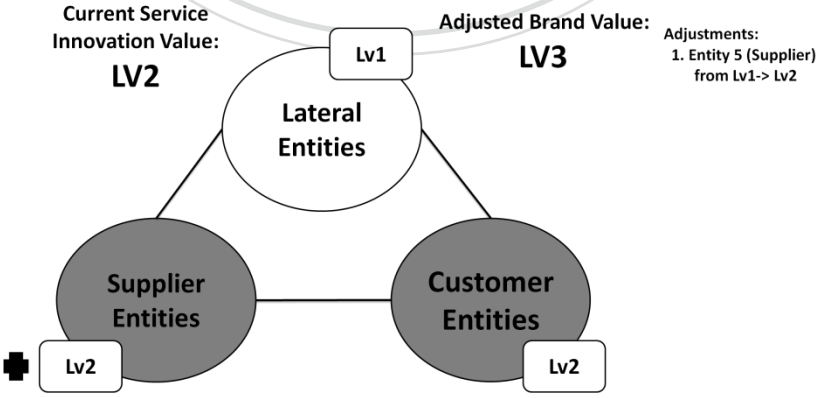


Figure 4.9 Top-down approach starts over again with a different starting point

(The system will ask the user choose an entity type again, like the step in Figure 4.6, but had an mark on the type of entity they choose before, and reminding on the right upper corner; in this case, the

system suggested supplier and customer entities as next improvement target)

Value Based Approach (Top-down)

SET Actors = Specific type of alliance partners *(customer, lateral, supplier)*

SET Entities(Actors) = Entities belongs to a specific type of actors

SET User_Service_Innovation_level = Current user service innovation level (ex: 1,2,3,4,5,) ← 1

SET Next_level = Next user service innovation level

SET Level_matching_rules = Rules of how to move User_level to Next_level, output Actors

/* ex: from Lv1 to Lv2, it needs to improve the interaction pattern with an entity A, other rules are listed in table 4.5 */

SET Adjustment_checking () = Check improvement based on inputs and Level_matching_rules

/* ex: check whether the improvement of interaction pattern with an entity A can make Lv2-> Lv3 */

Adjustment Step: ← 2

Set User_choice = Specific service innovation level that the user choose

List Entities in Actor(Level_matching_rules) *(EX: Entity 4, Entity 5, Entity 9)*

SET User_choice_entity = Specific entity that User chooses to improve interaction pattern ←3

SET User_choice_entity_interaction_pattern_level +1

If (Adjustment_checking (User_choice_entity_interaction_pattern_level) == True)

User_Service_Innovation_level +1

Next_level +1

IF (More adjustments wish to proceed) ← 4

GOTO Adjustment Step

END

Figure 4.10 Top-down approach adjustment algorithm

The second approach of the bottom-up approach is by adjusting the interaction patterns the SME users is having, throughout the adjusting process, possible achievable value will be calculated at the same time so that the SME users might try out many kinds of combination of interaction patterns with different roles of entities and choose the combination of interaction patterns that seem achievable from its current status and that the value it brings is attractive. The bottom up approach provides more flexibility to the user, but it requires the SME user to spend more efforts on the contrary. The

following Figure 4.11, 4.12 presents the idea of the bottom-up approach: a SME user currently is having Level 2 interaction pattern with customer, and level 1 with the others. The system lists all entities sorted by their roles and asks the SME user to choose (Figure 4.11), and display the outcome after SME user makes the decision (Figure 4.12). Figure 4.13 provides the algorithm, and use arrow 1 and 2 represents the starting of Figure 4.11 and 4.12 respectively.

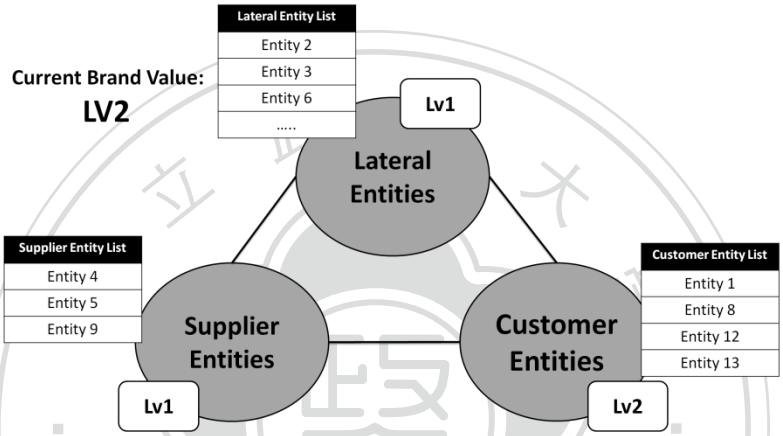


Figure 4.11 Bottom-up approach – ask user choose one type of entity

(The system asked the user to choose an entity from lateral, supplier, and customer entities)

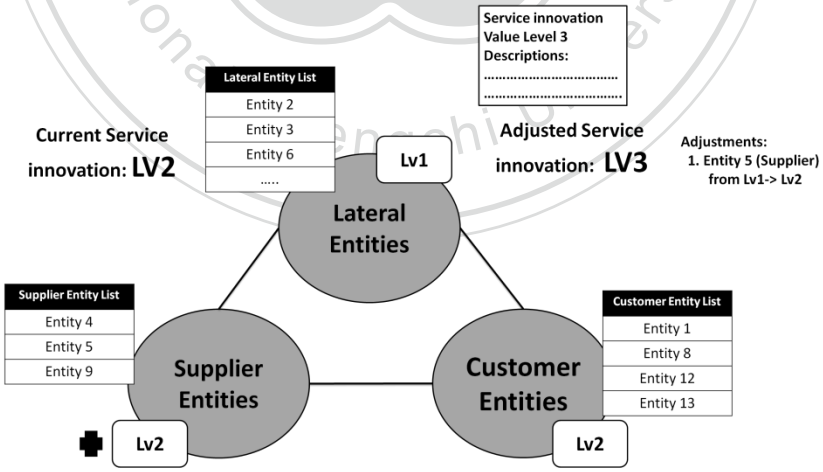


Figure 4.12 Bottom-up approach (2) – after choosing entity 5

(The changing of value of the entity is displayed at right-up corner, also a mark is given to the entity type the user had improved within the system. The process goes back to process of Figure 4.11 which is choosing a type of entity to improve)

Pattern Based Approach (Bottom-up)

Set Actors = Specific type of alliance partners *(customer, lateral, supplier)*

Set Entities(Actors) = Entities belongs to a specific type of actors

Set User_level = Current user service innovation level (ex: 1,2,3,4,5,) ← 1

Set Next_level = Next user service innovation level

SET Level_matching_rules = Rules of how to move User_level to Next_level, outputs are Actors

/* ex: from Lv1 to Lv2, it needs to improve the interaction pattern with an entity A, other rules are listed in table 4.5 */

SET Adjustment_checking () = Check improvement based on inputs and Level_matching_rules

/* ex: check whether the improvement of interaction pattern with entity A can make Lv2-> Lv3 */

Adjustment Step: ← 2

List all Entities(All actors)

Set User_choice_entity = Specific entity that User choose to improve interaction pattern

Set User_choice_entity_interaction_pattern_level +1

If (Adjustment_checking (User_choice_entity_interaction_pattern_level) == True)

User_level +1

Next_level +1

IF (More adjustments wish to proceed)

GOTO Adjustment Step

END

Figure 4.13 Bottom-up approach adjustment algorithm

After the SME user come out with a value and interaction pattern improvement direction with the module, these outcomes will serve as the first outcome this information system can provide, which is the direction of service innovation, links to the Arrow(4) in the conceptual map at Figure 4.1, also corresponds to the third problem in section 1.3 - how to provide innovation insights from interaction patterns. By knowing a value to work on and the path to achieve it, the SME user found its own service innovation direction to do, the next thing this system can provide is guidance throughout the path.

4.6 Alliance Adjustment Guidance Module

The final part (i.e., the Alliance Adjustment Guidance Module) of the service innovation supporting artifact we propose is to guide the SME users throughout the implementation process of the service innovation, which can be related to the Arrow(5) of the conceptual model. The purpose of this module is to link the service innovation direction created from previous modules to a business case database that stores cases of related situation and select proper cases for SME users as a guidance of implementation.

The following will explain the theory foundation supporting the use of case based approach, implementation details of the business case database, and the explanations of the case selecting mechanism during SME users using this module.

Case-based reasoning system have the following two advantages: using case base information is a good approach for people to learn how to do things at the early stage (Anderson, 1996), and it is more easy to acquire examples of a problem solution than to come up with rules to solve the problem (Tenback, 1994). Embedding the concept of case-based reasoning can bring these advantages into this system, which makes the guidance is easy to understand by the user, and the implementation will be easier for the system designer.

A case-based system requires a case database as its foundation, which in this research it shall be the cases of SME achieve service innovation by improving the interaction patterns. Some requirements must be met in order to fulfill the design purpose of this artifact, which is a service innovation supporting tool based on interaction pattern with implementation guidance. Requirements are listed as followings: the case must be a SME case, the result must be a service innovation, the

solution to achieve the result must contain the adjusting of interaction patterns, and the case must described the details of the solution.

Business cases done by research organizations can be found on the Internet, but most of them are big companies, which would violate the requirements of this research that the cases within the case base need to be the cases of SMEs. And cases mentioning the interaction condition are also less in numbers, not to mention the cases have detailed description of the adjustment of interaction patterns. However, researches of SMEs and interactions are not difficult to access, like the IMP group is one of the biggest organizations focusing on business interaction and their research is accessible. Through enough available researches, we might be able to abstract the cases from their research, and classified them into our business case database.

After a case is selected, it will be categorized for the selection mechanism in the guidance module. The classification will be based on the interaction pattern it is changing to, the role of the entity it is changing interaction pattern with and the interaction pattern value it would change, and the following Figure 4.6 provides an example.

Figure 4.13 is an imagine case example of an anonymous company's interaction pattern adjustment and corresponding interaction pattern value changing; it is a case of an anonymous company changing its interaction condition with its customer and supplier. At the beginning, we will examine cases from other available researches, and determine whether the case are fitting the following two requirements: the case company achieved some kind of service innovation value improvement from changing interaction with other companies, and provide enough detail of how the company did the interaction changing. If the case meets the ends, then we will analyzed the case to determine what interaction pattern is it changing and with whom it is changing interaction pattern. After the analysis, the case will be recorded in the

case data base and tagged with classifying information like Figure 4.13; the case example in Figure 4.12 is an example of classifying information of a case about an anonymous company changing its service innovation value from Level 1 to Level 3 through changing its interaction pattern with its customer and supplier entity.

Case : Anonymous Company
Value changed => No value(Lv1) -> New Services(Lv3)
Entity interaction pattern changed :
Customer => Lv1->Lv2
Supplier =>Lv1->Lv2

Figure 4.13 Example of an anonymous company's innovation case's case classification

When the result of the adjusting module comes to the guidance module, the result will be examined by the guidance module, in order to select the proper cases. For example, if there is a SME user wish to change its service innovation level from Level 2 to Level 5 by improving its interaction pattern with supplier entity from interaction pattern level 2 to level 3, and customer entity's interaction pattern from level 1 to level 3, the system will browse every case's tags to select the case that is matching to the requirements.

The following Figure 4.14 provides the case selection process of our example. The system records the steps the user selected during the process in the Interaction Pattern Adjustment Module, and select appropriate cases in this module. After the matched cases are obtained from the data base, the Guidance Module will then sort the cases by the steps and the corresponding interaction pattern the SME choose to improve. In this example, there are two cases match the description of changing interaction pattern level with customer entity from level 1 to level 2, one case for changing

interaction pattern level with supplier entity from level 2 to level 3, and two cases for changing interaction pattern level with customer entity from level 2 to level 3.

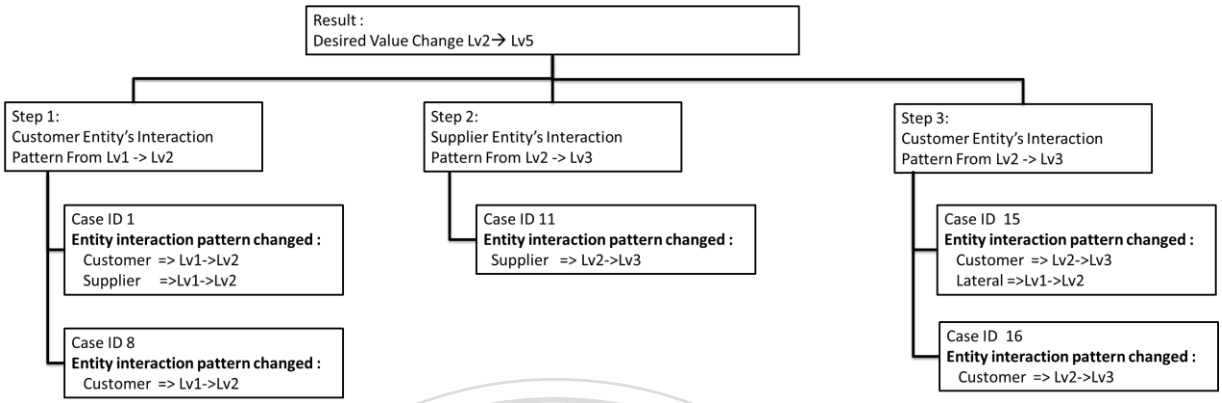


Figure 4.14 Example of the case classifying based on the selected patterns to improve, and automatic proper case selection
(Lv2→ Lv5; customer → supplier → customer)

```
Adjustment Direction Dividing and Proper Case Selection Process

Set First_Node = Current SME users service innovation level
Set Final_Node = SME users desired service innovation level
Set Steps= Each service innovation levels between current and desired level
    (Ex: 2→5 = 2->3; 3->4; 4->5,  3 stpes)

For each Steps
  Find all cases for each Steps

Next
 List all Steps to the SME users
```

Figure 4.14 Case classification and automatic proper case selection algorithm

Concluding the guidance module, it is designed to provide cases of SME business do service innovation through changing interaction patterns. The reason to use case base guidance is because case can provide a lot more details that other means cannot provide, and cases are easily for human to learn from. Cases will be classified based on the interaction pattern it is changing, the role it is changing interaction pattern with and the value it have changed. The result from previous module will be examined and divided into smaller sections if needed, and cases will be selected based on the

examination, Figure 4.14 provides an algorithm of the adjustment direction dividing and proper case selection.

After SME users choose its most favorite case example regarding to its service innovation direction, SME users are supposed to be able to reference the company in the case example to do their service innovation by changing its interaction pattern with other entities within the SME user's current service system.

4.7 Annotation Module

During the adjusting module, most of the adjustments are made by the SME users, and the system provides limited guidance. But for some situation, the system has to do more; for example, if the SME users are not able to provide the information of the entities within the service system, the SME users will need the system to help them with. The existing modules in this information system are not designed to provide this service to the SME users, so another module is required to fulfill this requirement. Annotation module is designed to meet this need; explanation of implementation will be present in afterwards paragraphs, and the purpose of the module is as following: Provide on-time support of what kind of entity might be related to the SME users and the name and information of the entity, upon SME users inputting data into the data collection module to provide more support to the SME users.

To provide SME users with the information they need, the information system need a database with required data firstly. Information needed here is the association of each entity within each industry, the connection of the entities and the detail of the entities (see table 4.5 for example). However, since each industry has their own features; to collect information by us only is not feasible and another method must be chosen. There are two methods that might be appropriate: the first one is to use the

search engine to collect the information automatically, and the second one is by collecting data through other SME user's input.

The search engine approach advantages include: it collects the data automatically and has massive data, and it is adequate for the information system design. However, the information needs to be examined and checked before providing to the SME users, and some detail information like the connection between two entities might not be able to be found on the internet. Also, since everyone can access to a good search engine, these information might not be able to provide too much uniqueness. So the search engine approach shall be considered later.

Table 4.5 Information required for the system to provide support for the SME users

Entity's Name
Entity role it might play in SME user's service system for SME
Entity Providing Service (ex: Logistics)
Entity's Region
Company's Detail

The approach to collect data through other SME users is to record each SME users' input data. For example, another SME users might input 10 entities information during the input process, and these 10 entities and the relation with the SME users will be recorded in the system and these information can provide other SME users as a hint and support during their data input process. This can be considered as another case base methodology, in which the case used here is to collect through other users. The advantages of using this approach are just counter to the disadvantages of using the search engine approach, with which these information are only accessible through

this information system and the information is trustable since it is another SME users condition and these features makes these information more valuable and convincible.

For connecting to the entire project design, the SME users will come out a story of an image at the end, and the image will pass down to the uVoyage system, which we can refer as the implementation work of the story. After implementation, the uVoyage system will record the implementation detail, which we can see as another case of SME doing service innovation; this information can be provided to this information system to give the coming SME users more support and hints throughout the information system using. Concluding the comparison, it will be better to use the information inputted by other SME users because it can provide more precise and convincible unique data to the SME users.

Examples of how the annotation module help the SME users during the data collection module is presented in Figure 4.15, in which dotted broader and black background entity is the suggestion from the annotation module based on other SME users input.

After the data is collected, the system will be able to provide support to the SME users during the adjusting module, the annotation module will function while the SME users are doing the adjustment of interaction patterns, and it will suggest what kind of companies that shall put in a specific role of entities and it will give the detail information of the companies. Another function is if the sample SME users have go through the entire projects process, the details will also be presented to the current SME users as another business case. The last function is the data collection work, it will access to other systems that are within this project's database. Through these functions, the SME users will be guided and supported throughout all the process within this information, which will leads to a better using performance of this information system.

Concluding, this chapter corresponds to the Build/Develop part of the IS research framework, and expatiated how we intend to solve the business needs we observed in current SMEs service innovation problems by combing different theories and information technologies. In this chapter, we had illustrated the concept model of this research, and the system architecture which contains five modules for providing service innovation based on interaction pattern, and the implementation detail of the information system in this chapter. In next chapter, we will demonstrate the details of our evaluation of our theory.

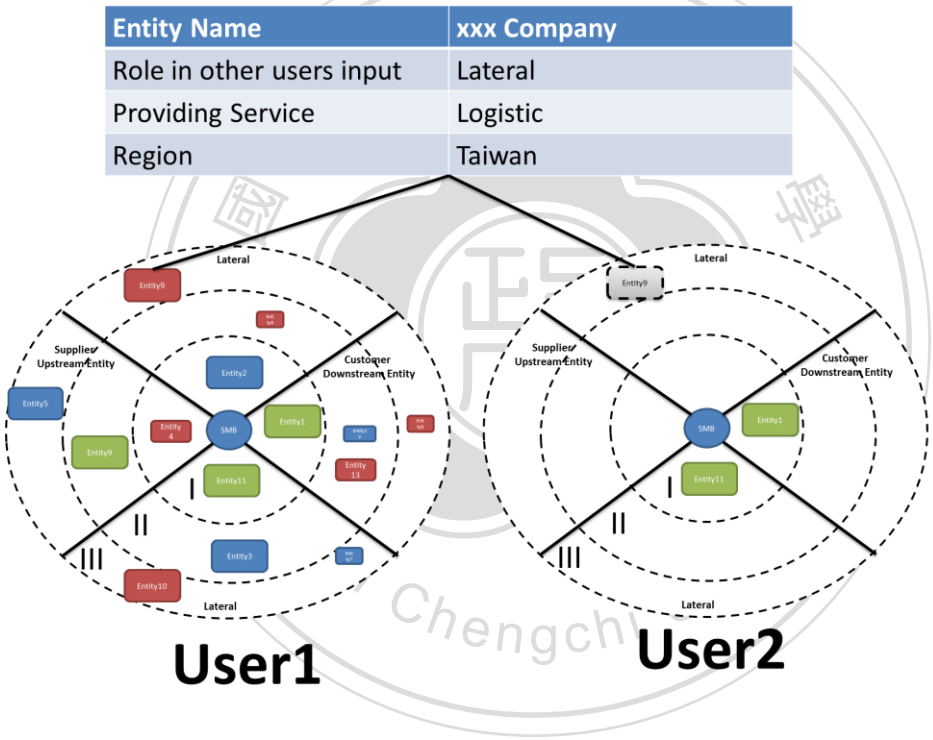


Figure 4.15 Example of annotation module support during data input process
(Annotation module gets information from another user's input
to support User 1 during the it's data input process)

CHAPTER 5. Evaluation

This chapter will describe the experiments used to verify the research questions and objectives listed in Chapter 1, and the proposed mechanism mentioned in Chapter 4; also, this chapter will serve as the evaluation part of the information research framework (Figure 1.3).

In Chapter 1, we have described three research questions and objectives, which are raised in order to fulfill the purpose of this research - to provide a service innovation theory that can avoid the shortcomings of preceding goods dominate logic, and support SMEs use with ease. To reiterate, we list the research questions and objectives again in the following:

1. To discover an innovative interaction-centric service innovation method.
2. To develop a system architecture that forms the basis for facilitating the interaction-centric-innovation service, and provide guidance-of-implement for SMEs.
3. To implement a prototype system to demonstrate the feasibility and practicability

In previous chapters, we mentioned we intend to tackle the abovementioned research questions through interaction patterns (Chapter 1), and proved the feasibility of this approach through literatures and other related researches (Chapter 2, Chapter 4). However, in order to make the arguments of this research even more robust and stronger, we intend to prove our proposed solution – that SMB can do service innovation through analyzing and managing interaction patterns – by more scientific research method.

In the following paragraphs, section 5.1 will illustrate the propositions of this

research, section 5.2~5.4 will provide the details and results of each different experiment designed to examine the propositions, section 5.5 will then summarize and discuss the results.

5.1 Propositions

The fundamental concept of this research is to use interaction to support service innovation which was enlightened by system thinking and service science researches. However, the weight of interaction in businesses or a service system has been mostly examined by qualitative data but less by quantitative data in real world situations; while different area researchers might not share the same view of system thinking and service science researchers, the lack of field data and qualitative research method of interaction research might make this argument be considered not effective enough to other researchers. Accordingly, the first proposition of this research is to survey the effectiveness of SME doing service innovation through focusing on interaction; and only if this proposition is supported, other hypotheses in this research then stand a possibility to be true. In other words, this proposition serves as the premise of other propositions.

Proposition 1: Interaction serves as an important aspect of business service innovation.

If the first proposition is supported, we can then verify the usefulness of our proposed interaction pattern adjusting model (CH4), for which SMEs could use it as a way to analyze their interaction situation, and follow the instructions given by the model to improve their service value and service innovation chance. Hence, the second proposition is as following:

Proposition 2: While SMEs is following the interaction pattern adjusting suggestions (section 4.5), they should be able to attain higher service innovation and service value.

In addition, we believe different situations of SMEs will affect the effectiveness of our proposed model, such as different composing and structure of the service system; for example, when the SMEs in the same service system is more tightly related or more loosely related, the proposed model's utility will be different. Due to the fact that we had several interviews with SMEs in Pillow Mountain Leisure Agriculture Area before, we intend to use the service system situation there as the testing basis of our proposed model. Based our interviews and observations, we defined each entity (SME) at Pillow Mountain Leisure Agriculture Area's service system to be - lesser in resource, loosely related (i.e., there are some conflicts within new comers and local SMEs, and the mass area makes it harder to interact frequently), less acquainted with business managing knowledge (i.e., SMEs know lesser in how to exploit the benefits of alliance and interactions with other SMEs). Hence, we have the following proposition for this issue:

Proposition 2-A: For SMEs whose resources are scarcer, the effectiveness of our proposed model will be higher.

Proposition 2-B: For SMEs who are more loosely related, the effectiveness of our proposed model will be higher.

Proposition 2-C: For SMEs who has lesser knowledge in exploiting the benefits of interaction, the effectiveness of our proposed model will be higher.

After validating our proposed model, we can further test the usefulness of the information system we designed as the supporting artifact for SME users to use our proposed model. Hence, the last proposition within this research will be:

Proposition 3: The proposed information system can effectively help SMEs analyzing and managing interaction pattern to create service innovation and improve their service value.

The next section will describe the details and results of the experiments for the above mentioned propositions.

5.2 Experiment Details for Proposition 1

5.2.1 Experiment Challenges and Design Principles

The hypothesis 1 is "Does interaction serves as an important factor in business service innovation". To make the experiment result to be easy to understand and convincing, we intend to find a proper comparison target which can benchmark with interaction to see the effectiveness and importance of interaction within businesses through by comparing the comparison target with interaction. The choosing of the benchmarking target will be very important because the experiment result will be persuasive and robust enough only if the target is a widely recognized business making theory; also it must be simple enough to be manipulated in an experiment to

easily see the difference. Moreover, the comparison target must show a great difference than interaction to show the difference clearly between two concepts.

After researching, a good candidate fitting the requirement of the comparison target is the resource based view of alliance by Das & Teng (2000). The resources aspect of alliance has been a widely accepted theory, and its usefulness is proved already; if we can benchmark our proposed model with the resourced based of alliance theory, the significance of the experiment will be sufficient thus convincing. Also, the main concept of resource base theory – company alliance to attain resource they required - is an easy-to-adopt theory because of its simplicity. Lastly, the resource based view of alliance is showing the feature of goods dominant logic by claiming that company choose partners based on the resource it lacks or is considered important (like an operand), thus is showing great difference from our research that encourages a company to find good partner candidates through interaction analyzing and manipulating, which is a more service dominant logic concept. Accordingly, we intend to use the resource based of alliance as the comparison of interaction in terms of business service innovation and value creating.

After selecting a proper comparison target, to model the differences between resource aspect and interaction aspect, a comparison basis which can show their difference must be discovered or developed. Considering the characteristics of these two aspects, we use the functions of alliance as our comparison basis, which refers to a list of alliance functions that might happen between two partners that were claimed in researches of Varadarajan & Cunningham's (1995) and Todeva & Knoke (2005).Some examples of these functions are like franchising, co-marketing, and joint innovation. We believe that SMEs with different points of views will do the alliance partner selecting based on different reasons. For resource based partner selecting advocate companies, because they intend to find for partners based on the perceived

ability and resource which they do not have, we can assume they will choose the alliance function to execute with its partner based on partner's ability and resource. However, for those SMEs who take the interaction point of view, because interaction is the key of their alliance, so instead of choosing which function to execute based on partners ability and resource, these SMEs choose the functions to execute more based on their interactions. Concluding, in the experiments to verify the effectiveness of interaction within service innovation and service value creating, resource based company will choose alliance function based on partners' perceived abilities and resource, while interaction based company will choose the alliance function based on their interaction condition. By using the alliance function, we can easily model two different concepts within our experiments, and verify whether interaction based stands an important in service innovation or not through comparing their alliance performance.

However, although we can develop proper experiment method, there are still more difficulties to tackle; one of the most critical problem is that it is hard to find company owners whom had experience in alliance for service innovation and are willingly to perform both theory of alliance to see the differences. Secondly, the time to see the differences between executing the two aspects might be very long and not controllable within our research. Finally, there might be other factors which are not considered in this research that can influence the results of our experiments, like government policies or economic conditions.

To overcome the research challenges in this research, we intend to use simulation techniques to testify the propositions. Simulation technique serves an excellent analyzing tool for problems that are impossible or extremely expensive to observe the changing in real world, but are possible to analyze if proper and able-to-validate model is formulated (Maria 1997). By using simulation, we can design models of

company's service innovation performance in alliance to test whether resource aspect or interaction aspect will do better for companies without influenced by the time and other uncontrollable constraints. On the other hand, through simulation, we can avoid using only several types companies because of the aforementioned constraints in this research, which enables us to come out with a research contribution that is regarded as without loss of generalities. Concluding, simulation techniques enables us to observe the difference between resourced based theory and interaction based theory by simulating companies apply different approaches, and the service outcome and value it acquires if we are able to design a proper and convincing simulation model.

5.2.2 Experiment Design Details

During the simulation process, we will generate 100 SMEs and 10,000 customers in a tourism attraction region (to simulate the Pillow Mountain Leisure Agriculture Area). Each of the SMEs provides one type of service - eat, accommodation (live), or entertainment to customer; and each of the SMEs has their own ability in marketing to link to its customers. Each type of the service is further extended into three styles, for example like eat style 1, 2, 3. Here we assume that each customer needs all but different styles of service, and will not go to SMEs that don't provide the exact services styles he wants. Given the assumption that each SME only provides one type of service, alliance is required to attract customers. The outcome value of the service innovation of the SME's alliance will be calculated by the number of customers the SME can serve. Figure 5.1 shows an example. (SME A acquired Customer A (match) through obtaining ability live 2 and entertain 1, and improved marketing ability from 1 to 4 from the alliance with SME B and C; however, the alliance did not give the proper ability and marketing ability to acquire Customer B and C (not match) , so SME A is only able to acquire Customer A.)

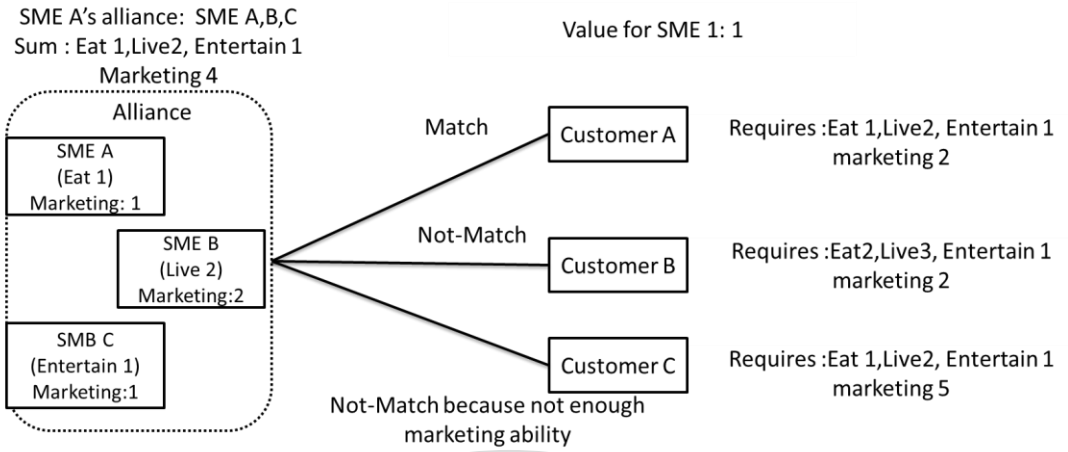


Figure 5.1 Example of SME's alliance and customer acquiring

Alliance Successful Rate:

In order to make the scenario within the simulation closer to real world, we create a factor - alliance successful rate, which represents the situation that alliancing or cooperating with other companies does not always bring benefit to business. The alliance successful rate is considered as the possibility that SMEs could obtain positive value outcome from their alliance, for example, when alliance successful rate in the entire environment is low, SMEs will have low chances of gaining benefits from their alliance; contrarily, if the rate is high in the context, then SMEs will possibly gain more new ability through their alliance.

Other than the first reason for using alliance successful rate within our experiments, it also serves as an indicator about whether SMEs in this region is good at building alliance. Reason for this is because one of this research's objectives is to provide good support for SMEs who don't know how to do service innovation from alliance, to model this feature, we intend to use low alliance successful rate to represent these SMEs.

Also, we intend to use this factor to demonstrate some differences between resource based aspect SMEs and interaction based aspect SMEs. In this research, we

consider that SMEs of the resource based aspect will put their efforts into enhancing this factor because they choose partners with higher accuracy (e.g., choosing partners on their perceived ability), and hence will put more emphasis on improving the effectiveness of this alliance - which shall lead to a higher chance of building up successful alliance; on the other hand, interaction based aspect SMEs will focus on other things (will be discussed later), which indicates a lower chance of a successful alliance building. Through the alliance successful rate, we can show different characteristics of SMEs ability in building alliance, and demonstrate them in our simulation process to see if any possible findings will occur.

Alliance Functions and Alliance Constraints:

Although the alliance successful rate could demonstrate some different features of the two aspects, it still did not mention about how to present the alliance function in our simulation process, which is necessary within this experiment to prove the importance of interaction in service innovation and service value creation within alliance. In order to model the resource aspect and interaction aspect of alliance, we select 5 functions of alliance according to Varadarajan & Cunningham's (1995) and Todeva & Knoke (2005) researches that are considered to be fitting into SME's situation and attaining the benefits for service innovation. These functions include joint innovation, co-marketing, co-servicing, co-service & marketing and franchising. Each function will lead to a different outcome, like joint innovation will possibly lead to a new service gain, and co-marketing will enhance SME's marketing ability.

In the simulation process, each alliance function will have its alliance constraints, which is designed and based on the function's feature, and will serve as a factor to model different context situations. SMEs of the resource based aspect, by definition, will choose alliance function to perform based on the perceived ability of their

partners; hence we model this feature through alliance function constraints and SMEs of resource based aspect will have to follow the alliance constraints because of their alliance partner selecting strategy and thus limit their possibility of trying other alliance possibility. On the contrary, SMEs of interaction aspect do not follow the alliance constraints because they do not decide the alliance function by the perceived ability, instead by the interaction details. Through the alliance function constraints, we can separate the focus of the two different aspects and see their comparisons. Details of the alliance functions are listed in Table 5.1. (Ex: If two SMEs: SME A and SME B both are in the service type "eat", if they are following the resourced aspect alliance choosing strategy, the possible alliance function will exclude Co-Service & Marketing because the alliance was constrained. However, if they follow the interaction aspect, it is still possible for SME A and SME B to have the Co-Service & Marketing alliance function between them.)

Table 5.1 Exemplar alliance constraints

Alliance functions	Alliance constraints	Result
Joint Innovation	No	Both SMEs acquire a new type of service or new style of service which they didn't have before
Co-Marketing	No	SMEs acquire partners marketing ability
Co-Servicing	Happens within same service types SMEs	SME A acquires SME B's service type and style. SME B acquires SME A's service type and style.
Co-Service & Marketing	Happens within different service types SMEs	SME A acquires SME B's service type and style. SME B acquires SME A's marketing ability
Franchising	Happens within same service types of SMEs	Franchising SME acquires partner's marketing ability The franchising partner acquires the franchiser SME's service type and style.

Following the above mentioned simulation design details, we can design different settings in each simulation round to model the different service system context. In Table 5.2, setting 1 is the comparison basis – SMEs without choosing resources based aspect and interaction based aspect. Setting 2 stands for SMEs of resources based

aspect with higher alliance successful rate, in which we assume SME owners are focusing on selecting partners base on their perceived abilities (thus following alliance function constraints), and focus on improving the alliance to have stronger alliance outcome (thus having higher alliance successful rate). The last setting is setting 3 of the same level of successful rate with setting 1, in which the setting represents the SMEs with higher interaction tendency by not following the constraints of alliance (i.e., the situation with SMEs more focusing on finding the most proper value proposition provided by the partners, instead of their partner's core ability).

Table 5.2 Details of each setting

Settings	Successful Rate	Alliance Constraints	Represents
Setting 1	Low	SME will follow the constraints	Comparison basis
Setting2	High	SME will follow the constraints	SMEs with resource based aspect
Setting3	Low	SME will not follow the constraints	SMEs with interaction based aspect

5.2.3 Experiment Results and Conclusions

Figure 5.2, 5.3, and 5.4 show the results of simulation. Figure 5.2, 5.3 stands for the different ratios of new ability gained and marketing ability gained through alliancing with adding one more new partner in different settings. The ability and the marketing ability are acquired through the alliance with other SMEs, and decided by the type of service the partner is servicing and the alliance function they are executing. Our simulation program simulates alliance building and ability gaining processes, accumulating the total ability gained and then calculating the ability gaining ratio.

Figure 5.4 shows the distribution of SMEs with different amount of customers, like the number of SMEs who can acquire more than 1000 customers, or the amount of 3000-customers- acquirable SMEs. The number of customers a SME could acquire is

computed by SME's ability and marketing ability and the customer's taste (Like Figure 5.1). For example, if SME A acquired the ability Eat 1, Live 2 and Entertain 1 by alliance, then the simulation program will count the number of customers whose requirement are as just as SME A's service.

The results of setting 1~3 show that while SMEs are focusing on the more resource aspects, the ratio of their ability increased by per new partner is much higher than SMEs that are not focusing on resource based aspects. By these two figures, it is obvious that through concentrating on resource based aspects, SMEs are having better efficiency in ability gaining from alliance.

However, from Figure 5.4, we can see that setting 2 and 3 are showing some different characteristics from Figure 5.2, 5.3. In Figure 5.4, the settings 1, 2 indicates that a much higher number of entities is attaining inferior outcome value in terms of the number of customers obtained (the left hand part), however setting 3 shows a much better outcome value in terms of acquiring more customers by having more entities in the right hand part in Figure 5.4 than setting 1,2 .

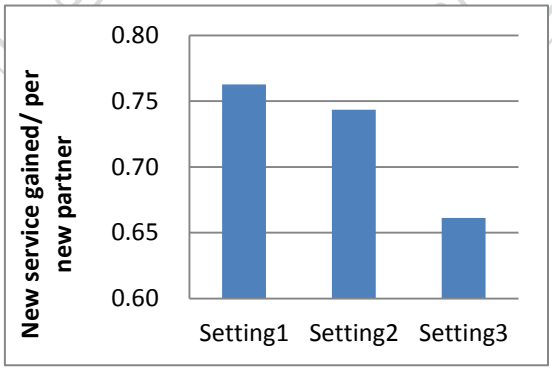


Figure 5.2 New service obtained per new partner

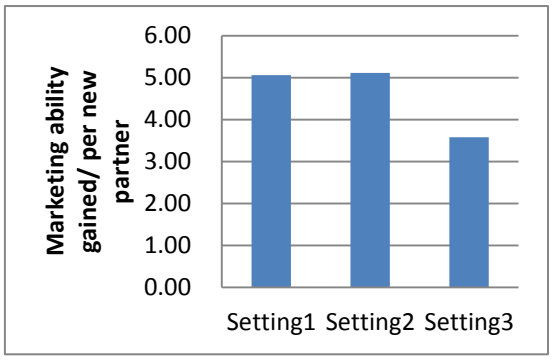


Figure 5.3 Marketing increased per new partner

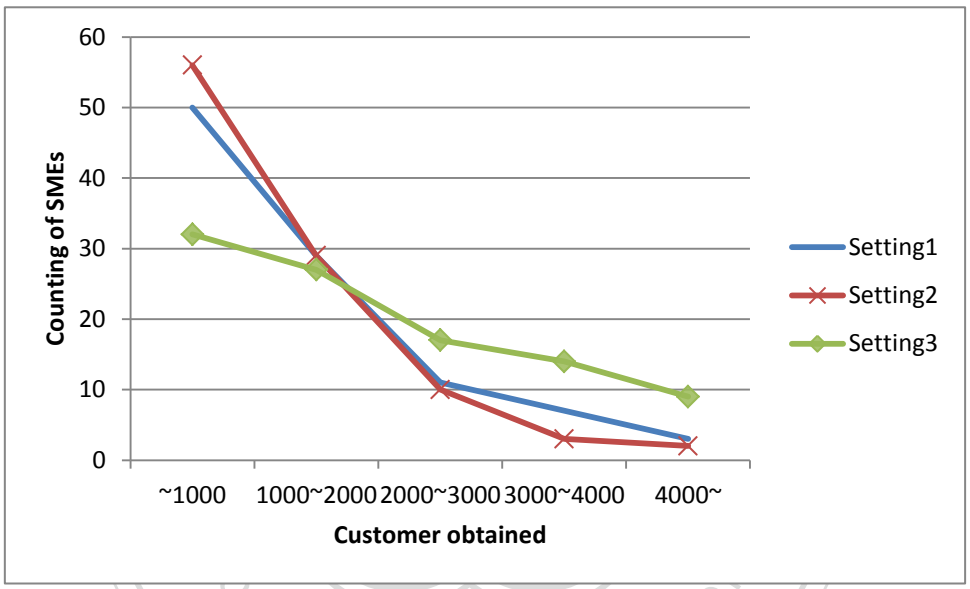


Figure 5.4 Actual market size distributions of all settings

Combining the results of the three figures, while Figure 5.2, 5.3 indicates that SME's has a higher performance in ability gain under a higher resource based tendency in alliance situation, Figure 5.4 shows some SMEs although gaining more ability per new partner in resource-focusing, in fact, are not doing better than higher interaction tendency SMEs. A possible explanation of this contradiction is that even though high resource based focused SMEs are more efficient in finding partners to increase their abilities, they might fail to meet to their customers' expectations. However, for SMEs with higher interaction tendency can find partners that are able to

provide critical components to its service value proposition to the customers, hence results in a better consequence.

If applying these explanations to our propositions, we can see through Figure 5.4 that the comparison of setting 3 with setting 1, 2 is showing that interaction-centric SMEs are doing much better in alliance for service innovation than resource-centric SMEs. Accordingly, we can say that our proposition – interaction serves an important role in service innovation and service value creation is supported, because it has the same even better performance- acquire more customers, than the well-recognized resourced base alliance selection approach in this simulation. Hence, we could argue that interaction is an important factor in SMEs alliance building if they pursue better outcomes from the alliance, and are able to go on with our other experiments given this premise being justified.

5.3 Experiment Details for Proposition 2

5.3.1 Experiment Challenges and Design Principles

By proving the importance of interaction in section 5.2 through simulation, we then wish to prove the effectiveness of our proposed interaction pattern adjusting model mentioned in CH4 in helping SMEs analysing and managing their interaction pattern to obtain higher valued service innovation in alliance. In this experiment, the simulation approach will be used again, in consideration of the same condition as the previous experiment – it is hard to find SMEs to observe, requires very long time to perceive the result, and is vulnerable to other factor influences. With simulation, we can observe the outcome of SMEs who apply and who do not apply our model in different situations, and evaluate the usefulness of our model.

5.3.2 Experiment Design Details

To demonstrate our model within the simulation, two more factors will be added into the simulation process, a) interaction quality degree and b) company resource.

Interaction Quality Degree:

The interaction quality degree refers to the intensity and quality of the interactions between SMEs within the region. With higher interaction quality degree, SMEs shall have better and denser interaction with each other, and shall result in higher possibility of gaining benefits or service innovation insights from the others. During the simulation process, we model this through pretending SMEs with higher interaction quality degree will have higher alliance successful rate, thus will have higher chance to benefit from the alliance.

There are two considerations for adding interaction quality degree factor. The first is because the interview target we've chosen is Pillow Mountain Leisure Agriculture Area, SMEs in areas like Pillow Mountain Leisure Agriculture Area were considered as having a more loosely inter-business relationships due to their far distance with others, and are harder to form higher quality and intensity interactions; hence we design the interaction quality degree to model this phenomenon, and intend to see the differences might occur within different given values of interaction quality degree.

The second reason for creating the interaction quality degree factor is that this factor can serve as the experiment method of interaction pattern level we've mentioned in CH2 and CH4, in which higher in interaction quality degree will refer to higher interaction pattern level, which can help us to demonstrate and verify our proposed model in the simulation process. In the simulation process, very high interaction quality degree will be considered as having a level 3 interaction pattern with another SME, a normal interaction quality degree will refer to a level 2 of interaction pattern with another SME, and level 1 interaction pattern will be modelled

by having an inferior interaction quality degree with another SME.

For different configurations in the experiments, a rate of happening higher interaction quality degree will be designed. SMEs under a higher high-interaction-quality degree setting will have higher possibility to have a higher interaction quality degree with other SMEs, which simulates areas where SMEs are very cooperative and more tightly bonded. On the other hand, if the given situation is SMEs are having low high-interaction-quality-degree, than SMEs under this setting will tend to have lower degree of interaction quality between them, which is simulating areas where SMEs are highly competitive, consider other SMEs as an opponent, and seldom interact with other. Given an example, if the rate of higher interaction quality degree is high, two SME: SME A and B will have a very high chance to have higher degree of interaction quality; if the rate is low, then SME A and B will possibly have poor interaction quality. However, SME A and B can still improve their interaction quality degree by using their company resource, which will be explained in the next section.

Company Resource:

The second factor to be added into the simulation is company resource. This factor represents the resource SMEs hold to improve their interaction quality degree with other SMEs; when an SME A wish to enhance its interaction quality with another SME B, it will cost both SME A and SME B's company resource to fulfil the enhancement. In addition, the costs of improving different degree of interaction quality will be different; while SMEs can relatively have a less expensive cost to reach a level 2 interaction quality degree with another SME, it will be more difficult to improve this relationship to a level 3 interaction quality.

The purpose of this factor is to serve as a limitation, and see the effectiveness of

our model under this given limitation. Our proposed interaction pattern adjusting model provides an analysis method and guidance for SMEs to decide their strategy to adjust interaction patterns. While given a limited company resource, SME could not choose every other SME to improve interaction quality (interaction pattern) with, so the strategy to choose proper target will be important. We would like to see the different outcomes of SMEs customers obtained by following or not following our model's suggestion.

Also, the target users (Pillow Mountain Leisure Agriculture Area) of our model are SMEs who are scarce in resource, and we intend to use the different given value of company resource to simulate SMEs with different amount of resource within our simulation process. Relation of alliance successful rate, interaction quality degree and company resource are given in the following table 5.3

Table 5.3 Factors relation

Interaction Quality Degree	Alliance successful rate	Company resource needs
I	Low	Don't required
II	Medium	Required less
III	High	Required more

Responding to the proposition 2, 2.A, 2.B, and 2.C, we design 4 settings with different configurations of these 3 factors, listed in the following table 5.4. Setting 1 refers to Pillow Mountain Leisure Agriculture Area, where we defined SMEs there to be loosely related, lesser in resource, and lower in knowledge and ability to form good alliance and benefit from it. Settings 2 refers to places where SMEs are higher in business knowledge (knowing more about how to make good alliance), but are having a loosely related inter-business relationship and little of resource. Setting 3 is for places where SMEs are having abundant of resource, but do not have a good inter-SME relation and not sufficient knowledge of doing business alliance. The last

setting 4 is for where SMEs have good interaction with others, but no resource and proper business knowledge.

Table 5.4 Details of each setting

Settings	Interaction quality degree	Alliance successful rate	Company Resource
Setting 1	Low	Low	Low
Setting 2	Low	High	Low
Setting 3	Low	Low	High
Setting 4	High	Low	Low

5.3.3 Experiment Results and Conclusions

The following Figure 5.5~5.8 are the results of our experiment to verify our proposed model under different settings, Figure 5.9 shows the comparison between them. As the previous experiment, the way we define how well our model is by comparing the number of customers the SME could acquire after adopting our model or not adopting.

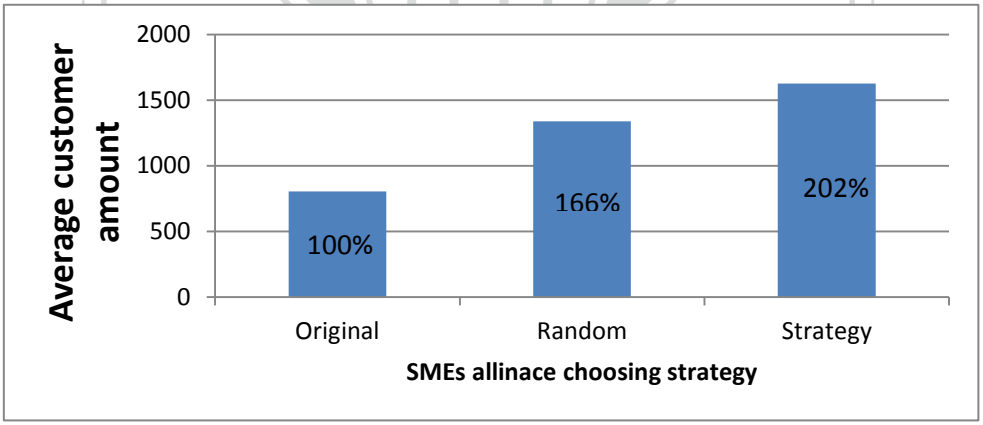


Figure 5.5 Results of Setting 1

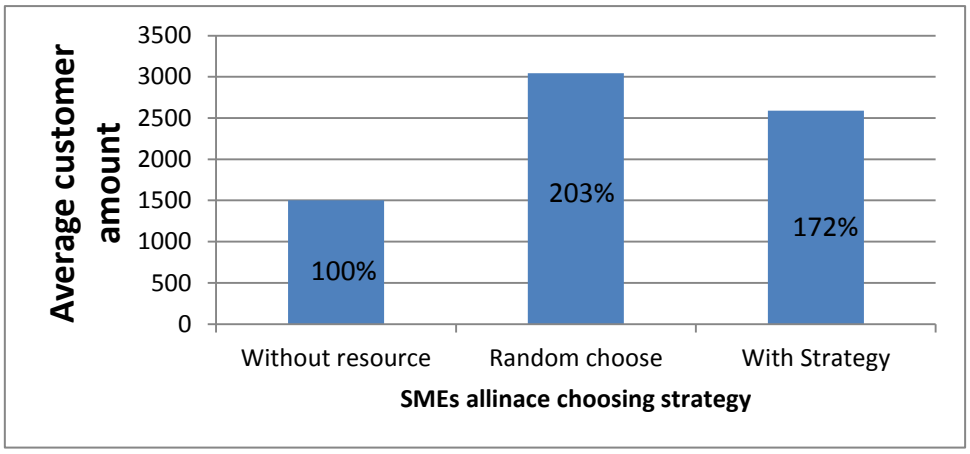


Figure 5.6 Results of Setting 2

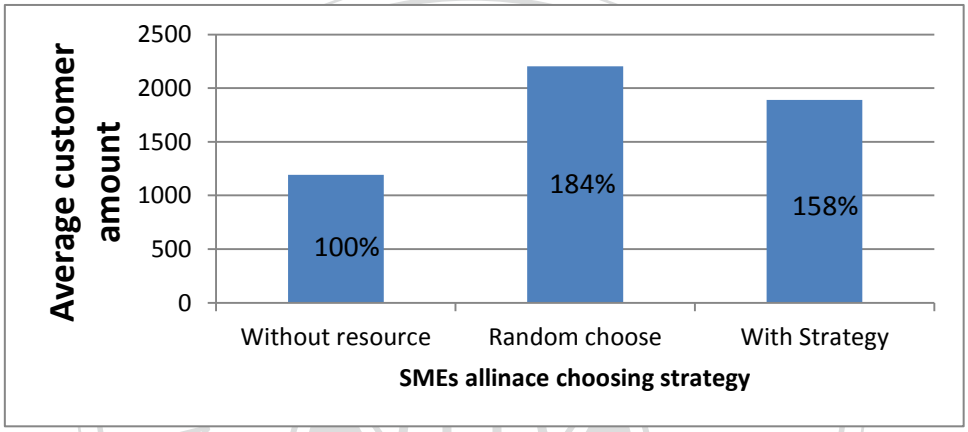


Figure 5.7 Results of Setting 3

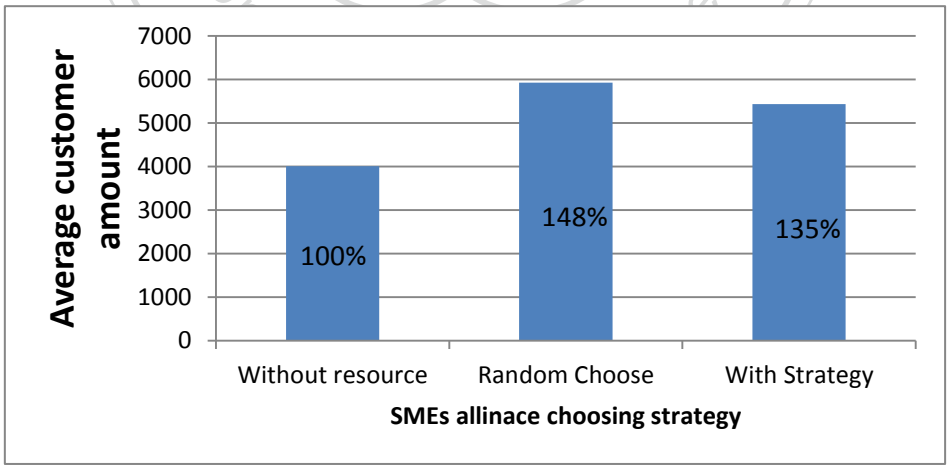


Figure 5.8 Results of Setting 4

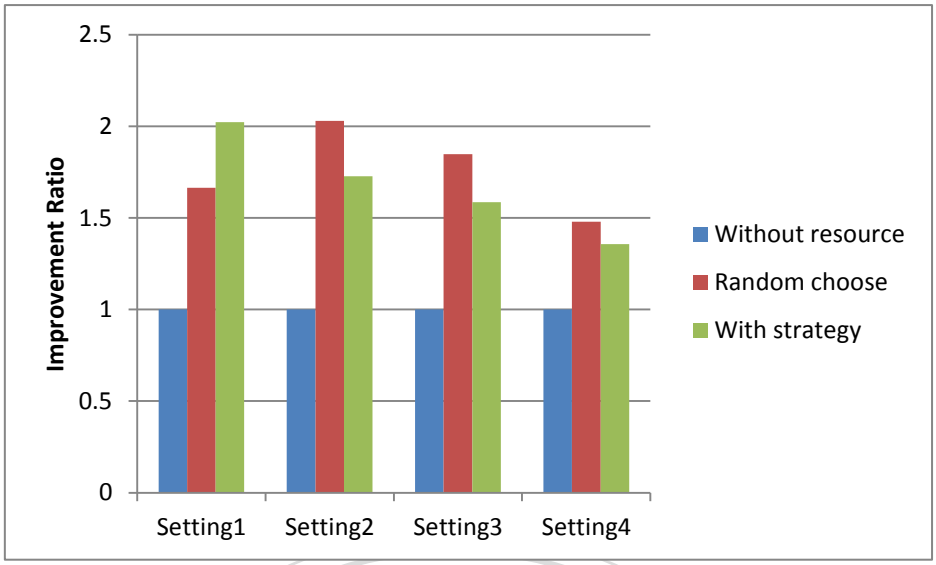


Figure 5.9 Comparison of improvement ratio of average customer acquired under all settings

From Figure 5.5, the results of SMEs who apply our model suggested strategy makes the total customer acquired grows 102%, and the results of not following grows 66%; so while under setting1, following the strategy is better for SMEs. However, from Figure 5.6, 5.7, 5.8 we can see a totally different situation that SMEs who follows the strategy are not doing as well as those who do not. Figure 5.9 shows a very clear comparison that only under setting 1 can our model do better than not applying, accordingly, we might only able to apply our model within the context of setting1.

To discover the reason of why our model only able to apply to setting 1 (for where SMEs are less in resource, less acquainted in businesses managing knowledge and more loosely related), we gathered other data from the simulation process to see more details. From Figure 5.10 which represents the average number of customers each SME could acquire under each setting, we can see that SMEs under setting 1 has the lowest average, and setting 4 has the highest. Comparing with the data of improvement ratio (Figure 5.9), while average customer amount is higher, the effectiveness of both strategy and randomly choosing is getting lower; in contrast,

when the average customer is lower, the effectiveness of building alliance grows more important. This information reveals a situation that where interaction pattern adjusting will be useful (i.e., where the average performance of the region is lower), but does not explain why our strategy is not applicable under other contexts than setting 1. Consequently, we try to find the reasons from another perspective, ability gaining perspective.

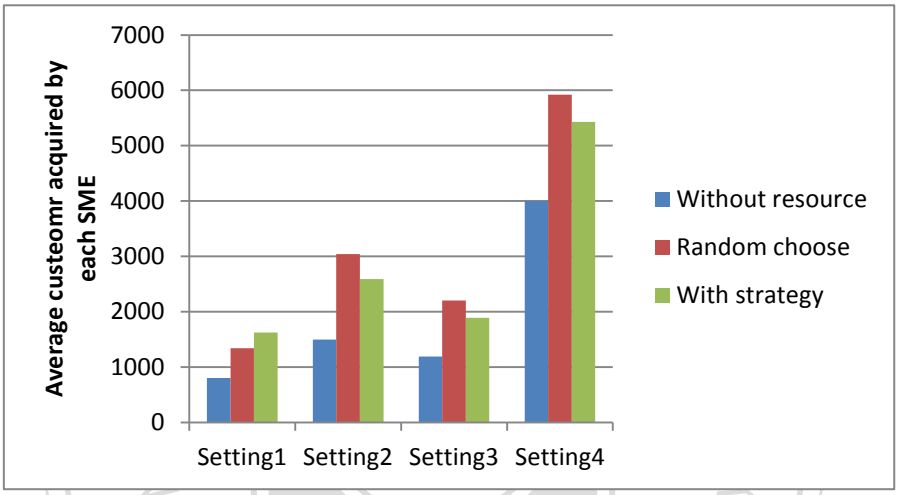


Figure 5.10 Average number of customer acquired by SMEs under each setting

During the simulation process, there were two factors affecting SMEs acquiring customers as mentioned before: ability and marketing. The abilities decide the maximum customers this SME could obtain, and the marketing ability influences the percentage of customer the SME could acquire from its able-to-acquire customers. Hence, the amount of customer acquired should somehow able to be decided by the accumulation of these two factors growth rate.

Figure 5.11 shows the comparison of the accumulation of abilities and marketing. From Figure 5.11, we can see that only in setting 1, those SMEs who follow our model, their accumulation of abilities and marketing growth rate is higher than those who do not follow; in other words, only under setting 1 the strategy proposed based

on our model, is benefiting the SMEs, which is same as what we discovered in Figure 5.5~5.9.

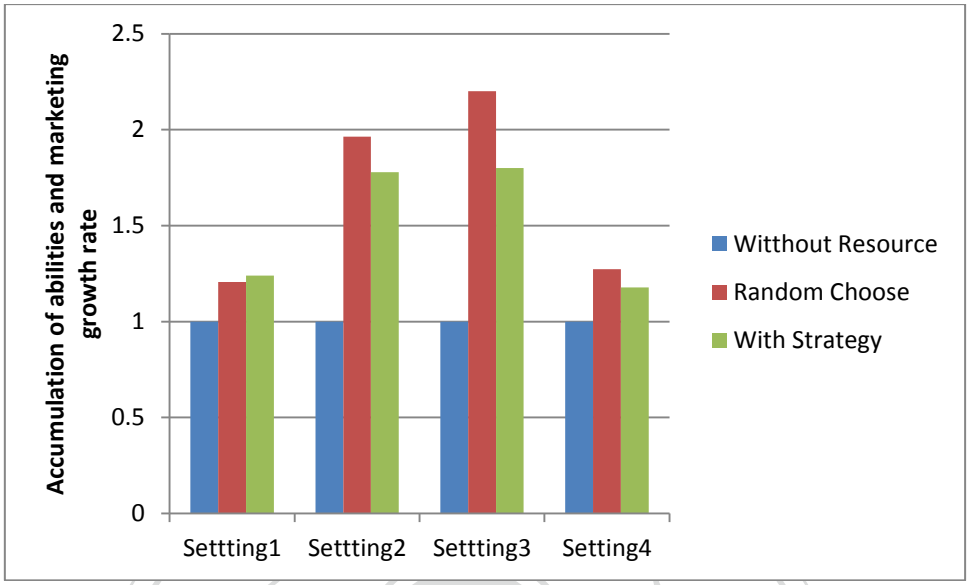
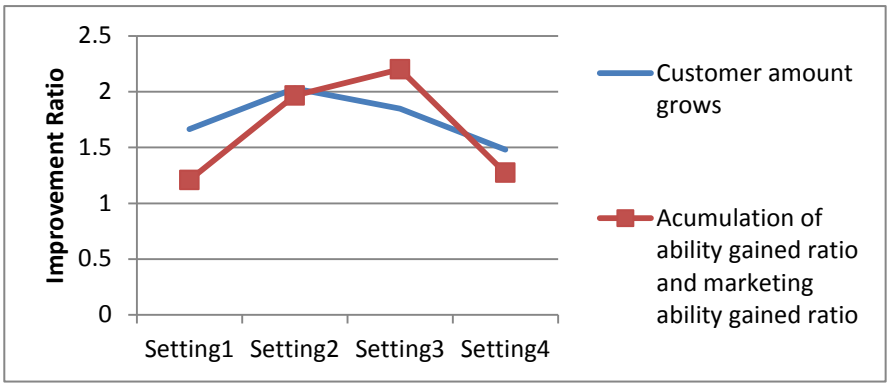
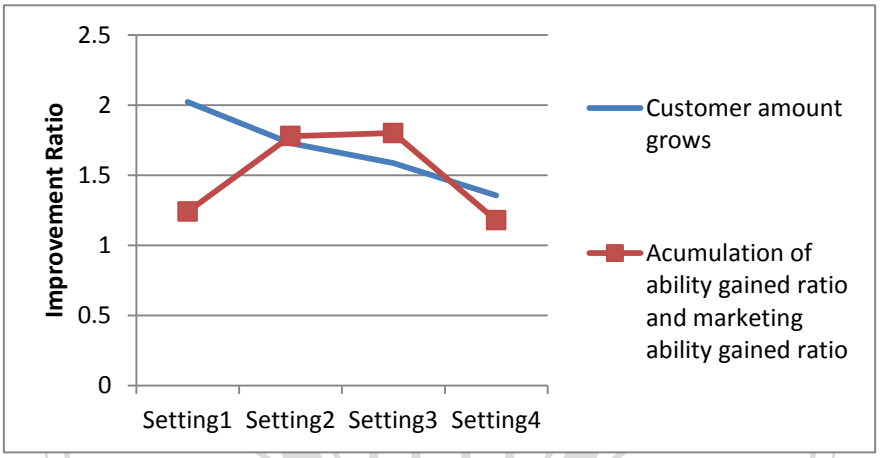


Figure 5.11 Comparison of the accumulations of abilities and marketing under different settings

However, although the comparison of results under each setting in Figure 5.11 are showing the same trend as Figure 5.9, there are still different discovery found in Figure 5.11. If we cross analyse the improvement ratio of customer amount growth and the accumulation of ability and marketing growth rate (Figure 5.12, 5.13), we can see under setting 1 and 4, the ratio of the accumulation of the two factors growth rate is lower than customer amount growth rate; and in setting2 and 3, the growth rate of two factors accumulation is the same as or higher than customer amount growth rate. Combining this discovery with Figure 5.9, we can see whenever the effectiveness of following our model is higher or almost same as randomly choosing, the accumulation growth rate of ability and marketing is lower or almost same as customer amount growth rate. In other words, when the elasticity of accumulation growth rate with customer growth rate is high, our strategy is more effective. Figure 5.14 shows the comparison.



5.12 Random Choosing



5.13 With Strategy

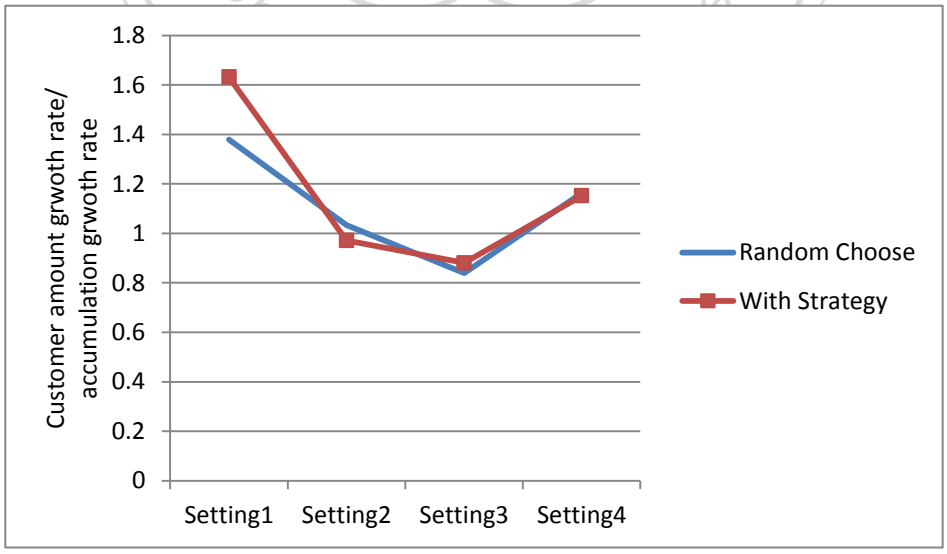


Figure 5.14 Comparison of relationship of improving accumulation growth rate (ability and marketing) and customer growth rate under randomly choosing and following strategy

This discovery reveals when our proposed model is effective and when is ineffective. First, while the effectiveness of gaining benefit from other SMEs through high interaction quality degree is lower, which means the difference between high and low level of interaction degree is smaller, the effectiveness of our strategy is lower (setting 1 compared with setting 2). Secondly, when the cost to achieve higher interaction quality degree is relatively lower (setting1 compared with setting3), the effectiveness of our strategy is also lower. Lastly, when the scarcity of higher level interaction quality is lower; in other words, when it is relatively easy to have a high interaction quality with other SMEs, our strategy will also be less effective (setting 1 compared with setting4). In contrast, when the effectiveness, cost and scarcity of interaction quality are all relatively high, SMEs are suggested to apply our model and follow the suggestion it gives.

This discovery is aligning with the design of the proposed model. In our model, we already presume the scarcity of higher interaction quality (interaction pattern) is high by defining that a level 3 interaction pattern could only be achieved when the all questions within the questionnaire (Ch4.3) are responded “high” in Figure 4.4. Also, there are only very few steps or improvement required for an SME to improve to level 5 service innovation value from level 1, which somehow can show the concept that each improvement is highly difficult and costly, and is in accordance with our discovery. For the last discovery, interaction is a crucial element in business is the fundamental concept of our theory, so our discovery also adheres to the design principle of our model. In brief, the discovery of our model is benefiting SMEs while the effectiveness, cost and scarcity of interaction quality is high not only shows when and what situation is appropriate to use our strategy, but also verified it is well-aligned with the design idea of our model.

Concluding, the usability of our model must be evaluated by comparing the customer growth rate and the accumulation of growth rate of ability and marketing, if possible. When customer growth rate is lower or equal to the accumulation of growth rate of ability and marketing, which indicates that one of the factor that influences interaction quality: effectiveness, cost and scarcity is low, our proposed model will become inappropriate for SMEs to comply with. However, if the effectiveness, cost and scarcity of interaction quality is high, which will makes customer growth rate higher than the accumulation of growth rate of ability and marketing, our proposed model will be very useful to SMEs to improve their service innovation value.

5.4 Experiment details for proposition 3

5.4.1 Experiment Challenges and Design Principles

After simulation testing, although our model is not effective in every case, we still discovered some situation that our model is able to provide support for SMEs. By this discovery, we then wish to test our proposed information system effectiveness in aiding the using of our model. However, unlike the previous experiments, the experiments in evaluating our system effectiveness cannot use simulation technique for the reason that we cannot simulate the user behaviour of our system due to that every user will have different using behaviour and it is impossible to design a simulation process to capture them all.

In addition, the effectiveness of interviews might also be limited in consideration that we will provide each user some short cases as guidance. The case guidance might be considered as the final output (section 4.6) of the system and will easily be how the customer evaluates this system. However, the quality of each cases are different; also, even given the same cases, different SME user might have totally different feelings and understanding of each cases. Hence, user interviewing might not be an effective

evaluation approach unless we can perform a lot of interviews, yet the problem of how to find a proper interviewee – a SME with service innovation experience and are willing to build new alliance or interaction with other SMEs based on the suggestions – will arouse again as other experiments.

Considering the difficulty that might happens within different kinds of system's evaluation, Henver et al. (2004) had given 5 main types of system evaluation method for different system's situation(Table 5.5). Within the 5 types of method, the reason for why type 1 and 3 is not applicable is listed before, and type 2,4 is more like measuring the efficiency of the system and is not fitting to the experiment purposes. Accordingly, in this experiment, instead of using simulation techniques (type 3) or interviewing (type 1), we decide to describe the system thoroughly by giving a using scenario to prove its usefulness (type 5). The scenario will leads through all the actions within system using process, and gives an easier to understanding to how may the system aids users while they uses the system.

Table 5.5 Types of system evaluation method for different situation

1. Observational	Case Study: Study artefact in depth in business environment Field Study: Monitor use of artefact in multiple projects
2. Analytical	Static analysis: Examine structure of artefact for static qualities Architecture analysis: Study fit of artefact into technical IS architecture Optimization: Demonstrate inherent optimal properties of artefact of provide optimally bounds on artefact behaviour Dynamic analysis: Study artefact in use of dynamic qualities
3. Experimental	Controlled Experiment: Study artefact in controlled environment for qualities Simulation: Execute artefact with artificial data
4. Testing	Functional Testing: Execute artefact interfaces to discover failures and identity defects. Structural Testing: Perform coverage testing of some metric in

	the artefact implementation.
5. Descriptive	Informed Argument: Use information from the knowledge base to build a convincing argument for the artefact's utility Scenarios: Construct detailed scenarios around the artefact to demonstrate its utility

5.4.2 Experiment Design Details

The scenario will be an imagination SME owner Peter, who owns a hostel at Pillow Mountain Leisure Agriculture Area who needs to improve its service value to survive. In the region, there are many different kinds of SMEs, like other hostels, food stands, restaurants, farms, bakery, and car rental company etc.; also, there are some travel agencies that have relationships with this regions and will help promoting. However, Peter is not interacting well and frequently with them, because Peter was putting his focus on improving his hostel before. Recently, Peter understands that what he can achieve by his own strength is limited, so he wishes to try another approach; nevertheless, he has no idea about other approaches that he might able to use, so he start using this system.

5.4.2.1 Data Collection Process

At the beginning, Peter registered the account of the system, and then started inputting some basic data of him and his hostel. After the registration, Peter was presented with an input screen of the system where he can input data and interaction condition of him and his fellow SMEs, some possible candidates for Peter are presented already on the screen based on the location data Peter inputted during registration (Figure 5.16, also for the Annotation Module). Peter considered to input 6 more SMEs data as the following table 5.6 into the system (table 5.6 also include the

data of the 4 candidates the system recommended), and considered them as a specific type of entity according to the interactions between them as table 5.7.

Table 5.6 Other SMEs details

SME name	Descriptions
Hostel A	Competitor, targets the same customer segment, and is cheaper and better than Peter's hostel
Hostel B	Competitor, but targets an even cheaper customer segment
Bakery A	A small bakery where Peter will buy breakfast for his customers
Car rental A	A car rental SME nearby Peter's hostel, Peter sometime drives his customer to there to rent cars.
Restaurant A	A restaurant nearby where Peter will order for his customers sometimes
Restaurant B	A famous restaurant nearby, Peter will introduced his customer to this restaurant sometimes
Souvenir shop A	A nearby shop where Peter's customer will go sometimes
Souvenir shop B	A bigger souvenir shop at the centre of the region.
Farm A	Peter will take his customer to this farm to let them experience farming life if the customer asked.
Travel Agency A	A smaller travel agency, they will contact Peter to arrange accommodations if they are planning for any activity to that region sometimes
Travel Agency B	A bigger travel agency, usually find other more famous hostels than Peters

Table 5.7 Interaction Details of other SMEs

SME name	Interaction pattern	Reason
Hostel A	Lateral, Lv1	No direct relationship
Hostel B	Lateral, Lv1	No direct relationship.
Bakery A	Supplier, Lv1	Supplies food for Peter.
Car rental A	Supplier, Lv1	Supplies services for Peter's customer.
Restaurant A	Supplier, Lv1	Supplies food for Peter.
Restaurant B	Lateral, Lv1	No direct relationship.
Souvenir shop A	Lateral, Lv1	No direct relationship.
Souvenir shop B	Customer, Lv1	Can help promoting Peter's hostel.
Farm A	Lateral, Lv1	No direct relationship.
Travel Agency A	Customer, Lv2	Can help promoting Peter's hostel, and have done many businesses before.
Travel Agency B	Customer, Lv1	Can help promoting Peter's hostel

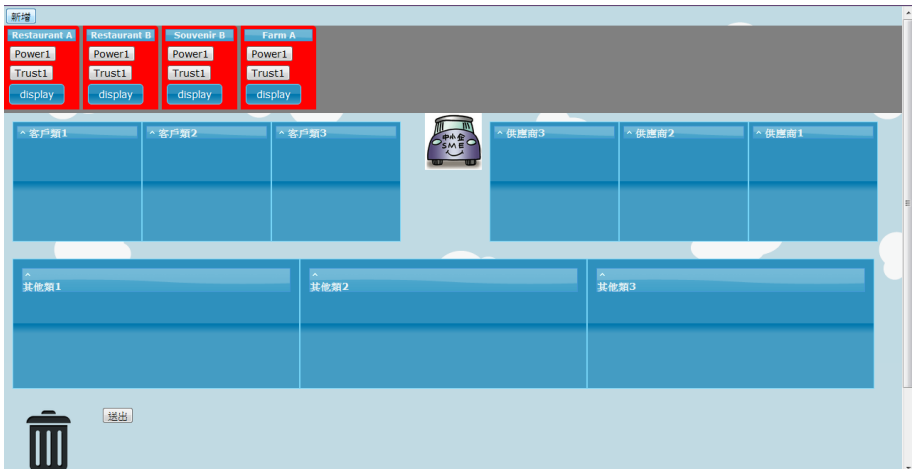


Figure 5.16 Data Collection Module enter page

In this module, Peter could create new entity easily by pressing the "add new" button on the left upper corner (Figure 5.17); also, the system provides Peter a light solution to insert what the type of the entity and their cooperation level by drag and drop the entity into different boxes (Figure 5.18). In addition, to tackle the remaining constructs – power dependence and trust, Peter could click the buttons – "Power", "Trust" on the entity to change the level of these constructs (Figure 5.19). Finally, when Peter is not sure about the current status of his interaction pattern with another entity, he could click the "display" button to call the questionnaire screen out to fill in the more accurate data (Figure 5.20). The results of Peter's input could be found in Figure 5.21.

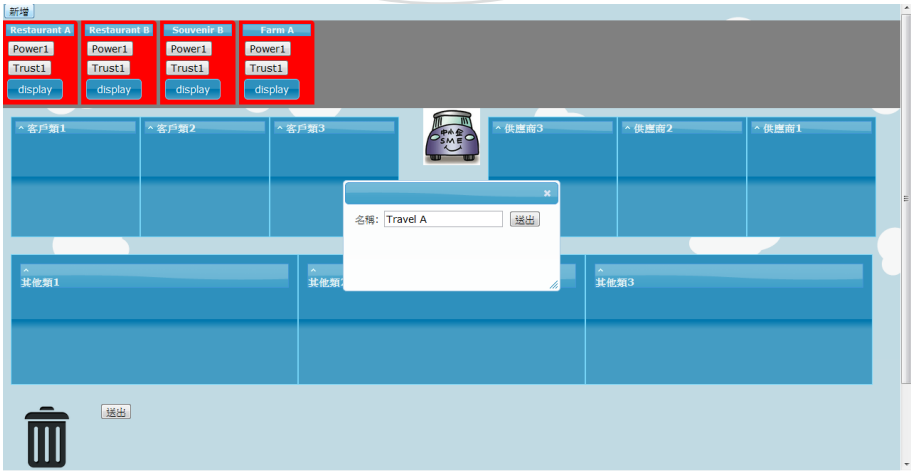


Figure 5.17 Adding new entity

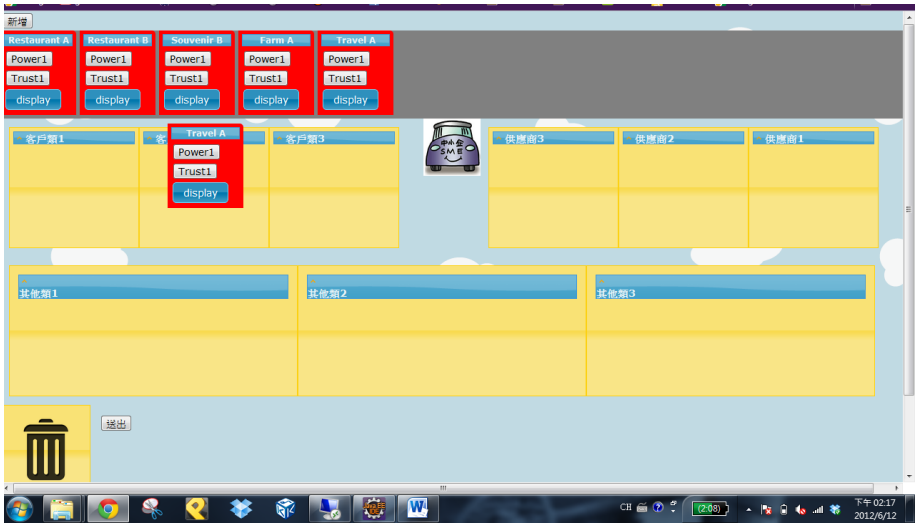


Figure 5.18 Dragging and drop the entity to desired location

Figure 5.19 Changing the Trust construct of entity by clicking the Trust button

Figure 5.20 Call out the questionnaire input box to fill in the data more accurately

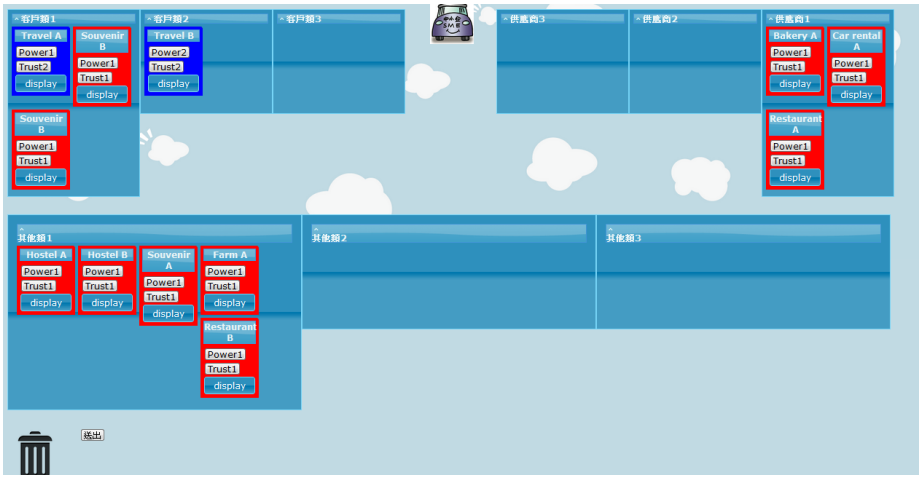


Figure 5.21 Results of Peter's input

5.4.2.2 Pattern Improvement Process

After Peter finished the data input process, the system will automatically execute the pattern recognition process to identify Peter's current interaction pattern (customer type: lv2, supplier type: lv1, lateral type: lv1) and current service innovation value (Level 2 now), and then provide the interface for Peter to select and decide how he might want to change his interaction pattern and what degree of service innovation level he pursues. In addition, Peter can choose to activate the system's support during the selection, in case that he might be unfamiliar about how to choose a SME to improve interaction pattern with (Figure 5.22, 5.23).

Peter selected to improve his interaction pattern with Restaurant A first with the hope that he could improve the total living quality of his hostel by providing better food supplied by Restaurant A (Figure 5.24). Due to this selection, based on the service innovation value calculate function, his service innovation value could be improved to level 3 because of having better interaction pattern with a supplier entity and a customer entity. If Peter had activated system support, then the system will suggest Peter to improve pattern with customer entity and supplier entity, based on our interaction pattern adjustment model. (Figure 5.25)

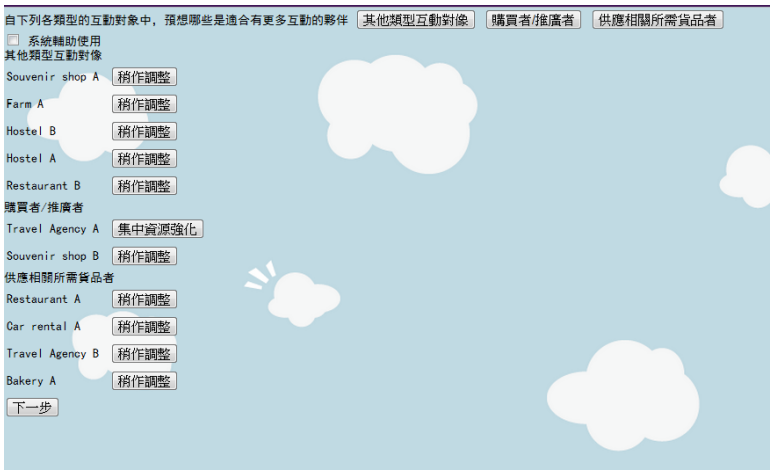


Figure 5.22 Pattern Adjusting Module- without system support

Figure 5.23 Pattern Adjusting Module- with system support
(the customer section was erased from user's choice)

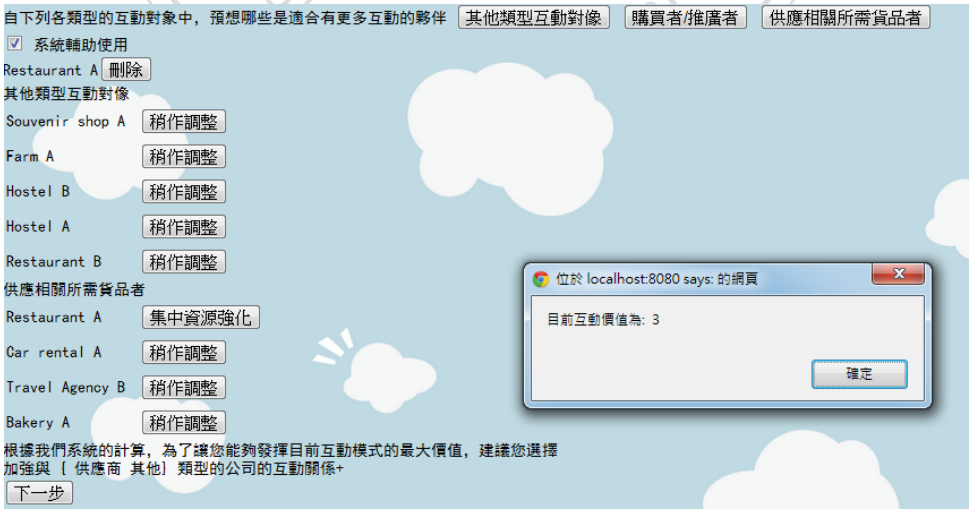


Figure 5.24 Pattern Adjusting Module- After selected a target SME

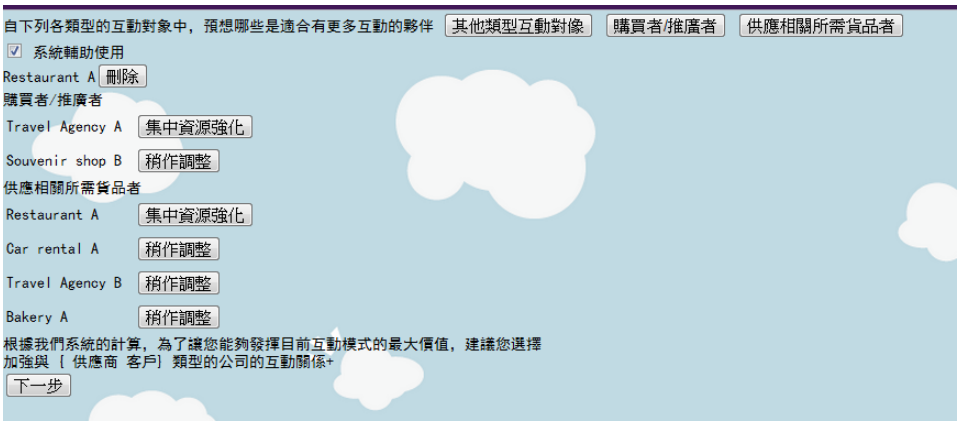


Figure 5.25 Pattern Adjusting Module- After selected a target SME, the system will change the candidates automatically

With the help of the system support, Peter chooses to improve his interaction pattern with Restaurant A and Travel Agency A, in consideration that the previous one might be able to provide him better accommodation quality, and the latter one is supposedly capable to promote his hostels features (Figure 5.26).

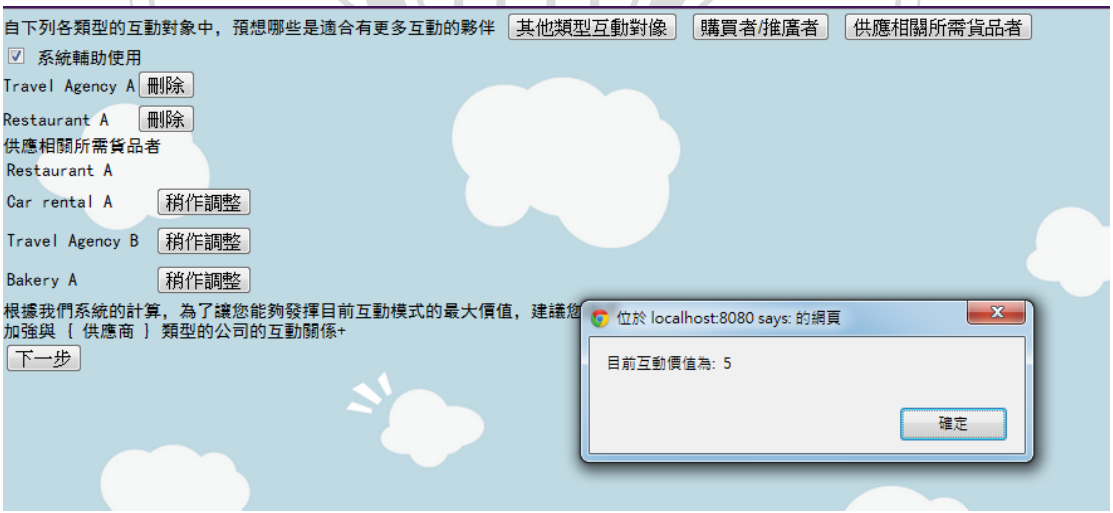


Figure 5.26 Pattern Adjusting Module- After reach to service innovation value 5

5.4.2.3 Case Selection Process

After Peter selects the interaction pattern adjustments, the system analyses his choice and provides Peter some successful interaction pattern adjustment cases as

guidance (Ch4.6) to help him adjust his interaction pattern to achieve higher service innovation value.

Each pattern improvement that Peter chooses will have several corresponding cases; for example like Peter had choose to improve his interaction pattern with Restaurant A (supplier), 4 cases are within the system are for improving interaction pattern with this kind of entity, so the system will display all the 4 cases to Peter to choose based on Peter's own judgement.

In addition, for situation like Peter's who had chosen 3 pattern adjustment steps (Restaurant A from level 1 to level 2, Restaurant A from level 2 to level 3, Travel agency A from level 2 to level 3), the system will show 3 groups of interaction pattern adjustment case to Peter, each for one pattern adjustment step (Figure 5. 26).

To make the interface neat, we choose to make the case's content invisible until the user decide to see it. Peter could see the content of each case by clicking the "Read Content" button, and the case content will then be displayed on the screen (Figure 5.27).After selecting one case from one group (Figure 5.28), that group will become invisible, and will appear again only when the user decides not to use this case and press the delete button. When all groups have been selected, (for Peter's case, when all the three groups had been selected), the submit button will appear (Figure 5.29), and will lead the user to next page and combine all the cases together. The cases will be sorted base on its belonging pattern choosing order (Figure 5.30).

Figure 5.26 Case selection interface – entering page

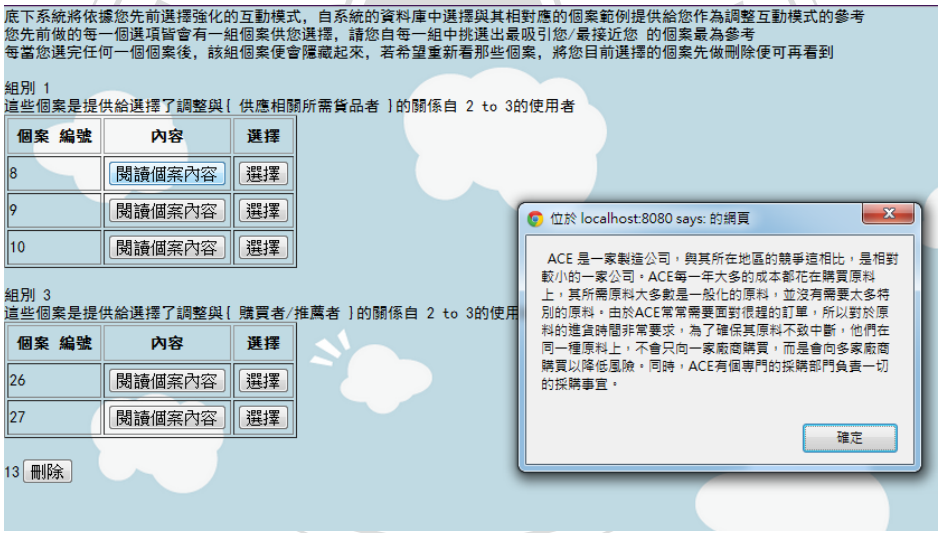


Figure 5.27 Case selection interface - Case content

Figure 5.28 Case selection interface – after selected one case

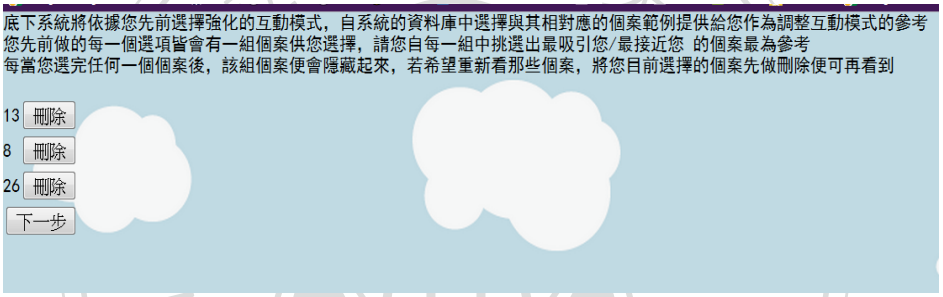


Figure 5.29 Case selection interface – after all required cases are selected

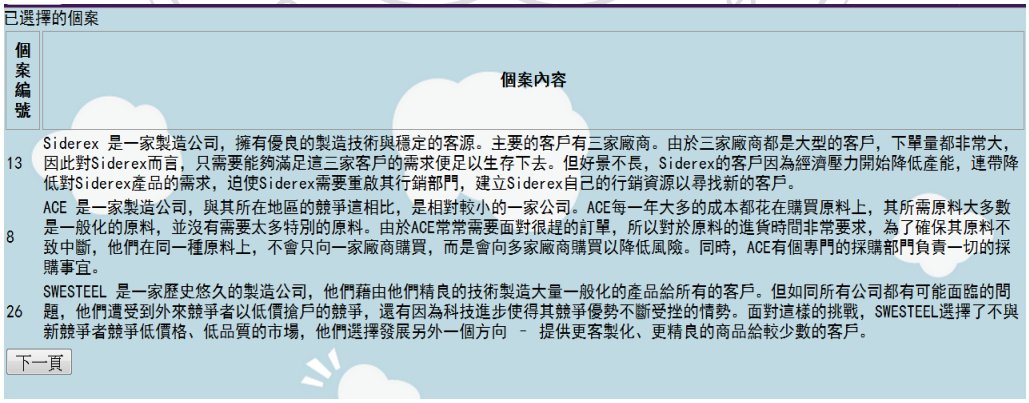


Figure 5.30 Case selection interface – All selected cases will be displayed after submit

5.4.3 System Using Scenario Conclusion

The purpose of this system existence is for assisting users to implement and make

use of our theory and model through information technologies. By showing a detail using scenario by imaginary user- Peter, we can see the effectiveness of how the system may support user using our model. Beginning with the data collection process, during this process, we've provided a simple but clear user interface for users to input their interaction data with other SMEs, which enables us to collect user's interaction condition quickly and accurately. Secondly, the pattern adjustment process which corresponds to our interaction pattern recognizing module and interaction pattern adjustment module, is carefully designed with java scripts and ajax techniques to provide user a fluent using experience; also, we had designed a supporting function within this process, hence users could consider thoroughly about their interaction pattern improvement strategy without influenced by their information techniques or unfamiliar with the system.

Last, we had collected many interaction adjustment related cases for the users as guidance, and had grouped them base on the type of entity they are facing with and the degree of adjustment. Accordingly, users shall be able to find proper case for them to learn from easily, and can follow the case guidance step by step because the cases had been arranged according to patterns adjustment selections.

Concluding, although we are not able to test our proposed system in field by SME users, through the scenario simulating process, we can see this system is designed well in assisting user in using our theory of interaction pattern adjustment for service innovation. From the beginning data input process, the interface was designed to be as simple as possible to avoid unnecessary distraction and misleading; the pattern adjustment process was designed carefully to help user in using the system and get feedback immediately; the case selection process corresponds to previous steps, select proper case and provide an user-friendly interface for users to choose proper case for guidance. By these system design techniques, users shall be able to use our model

with ease by the help of this artifact.

Last but not least, this system could be improved when more SME users had used it to look for service innovation chances; also, this system is related with other system and theory which were mentioned in CH3 and hence more user data and using data could be obtained from other related system.

5.5 Discussion of Findings

The goal of this study is to provide SME a new way to find service innovation chances and values which is based on interaction patterns adjustments, and create tools for them to use the theory. The experiments had provide a general support for our proposed theory, and revealed some possible explanation for the result.

At the beginning, we test the applicability of interaction adjustment in business environment by simulation techniques in hope to justify some service science and system thinking researches opinions. The outcome showed a positive outcome for our research and supporting data of our proposed idea by displaying the difference of service value of SMEs between resource based aspect and interaction aspect, and proved that interaction is a point of view worthy for more research for service innovation.

Secondly, we hypothesized in proposition 2 that our model for interaction pattern adjusting will be good for SMEs who are not abundant in resource, less acquainted with business managing knowledge and less tightly related because our target user are SMEs Pillow Mountain Leisure Agriculture Area who are fitting to those descriptions. The experiment results of experiment 2 proved our model is applicable for users to apply to change their interaction pattern for higher service innovation value.

Moreover, after several testing, we discovered that our model is useful for and only for the target user we have presumed. We believe the possible explanation for the

result is that because our model is based on the assumption that interaction pattern is the core of business value generating, thus we believe every single interaction pattern with another business can play a very important role for the SME, and is difficult to change. However, only in the given environment, where SMEs are not abundant in resource, less acquainted with business managing knowledge and less tightly related then our assumption (every interaction pattern is important are hard to change) will be true; for other situations, because the interaction pattern with single company might not be influential enough, or could be relatively easy to be modified, our model will be less effective.

In the last experiment 3, we presented a usage scenario of our proposed mechanism to aid users in using the model which is verified in experiment 2. Although without enough users testing and suggestions due to the system's purpose restriction, our system still showed a high applicability to aid users to apply our model even not familiar with information technology, and support them throughout the using process. Also, this system is designed a self-improving system, the case included in the case database will increase when more users had go through all ImageCons projects (CH3, CH4) , hence its value will increase with the amount of users grows.

Results from the experiment had shown supportive data for all of our propositions. These findings convince us that interaction pattern adjusting could be a promising focal for SMEs to use as a method to improve their service value and service innovation value. In addition, for SMEs who are interested in using interaction pattern adjusting, our model is proven through experiments that it could provide proper support for pattern adjusting selection as long as these SMEs are under appropriate environment. If relate the findings with our research questions, by proving interaction could be a new focal for SME businesses managing, it also provides to be a good aspect to understand SMEs service system structure; and our model and system

provides users with good support to create service innovation outcomes base on their own situation.

Moreover, these discoveries not only answered the research questions, but also are well corresponding to service science's concepts, which are our fundamental theory basis. In service science theory, entities could be divided into two groups: operant and operand, and values are created only through the exchange of value propositions. From good's dominant logic perspective, entities are considered as operand – resource only; but service dominant logic considered other entity as operant, which are entities that are able to manipulate itself and other entities. Place different dominant logic with different perspective. For resource based perspective, companies decide which resource they need, find the proper candidate who possess this resource, then intensified their alliance building ability in gaining benefit from alliance. We could considered this as companies are taking other companies as an operand – unchanging and waiting to be obtained; and also, the candidate choosing process makes the alliance process unlike value propositions exchanging – flexible and full of possibilities, but more like giving a consolidated value to the other, making the alliance building more like goods exchanging.

However, the results from experiment 1 show that these companies gain less from alliance building than interaction based companies. We believe the key is that interaction based companies considered other company more as an operant – self controlling entity, but not as mere resources. These interaction-centric businesses spent more efforts on the interaction process. The more intensive interaction creates more chances to propose and exchange value propositions with their potential allies, makes the alliance with all kinds of companies within their service system useful by seeing their potentials through more interactions, and thus makes the difference between two different groups.

Concluding, in this chapter, we have proved that interaction pattern adjusting is a good concept for business to improve their service value other than goods dominant logic, and had given a successful theory for SMEs to make use of this concept. Furthermore, the proposed information system an artefact to provide aid for users who do not know how to apply our method had also been tested, and is testified that it could provide proper help to users. By these simulation and scenario analysis, we finished the last part of the IS research framework – justify/ evaluation.

In the following, we listed some results worth summarizing, which also could correspond to the research objectives we stated at the beginning of this thesis:

1. Interaction could become a good focal for whoever interest in improving their business service value and service innovation value.
2. The proposed model for interaction pattern adjusting does have the capability to help users to use interaction to improve their business.
3. The proposed model is beneficial only in an environment where the cost and effectiveness of single interaction is high. In other words, it is useful in areas where businesses are less in resource, loosely related and not highly disciplined in business managing knowledge.

CHAPTER 6. Conclusion

In this chapter, we will summarize the contribution of this research, which then followed by the managerial implication for SME owners. Secondly, limitation of this study and the future research perspective will be presented. Finally, a discussion of our discovery and conclusion of this work will be given to summarize our work.

6.1 Contributions

(a) Provides supports for the notion: interaction as a focal of business alliancing and service value innovation

This research is relying on the notion that interaction plays an important role in businesses (Demirkan, 2011), which is a statement proposed by system thinking researchers for years, but lack of solid evidence and remained abstract concepts. The first and one of the most crucial contributions of this research is to justify this statement within our experiments by comparing it with a benchmark theory – resource based perspective of alliance building and choosing. Besides, through jointing with the research of service sciences, we discovered the results of our experiments are corresponding to the idea of operand and operant, that in service domain one considers others as operant, while goods domain one will take others as operands. By having these solid facts of the importance of interaction within business environment, we believe these findings will provide a good foundation for any future service science and system thinking research.

(b) Provides an interaction pattern centric service innovation theory for SMEs

The second contribution of this research is the development of the interaction

pattern adjusting model (Section 4.4). The theory of interaction patterns are interweaved by IMP's interaction research, service science's concepts and system thinking's framework, and extends the research of Wynstra et al. (2006). By combining these literatures, we successfully created an evaluated model that could be used to analyze SME's interaction patterns, to assess their current business performance and environment, and helps SME improving the service outcome's value. In our model, we divide all entities within a service system into three categories: customer, supplier and lateral entity; each entity provides different value proposition and could improve their possible value provision by changing the interaction pattern with them, and the accumulation of all entities interaction patterns could be further calculated as the service value level of a company. Future researcher could apply our model as their basis of interaction pattern research, and SME owners could apply our model to improve their service value.

(c) Provides an interaction pattern adjustment supporting system

Last but not least, this research developed an information system which is intent to aid users in applying our interaction pattern adjusting model. This research follows the framework of information system research framework, and brings the environment and knowledge base into the development consideration. Also, in consideration of our target users condition (SMEs without abundant resource and business knowledge), we have designed different user interaction mechanisms and support system to aid users in using the system (section 4.3, 4.7). By testing the system through scenario analysis, the guidance and design of the system would able to aid users to get started with the interaction pattern adjustment model more efficiently. In addition, due to other ImageCons project's systems, the case database of our system could increase by more user involved into our system, also

the on-time user input supporting. Accordingly, the self-evolving system we created to increase the usability of our interaction pattern adjusting model could be a valuable system prototype worthy for further implementation in future interaction studies; also, due to the fact that most of our target user are non-computer users, this research is also an attempt to involve this kind of user into an heavy data input required using information system.

6.2 Managerial Implications

Previous literature stated that interaction is the basis unit of business analysis (Håkansson, 1982; Håkansson &Snehota, 1995; Naude & Turnbull, 1998; Turnbull & Valla, 1986) and service value creation (Araonson ,1997); however, in this research, we push this concept one step further to that interaction could possibly become another focal of alliance building and value creation that is worthy to be noticed for any business owner. In the experiment 1, it has been proven that when benchmarking with resource based of alliance building concept, interaction centric perspective could out performed resource based alliance building. By the lesson learned in the experiment, companies shall enhance their linkage with other business to improve their interaction density to discover more possibilities within their current service system; also, to maximize the value of alliance, SMEs shall consider other companies as operant within the service system in order to capture all potential value that could occurs between them.

Furthermore, in our experiment 2, we revealed the proper situation when this model will works, and discovered it is matching to the target user of this research. During our experiment, SMEs who are located in highly competitive area, without enough resource, and lack of proper business managing knowledge to improve their service, are tested that they can gain more advantage by adopting our model than any

other kinds of users. In other words, while SMEs are having difficulty in creating good interaction patterns, our theory is proved to be useful for them. Accordingly, for SMEs who are possibly classified into this category, are encouraged adopt our model - categorize other SMEs within their service system into customer, lateral and supplier entity by their interactions, and follow suggestions to design their improvement route to achieve higher service value.

6.3 Limitations and Future Works

There are several limitations that we've noted within our work and shall be taken into consideration when applying our research result, and is pointing the destination for future research.

(a) The Difficulties in Interaction Data Collecting

First, the separation of different interaction pattern levels is still vague due to the reason that the data required for recognizing a clear and accurate interaction pattern is enormous, and is almost impossible to collect through self-enabling information system. Also, the interaction pattern between SME A and B shall be considered at both sides to gain balanced and just results, but if the data input process for one SME needs all SMEs within the service system to be involved will make the process be too lengthy, and very hard to complete. These difficulties will cause the collected interaction pattern data be insufficient, and jeopardize the outcome of our model and system. Future information system research could towards enhancing the interaction data collection methods, to increase the efficiency and accuracy of interaction pattern analysis.

(b) Insufficient Practical Data

Another limitation of this research is caused by the required time length and scope of our research is mass, because the difference between different ways of alliance

building between SMEs needs a great amount of time to see. While we are not granted with enough resource to perform a research project that is able to cover the whole field data collection requirements, the only feasible choice is to use computer simulation techniques. Although we are confident with the simulation and experiment process, the pure computer-generated experiment result could still raise questions to the research results and decreased the possible credibility of this research. Future research could focus on this consideration, and perform field tests to collect practical interaction data.

(c) Discovery of Different Interaction Patterns

Within this research, nine types of interaction patterns by combining different levels and target entity are categorized. Besides other categorization considerations that had been explained in previous sections, one of the concepts of the classifying logic is that we only take positive interaction patterns into account. In other words, we can consider interaction pattern level one as a default pattern of interactions that happens between two entities, and interaction pattern level two, three as better interaction patterns that could happen between them. Nevertheless, interaction shall be considered in both ways, while there are improved versions of interaction patterns exist, inferior interaction pattern shall also exists within the service system, for example like the interaction patterns with contract breaking companies. In this research, we did not take the inferior interaction patterns into account due to the reason that we believe inferior interaction pattern will be less likely for companies to create service innovation values within. However, if interaction pattern is not only used as service innovation but also in managing and analyzing the entire service system, then all kinds of prospects of interaction pattern shall be involved to model the real world situation. Accordingly, different interaction pattern discovery will be an important research topic for future researchers who are

interested in interaction pattern research to work on.

6.4 Discussion

The novel view of interaction we presented offers substantive implications for business and strong standing position of system thinking. However, besides the grand notion of system thinking that entities interact to create outcome in an ecology, we borrow some key concetps from the current system thinking framework. Instead of embracing the whole traditional system thinking framework within our research, we discovered some other perspective of system thinking by focusing on a specific value type.

The system thinking model separates interactions into two categories – value proposition generated and governance mechanism facilitated. In our research, the concept of value is throughout our whole theory development and experiment design. We mapped different possible values - service innovation value levels to different combination of interaction patterns; also, we used acquirable customer number as the value measurement of our experiment. These are all focusing on the value to be created from interaction of entities, thus our research results shall be classified as following the value proposition generated part. However, the main discovery we found in our research that is worthy of further discussion is that our interaction concept does not follow how system thinking described the structure of interaction value proposition.

Within our research, the interaction for service innovation could be perceived as two elements, the current interaction pattern and value proposition. Interaction pattern describes how the interaction is preformed, and regulates its possible maximum, like we defined that having interaction pattern level three with two different types of entities could possibly lead to a level of major innovation of service innovation in

their system, and the four constructs: trust, power dependence, cooperation and expectation and entity type will classify how the interaction is.

The value proposition then expatiated the desired outcome of both sides through a process of value's proposal, agreement and realization. The proposal indicates the original value that each side desired, but after the negotiation process it will be altered and become the accepted agreement between entities. Realization then stands as the final value proposition of entities, but also might be altered when putting the value into a bigger ecology scope; also, the final value might feedback to the entity and the interaction patterns. In our research and experiments, the proposed mechanism facilitated by the information system is tackling the proposal part by providing a model for SMEs to imagine and considers what level of service innovation that they shall try, and the agreement part by providing cases to support them in achieving the desired value.

Combining our concepts of interaction patterns and value propositions, an abstract model of our discovery could be found in Figure 6.1.

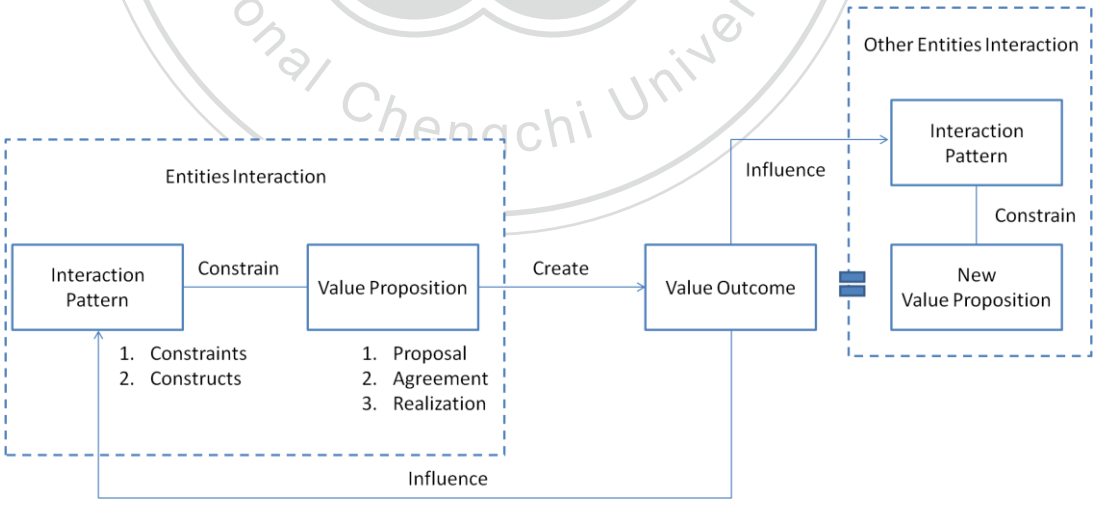


Figure 6.1 Abstraction Of Interaction Pattern And Value Proposition Relations And Constructs

This give rises to a new way to consider system thinking framework. The key

point of our discovery is that we have different emphasis on the value with traditional system thinking structure: system thinking model considers the outcome in a wide variety form, but we perceive value only in a specific type (service innovation levels). Although sacrificing the ability to fit into different cases, the advantage of focusing and constraining the variety of value is that it makes system thinking structure become more adaptable to business analysis, and concentrates the user on value creating process within interactions. By using this concept, business users could possibly know more about how their interactions with other entities will influence their final outcome, and could tackle the issue by managing the interaction pattern or value proposition.

Moreover, when intend to adapt the system thinking and interaction pattern to areas other than service innovation; we discovered that researchers could possibly do so by finding new mapping logic of value proposition with interaction patterns. For example, if the researcher intends to use interaction pattern to measure business performances, they could use the interaction pattern we defined, but change the service innovation level to different categories of business values and map them together; or also, they could keep the service innovation value we used, but extend the interaction pattern types to smaller but more accurate patterns to measure the service innovation better. In other words, while the concept of outcome is restricted in the norms of business and customer's value, researcher could extend the notion of how interaction pattern and value proposition interacts with each other to create service innovation to other areas by changing different types of interaction pattern or value proposition, and the mapping reason behind them.

This notion of changing interaction pattern and value proposition types for new areas makes interaction pattern and value proposition all an entity-like concept,

which is able to be replaced by new corresponding entity for a new purpose, and coherent with the service science's norm: operant, because it is able to be altered by and could manipulate other entities. Combining with current system thinking structure and aforementioned value focused interaction, we could possibly derive a new system thinking framework based on the current system thinking concept but better for a service and business purpose. The following Figure 6.2 is our proposed adjustment, which we believe, though not a grand modification, but is a novel idea for system thinking theory usage and worthy to note.

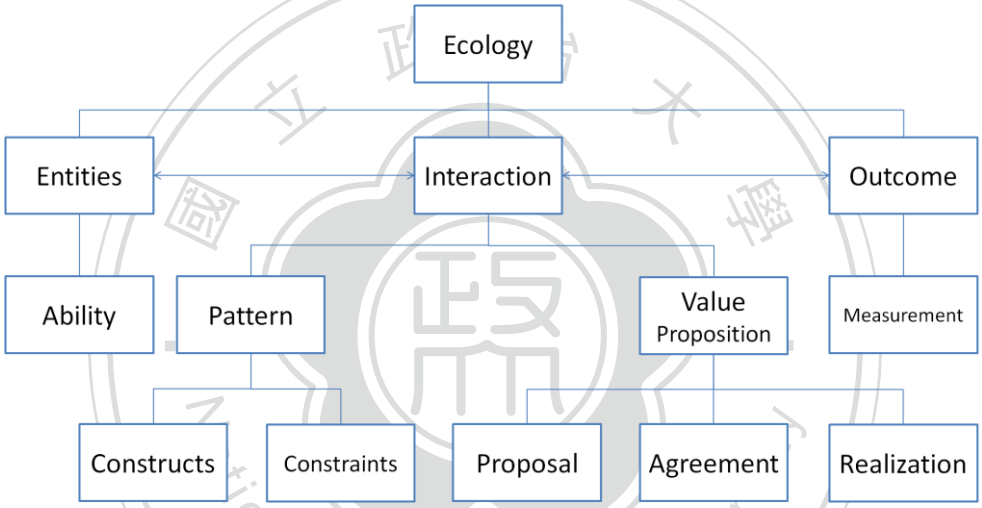


Figure 6.2 Value Oriented System Thinking Structure.

6.5 Conclusions

This research is a business interaction manipulating system research that developed and formed in order to create service innovation chances for SMEs that could be easily used by SMEs in their businesses. Throughout the research, we followed the IS research framework strictly, and embodied the concept of system thinking and believed that interactions are the core of any service value creation. By also adopting the service science theories, we successfully created a model and artifact to understand, adjust, and guide SMEs in service innovation, which provide an relevance application solution for the problem we observed in the SMEs environment.

The simulated evidence created by information system for evaluating our theory supports two concepts greatly: interaction as a new focal of service innovation and the usability of interaction pattern management for service innovation. Interaction was proclaimed as core factor in business environments by previous research, and our research give this notion an even stronger grounding by quantify data. The idea of interaction pattern as an analysis tool for measuring interaction was given later with a whole model suggesting how to assess and manipulate interaction pattern for better service innovation. These discoveries provide some managerial implication for business users, and foundations for future interaction research.

At the end, we deducted our discovery to feedback to the system thinking theory which corresponds to the knowledge base of IS research framework, and came across that although our interaction concept is basically derived from system thinking, but are having differences with the original system thinking framework by having a focused value type. We find out that when a specific value type of the service system is given, the interaction pattern and value proposition could be an entity-like notion, become replaceable and changeable by different settings of pattern and value proposition for different analysis target.

Appendix 1: Questionnaire formation

There are 3 constructs with totally 8 questions within the questionnaire. The questions of Cooperation is using the questionnaires within Woo and Ennew(2002) research; questions of Trust is embedding the measurements of Johnson, Cullen and Tomaki's (2000) research; and the last power dependency is taking the constructs of Frazier's (1983) research of power dependency between firms. Further detail can be found in the following:

Cooperation:

In Woo and Ennew(2002) research, they are focusing on the relationship quality between firm and consulting company, one of the construct within the research is cooperation. The original question within their research is as following (Woo & Ennew, 2002):

(1) The consulting engineer cooperates closely with us in project management.

(2) The consulting engineer is able to handle our complaints.

(3) The consulting engineer is collaborative in resolving conflict with us.

In our research, every company is considered as an entity, so the first move of modifying of the questions are replacing the consulting engineer into entities. The second consideration is that we did not categorize the value propositions between entities, so we rephrased the consulting service to requirements. At the end, we have re-organized the questions of cooperation into the following table A1:

Original version (Woo & Ennew, 2002)	Revised version
The consulting engineer cooperates closely with us in project management.	The level of process-cooperation of the entity
The consulting engineer is able to handle our complaints.	The level of the entity can response the requirement or solve the complaints
The consulting engineer is collaborative in resolving conflict with us.	The level of cooperation of the actor during conflict

Trust:

A research of trust and commitment between alliance companies was proposed by Johnson, Cullen and Tomaki (2000). In their research, they have concluded that for business wishing to gain competency through alliance, they shall not consider only about the hard side of alliance management (financial, operation issues), but also the soft side of alliance, which referring to the commitment and trust of company. They have constructed a model of trust and commitment which can found in the following figure A.1:

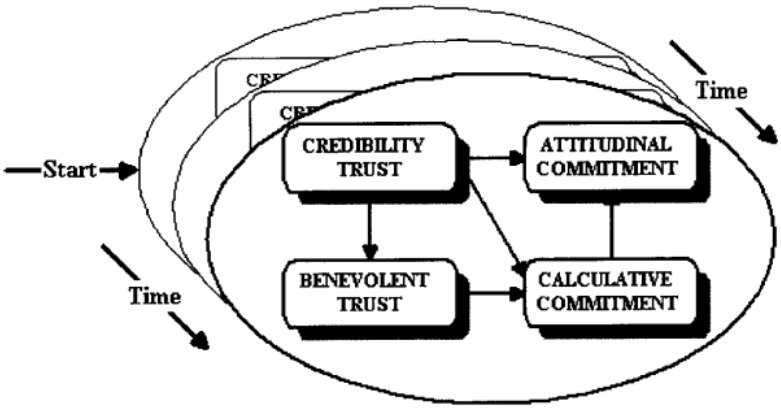


Figure A.1 Trust / Commitment Cycle (From "Success Through Commitment and Trust: The Soft Side of Strategic Alliance Management" ,by Johnson, Cullen and Tomaki ,2000, p10)

The construct of trust was divided into two sub-constructs, which was credibility

trust and benevolent trust. The credibility trust was referring to the trust of a partner's willingness and ability to fulfill the requirement a company had proposed. The benevolent trust was considering the trust against that whether a partner will have the intention to take advantage in the alliance or not.

The researcher didn't provide the questionnaire within their research; however we think that these two sub-constructs are easy to understand and easily measured, so we intent to use the two sub-constructs as the questions within our research.

Power Dependency:

Power dependency is the last construct within our research towards interaction patterns; we here use the highly cited research of Frazier (1983) about the power measurement between two firms. In Frazier research, he had built a model of the development of dyadic channel relations, which can see in following figure A.2.

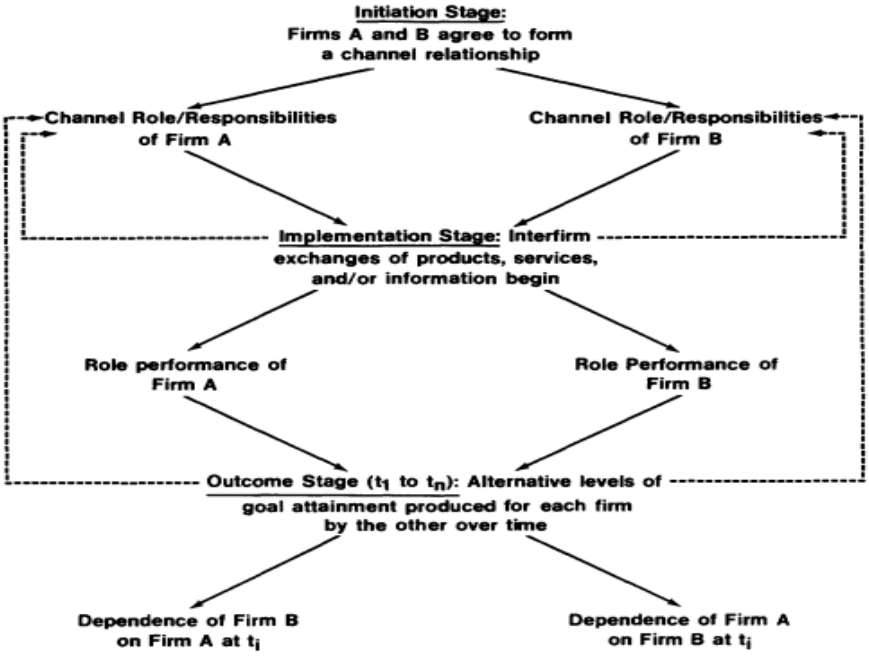


Figure A.2 Development of Dependence in a Dyadic Channel Relationship (From "On the Measurement of Interfirm Power in Channels Distribution", Frazier, 1983, p3)

Three main elements are within his research, which are: the channel role of a firm, performance of a firm, dependence of a firm, we will discuss them in order.

The channel role of a firm refers to the role the firm is having within its service system, for company that is providing more desired service, the role it plays will be more important than the others for a company. Since our research is to find out the interaction between two entities, the role of another company means to a company actually regards to the level of involvement of another company's service for the company. We rephrased the question in terms of our research topic is service system not channel, so the final version of the question is: The level of involvement of this entity.

While originally the question of "the performance of a firm" was designed to measure the performance of a company to provide the desired service for other companies within the channel, we further argued that companies that have higher performance within a service system supposed to be a bigger and more competent company in the service system because of scale economy. The bigger and more competent a company is, shall mean it is more important in the service system. So we might re-organized the question to fit more accurately to our research, which will become: The level of importance of this entity

The last element was "the dependence of a firm", referring to how much a Company A is relying on another company – Company B's competence to survive; like Company B might be the biggest or only customer of Company A, for example Dell is the "Company B" for most of its supply chain partner; or Company B provides the rare resource that Company A requires in its service, like Google is providing Android operating system to many smart phone manufacturer, play the role of "Company B". The dependency makes Company A relatively vulnerable in their interaction with Company B, because Company B is "irreplaceable" for Company A.

This kind of irreplaceably issue happens in most business occasions, especially for SMEs since bigger company usually have more diversification in their business to avoid the risk of dependency. Considering this research is aimed at SMEs, we rename the “dependence of a firm” into the “irreplaceability of a firm” to depict the situation of SMEs more clearly and vivid.

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