國立政治大學資訊管理學系

博士學位論文

指導教授 ： 苑守慈博士

中小企業服務創新價值網路模式設計:
顧客導向與意象模式方法

Value Network Design for Cluster SMEs Service Innovation: A Customer- Driven and Imagery Based Approach

研究生 :謝沛宏

中華民國一百零一年六月

Acknowledgements

In the four years of Ph.D. study, I have learned many things about academic research and life attitudes. I was lucky enough to have many people supporting me in these years. Especially, when I considered studying Ph.D. program, my family and my advisor, Professor Soe-Tsyr, Yuan, encouraged me to make up my mind. During these years, Professor Yuan taught me to become a researcher with innovative and creative thinking. Without them, I cannot have this achievement. I deeply thank them for their help.

I would like to thank my committee members, Professor Tung-Jung Sung (DT, NTUST), Professor Nai-Yi Hsiao (PA, NCCU), Wei-Yuan Hsu (IM, NTU) and Hsin-Lu Chang (IM, NCCU), for their valuable comments and suggestions on my research and dissertation. Additionally, I am grateful to my Ph.D. classmates and my ex-colleague in NARL for sharing their research and life experiences.

Also, thank AeSL lab Ph.D. members (Andrew, Allen, Katrina, and Alfred), uVoyage members (ShihMing, Charla, and Anderson) and ImageCons members (Kenny, Claude, Diana, Sherry and Claire) for their suggestions, experience sharing and support in these years. I wish you all have a colorful life.

Again, thank my grandmother, father, mother and sister. I will try my best to start my new career. I hope I can not only achieve my goals in my life, but also contribute my capabilities to the society.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Value Network Design for Cluster SMEs Service Innovation: A Customer- Driven and Imagery Based Approach

Abstract

Evolution of the global economic system has significantly impacted on customer behaviors. The service economy era has accompanied rapid growth of the service industry. This work focuses on service innovation enhancement for cluster SMEs, which play important roles in the global economic system. These SMEs, which have specific knowledge and capabilities, are keys to improving customer service experiences. However, the entire service system has evolved, as have customer behaviors. In addition to understanding how service value is created, interactions between economic, social, and environmental systems during value creation are also crucial for the sustainable development of service industries. For service systems consisting of SMEs, the design of a value network for clustered SMEs still faces huge challenges in finding key value propositions and assessments for value creation.

To assess service value, relationships, and customer feedback from both economic and social psychology perspectives, this research proposes a novel service ecosystem for value creation in service dominant logic and customer-driven and imagery-based value network design approach (CIVNDA) grounded in service dominant logic and image theory. The CIVNDA (1) provides a framework for designing and configuring a service value network that can identify the roles and value propositions of each partner; (2) provides a novel service imagery representation to characterize services of businesses from a customer psychological

perspective; and (3) generates appropriate partners for specific cooperation goals and service journey designs.

Due to the importance of information technology in service innovation, integration, and provision, this research also implements an ICT-based service platform—uVoyage using color image scale and metaphor theory. Tourism is selected as the study industry to evaluate the effects of the CIVNDA and the uVoyage service platform. Interview and focus group results (1) show that four different evolutionary stages of tourism SMEs exist when adapting to the current service economy era; (2) indicate how the CIVNDA and uVoyage platform facilitate value co-creation for tourism SMEs during different evolutionary stages; and (3) demonstrate how the features of service imagery differ from brand images and can be utilized to bridge gaps between product design and customer-driven service design.

This research can contribute to our understanding of service system ecology and service value evaluation in service value network designs consisting of SMEs in the tourism, design, cultural, and creativity service industries. The proposed concept of service imagery also guides future innovative research and outcomes of service value network design.

Keywords: Service System Design, Value Network, Service Imagery, Service Innovation, Service Science

Chapter 1 Introduction

The development of human economics, society, and the environment has followed the trend of sustainable development since 1987 (World Commission on Environment and Development, 1987). Sustainable development means “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Costanza *et al.*, 1997; Kates *et al.*, 2004). The interactions among economics, society and the environment system have shifted the dominance and focus of economic theory (Mulder and Van Den Bergh, 2001). The core concept of the sustainable development evolutionary approach has made evolutionary economics one of the mainstream economic areas (Nelson, 1995). In other words, the evolutionary economy is concerned with understanding changes in the environment and social system for long-term economic development and co-evolution with the environment (Norgaard, 1984).

The industrial revolution changed the methods in which industries manufacture goods, and human life has improved rapidly due to increased production efficiency. Mass production following industrialization facilitated the production of large amounts of standardized products for consumers. The paradigm of human economic activities has gradually shifted from the manufacturing sector to the service sector. With the advent of a service economy, the output value of economic activities is progressively measured by their benefit to customers, and the complexity and activities in economic networks (*i.e.*, value networks) are increasing. The way of value creation evolves from value chain to value networks in the service economy (Vargo and Lusch, 2004, 2008). Economic, social and environmental actors are involved and interact in the value creation process in the value network.

A value network represents delivered output value, relationships, and the structure of businesses (Allee, 2002; Peppard and Rylander, 2006). Analysis and design of a value network can improve value creation (Basole and Rouse, 2008; Peppard and Rylander, 2006). The challenge in value network modeling is to provide a systematic method that can construct an ecosystem (Tian *et al*., 2009; Blau *et al*., 2010). A service ecosystem involves the interaction between economic, social and environment system. The evolution of economic system and changes in customer behavior would influence the definition of value and value creation in a service ecosystem. This research investigates methods for enhancing the synergy of value networks for long-term sustainability of a cluster through imagery-based value quantification and integration in value networks. To achieve this goal, a novel value network design approach along with the information and communication technology (ICT) service system architecture for industrial clusters is applied and evaluated through the lens of service science, management, and engineering (SSME).

1.1 Motivation

1.1.1 The Role of SME in Service Economy

Small- and medium-sized enterprises (SMEs) are disadvantaged in today's global economic system. The size of an enterprise can be classified based on its number of employees, annual turnover, and balance sheet statistics (European Commission, 2005). An enterprise with no more than 250 employees and generates more than €50 million in annual turnover or €43 million on its annual balance sheet is considered a medium-sized enterprise. In Taiwan, an enterprise with fewer than 200 employees and less than NT$80 million in capital is an SME. Thus, SMEs have limited financial and human resources, which result in a lack of investment in both technology and

management skills when compared with those of multi-national enterprises (MNEs). However, SMEs are the main drivers of innovation in developed economic systems (OECD, 2009). These SME are characterized by low production and cost and a high degree of flexibility. Local knowledge and culture can be used to create better service experiences than those offered by MNEs. Additionally, the sustainability of SMEs is positively related to job security and economic growth (OECD, 2008a, 2008b, 2010).

Cooperation is an important strategy for SMEs to maintain growth and innovation capabilities by overcoming disadvantages associated with resources, capabilities, and financing, and by sharing risk with partners and competing with MNEs (Merrifield, 2007; Lu and Beamish, 2001; Pitelis and Pseiridis, 2006). Relationships between cooperative SMEs make cluster SMEs in economic networks, which have high performance in terms of resource access and low operating cost (Navickas and Malakauskaite, 2009). Additionally, clusters help enterprises enhance productivity, technical innovation, and competitive performance (Karlsson *et al.*, 2005). The growth of cluster SMEs facilitates the development of regional economies and creates beneficial economic networks.

Generally, three clusters have been identified (Gordon and McCann, 2000). The pure agglomeration, industrial complex, or social network clusters have different characteristics based on relationships among enterprises in the cluster. Cluster SMEs provide resources and information and contribute to innovation capability to maintain the cluster. However, the service economy impacts relationships among businesses, including those among SMEs. When the value chain in the traditional economic system is extended to value networks in the service industry, the characteristics of cluster SMEs are transformed to embrace the service economy. Furthermore, the

transformation of economic systems can impact both social and environmental systems. An investigation of the transformations of cluster SMEs will contribute to our understanding of cluster features.

1.1.2 Service Science in Service Economy

Service science is an interdisciplinary knowledge that studies the design and implementation of service systems. A service system is a platform integrating technology, and operand and operant resources for value co-creation. The term "service" is defined as an economic activity that creates benefit for customers. A service system designed for service provision is concerned with how to co-produce value within a value network (Spohrer *et al*., 2007). Since the service economy changes the global industrial structure, the service industry has grown rapidly. Services, instead of products, have become the primary output of many economic systems. Thus, service-dominant logic (SDL) is a foundational theory in service science (Vargo and Lusch, 2004, 2008). To understand an economic system under influence by a service economy, service science research provides knowledge of service system evolution and value co-creation, which can be applied to improve service systems (Spohrer and Maglio, 2008; Spohrer *et al.*, 2007). Additionally, with advances in ICT, the study of service science is also integrated with ICT system engineering. Service systems with ICT enable efficient improvements in resource integration, service productivity, and service innovation.

As members of economic systems, SMEs are also affected by trends in the service economy. The shifting logic of output value determination from goods-dominant logic (GDL) to SDL redefines the business model and value provision of enterprises (Vargo and Lusch, 2004, 2008). For SMEs to deal with this

shifting logic, service science and ICT-enabled design and development of service systems are believed to be important topics for exploration.

1.2 Research Questions and Significance

When the global economic system is transforming into customer-centric, the structure and relationships inside economic systems also evolve. For instance, the industrial revolution rapidly increased product delivery efficiency, and advances in ICT allow people to communicate instantaneously without geographic constraints. Both examples have a huge impact on the structure and relationships in the global economic system. The service economy should not be an exception. Therefore, existing cluster SMEs also evolve with economic systems. When value creation in the service economy differs from that in the traditional economy, the balance between the growth of economic, social, and environmental systems can change. This research attempts to answer three research questions to understand the evolution of service ecosystems and cluster SMEs and to identify methods that improve productivity, innovation capabilities, and the growth of a cluster SME. These three research questions are as follows.

1. What is the evolutionary path of a cluster SMEs when adapting to trends in the service economy?

This research question is used to understand why an SME joins a cluster and the benefit a cluster provides to SMEs in different economic system stages. Answering this research question requires that one study the background and characteristics of cluster SMEs and construct propositions related to the evolutionary path of cluster SMEs. Analyzing cluster SMEs in a service economy is the first step in configuring

the innovative value network design for cluster SMEs.

2. How does one design a value network for cluster SMEs with productivity, innovation, and growth improvements in a service economy?

For cluster SMEs competing with clusters in an entire economic network, overcoming drawbacks of SMEs and enhancing the contributions of cluster SMEs to the economic system are necessary tasks. A value network describes the roles of and relationships among each participant, and is the value output in an SME cluster. Thus, value network analysis can be utilized to identify a cluster's bottlenecks. Notably, the efficiency of a value network can be improved using a novel design approach.

In this research question, the elements of and relationships in a value network must first be identified and modeled. Image theory (Beach, 1990), which addresses psychological value cognition, is used to model both tangible and intangible output values. Image theory provides a good foundation for modeling service value using imagery. Consequently, this research question also has three sub-questions. What are the characteristics of output value from cluster SMEs? How can one describe and quantify tangible and intangible value output from cluster SMEs? How does one encourage interactions among SMEs for value co-creation? The proposed value network design approach in this research is based on answers to these sub questions.

3. How does one design an ICT-based service system that facilitates a value network to enable value co-creation in cluster SMEs?

In a service economy, output from economic activities is both tangible goods and intangible services. The application of ICT has been proven to improve manufacturing processes, reduce transaction costs, and enhance goods delivery. Value co-creation

among enterprises in a value network is strongly emphasized in SDL. Notably, ICT efficiently enhances output from service systems and deals with the increasing complexity during the extension of a value network. Resources and value can then be effectively integrated and delivery in the ICT-enabled value network (Basole and Rouse, 2008). Therefore, the design of service system architecture is crucial to value co-creation in cluster SMEs.

1.3 Research Objects

The objects of this research are the evolution of a service ecosystem and the evolutionary path of cluster SMEs during service economy transformation. Based the understanding of how cluster SMEs evolve, a novel value network design approach for cluster SMEs is proposed. The design of the value network should analyze the characteristics of service value of each business from customer service experiences on the Internet and the service value of cooperative services according to business characteristics. Additionally, ICT-based service system development toward a value network design can cause artifacts to improve service industry growth based on a study of service ecosystem evolution. In short, this research contributes to literature in the following ways:

- Propose a conceptual framework of a service ecosystem to describe the shift from GDL to SDL in the value creation process, and a model of the evolutionary path of cluster SMEs in one industry on the basis of SDL. A pilot study is conducted to analyze other service industries. The characteristics of evolutionary stages of the cluster SMEs in the proposed model are determined to understand the differing needs in SDL adaption. The conceptualization of service value creation in the service ecosystem provides a theoretical contribution to service science in service

value network design and service innovation.

- Propose a novel value network design approach and configuration that can facilitate resource integration among SMEs at the value level and predict benefits of SME cooperation. Customers are also involved in the value co-creation process in the entire value network design by contributing preferences for images for service value evaluation. Once co-created value can be presented and evaluated, the adoption by cluster SMEs of SDL would run smoothly.

- The implementation of the ICT-based service system, based on the imagery-based value network design approach, produces valuable artifacts for service science management and engineering (SSME) to examine the effect of ICT on the value co-creation process.

1.4 Overview of Research Methodology

This research uses the information system (IS) research framework proposed by Hevner (2004) as its research methodology. The seven guidelines of this methodology (Table 1.1) indicate that research should produce viable artifacts from relevant business problems based on relevant theories and methodologies. The artifacts from well-designed evaluations can contribute to theoretical refinements through the rigorous processes. The goals of this research are to apply a novel value network design approach and implement a technology-based service system to characterize the evolution of cluster SMEs. Therefore, the IS research framework provides a foundation to test artifacts of the implemented service system.

The leisure agricultural service, which is a sector of the tourism industry, is selected as the focus business environment. Transformation from production to

service in recent years in leisure agriculture is the research background. In Taiwan, since the first farm tour in 1965 (Taiwan Leisure Farming Society, 2004), the number of leisure agriculture operators has increased to 5,829 at by end of 2005 from 1965. This rapid growth indicates that leisure agriculture has become a major operating model for transforming traditional agriculture (Tuan, 2007). For each research question, the model of cluster SME evolution, the imagery-based value network approach, and ICT-based service system architecture are constructed first to produce artifacts for evaluation. The artifacts produced from evaluation data should contribute to Taiwan's tourism industry, service science research, and related theories.

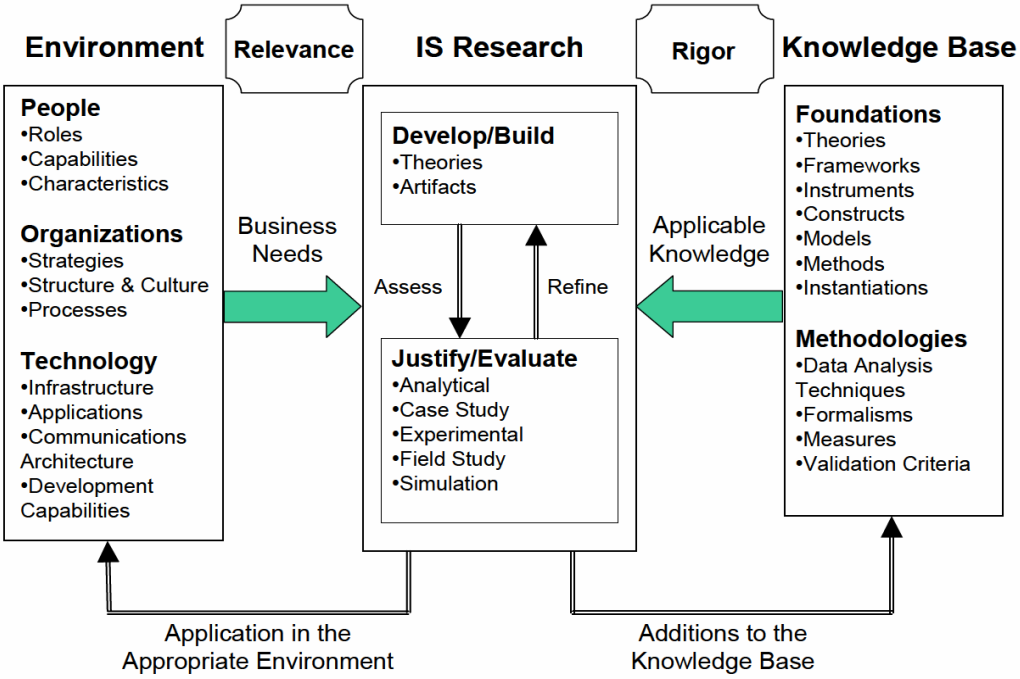

Figure 1.1 Information System Research Framework

(Hevner *et al.*, 2004)

Table 1.1 Guidelines of Design Science Research (Hevner *et al.*, 2004)

Guideline	Description
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

1.5 Content Organization

The dissertation comprises nine chapters. Figure 1.3 shows the dissertation outline. Chapter 2 is the theoretical foundations. The contents in Chapter 2 are the knowledge base in the entire IS research framework. Chapter 3 details the methodology of this research. The contents of Chapter 4 are for the research question 1 which indicates the relevant business questions in the service economy environment. A case study for the research question 1, the development process model of SME in

service innovation, and related proposition and implication are included. In Chapter 5, this research presents two design artifacts: the service ecosystem for value creation in service dominant logic and the propositions for customer-driven and imagery-based value network design. Chapter 6 describes the ICT-based service system design - the uVoyage framework and service system architecture as the third design artifact. The underlying theories of each module in uVoyage system are also explained. The design of uVoyage service system aims to create artifacts to evaluate the customer-driven and imagery-based value network design in Chapter 5. Chapter 7 reports the evaluation and data collection for the entire research design by using system dynamics approach, interview and focus group. In Chapter 8 the findings and implication in the entire study are discussed. Finally, Chapter 9 concludes this research, limitation, and future research directions.

According to design science framework, artifacts should be found to contribute both the business environment and knowledge base. The artifacts, the evolutionary stages of tourism SME cluster development and service imagery, were found from the study of the service ecosystem for value creation in service dominant logic, customer-driven and imagery-based value network design approach (CIVNDA) and uVoyage design. Figure 1.2 illustrates the summary of the contents in this research in design science framework. For the contributions to business environment, the design of CIVNDA and uVoyage service platform is dedicated to tourism industry and also other service industries consisted of cluster SMEs in the improvement of value network design. For theoretical contributions, this research proposes a service ecosystem (Figure 5.4) to comprehend how service values are created, what are the roles of the economic system, social system and environment system in service value creation processes and why service value, recyclable resources and wastes are created

in the ecosystem.

The study of cluster SMEs in tourism further derives the four stages of cluster SMEs evolution to explain the phenomena of the product-based to service-based economy transformation. And this research also proposes a new concept - service imagery which is different from brand image and destination image for service value representation. With the combination of service imagery, CIVNDA and uVoyage design, this research is believed to have contributions to the service industry. To detail the connections between the artifacts and the service industry, in this chapter, this research discusses the artifacts and the impact to the service industry.

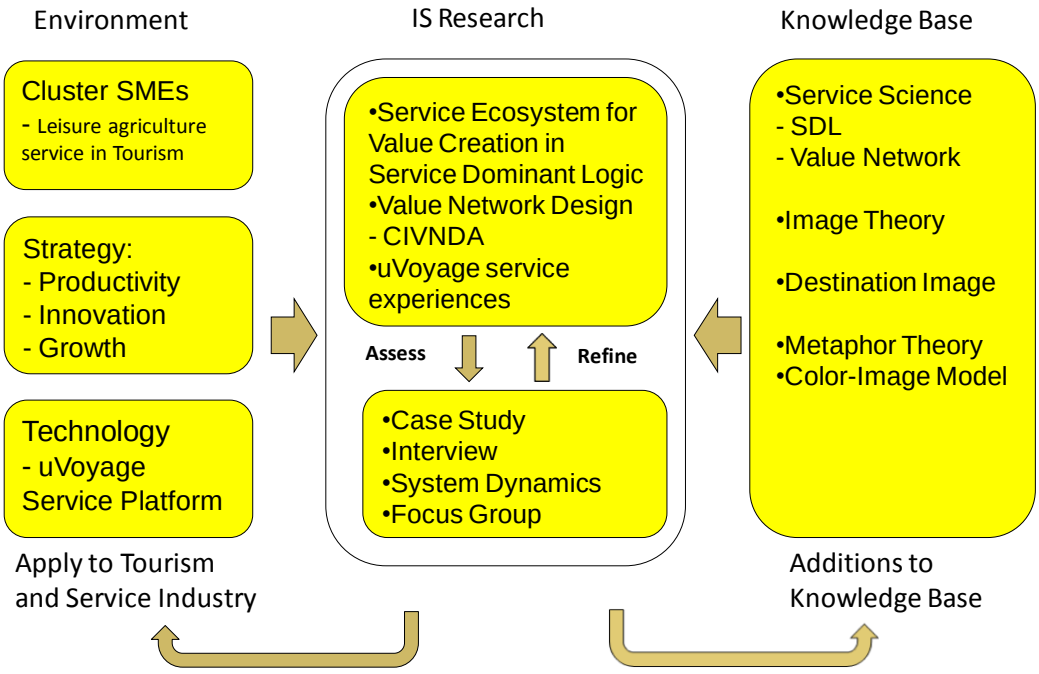

Figure 1.2 Summary of the Study to Design Science Framework

<table>
<tr><td colspan="3">Chapter 1 Introduction</td></tr>
<tr><td colspan="3">Chapter 2 Literature Review</td></tr>
<tr><td colspan="3">Chapter 3 Research Methodology</td></tr>
<tr><td>Chapter 4 Roles of SMEs in Cluster Innovation</td><td>Chapter 5 Value Evolution and Value Network Design in Service Ecosystem</td><td>Chapter 6 The Design of Imagery-Based Service Cooperation and Recommendation Platform for Cluster SMEs</td></tr>
<tr><td colspan="3">Chapter 7 Evaluation of Artifacts</td></tr>
<tr><td colspan="3">Chapter 8 Discussion and Implications</td></tr>
<tr><td colspan="3">Chapter 9 Conclusion Remarks</td></tr>
</table>

Figure 1.3 The Dissertation Outline

Chapter 2 Literature Review

Service industry is flourishing in the global economic system. In response to the trend of service economy, the research of service science aims to develop scientific theories to improve service systems. Service dominant logic (SDL) is one of the foundational theories in service science discipline. The insight of SDL redefines the relationships between service providers and customers, the logic of value creation and service provisioning (Vargo and Lusch, 2004). The concept of service value networks is extended from value chains in the viewpoint of SDL (Lusch *et al.*, 2008). Studies on service value network involve the dynamic interactions among businesses and customers, value linkage in both B2B and B2C relationships and other enablers (*e.g.*, ICT and government policy). In this research, the design of imagery-based value network is the primary focus. Therefore, in this chapter, SDL and value network related studies will be described first. To identify the value created in an imagery-based value network, the image theory is subsequently illustrated from the psychological viewpoint for both operant and operand inputs. The previous studies of cluster enterprise and their evolution logic differentiating from SDL will also be provided. In addition, the past research on SME cluster in the specific domain of tourism will be described as well. At last, a discussion of why the imagery-based value network design approach for SME clusters is required to be carried out to advance the state of the art in either value network design or cluster SME evolution.

2.1 Service Dominant Logic and Service Value Network

2.1.1 Service Dominant Logic

Changes in consumer behavior have increased the importance of service value and competitive strategy leading to their importance surpassing that of tangible physical products, thus making the consumer market more service-oriented. Vargo and Lusch (2004) believe that the structure of the consumer market has evolved from product-based to service-based. The focus of consumer market development lies in transforming the traditional Goods-dominant logic (GDL) into the SDL, where the SDL is considered an evolutionary process of the consumer market. SDL stresses that services are a process rather than an output unit; the focus thus lies in operant resources (such as knowledge, skill and customer) rather than operand resources (such as natural resources); the value of service lies in collaboration involving the provider and consumer (value-in-use) rather than the creation and delivery process from the producer to the customer (value-in-exchange) (Vargo and Lusch, 2004, 2008).

Table 2.1 shows the differences between GDL and SDL. The value of service provided is no longer only determined by producers. Instead, producers propose their value proposition to consumers and the service value is determined after consumers' service experiences (Vargo and Lusch, 2004; Sandstrom *et al.*, 2008). Therefore, in order to create attractive value proposition, the interactions between firms are necessary, but are not only exchange operand resources only. Firms can share their operant resources including the needing from their customers to create innovative service (Vargo and Lusch, 2004; Vargo *et. al*, 2009). Consequently, an original value chain among firms would extend to a value network which enables more innovative services driven by customers (Lusch *et al.*, 2008; Lusch *et al.*, 2009). The value

co-creation process in SDL then is able to foster both growth and innovation among cooperated firms (Michel *et al.*, 2007).

Table 2.1 The Logic Shift from GDL to SDL

(Lusch *et al*., 2008)

From : Goods Dominant Logic	To : Service Dominant Logic
Operand resources	Operant resources
Resource acquisition	Resourcing (creating and integrating resources and removing resistances)
Goods and services	Servicing and experiencing
Price	Value proposing
Promotion	Dialog
Supply chain	Value-creation network
Maximizing behavior	Learning via exchange
“Marketing to”	Collaborative marketing (“marketing With”)

Vargo and Lusch(2004, 2008) also mention that SDL has ten foundational premises (FPs). FP1 indicates that services are the basis for all transactions, and thus involve the application of operant resources, such as knowledge and skill. Tangible physical products are considered sales channels provided by services (FP3). From the perspective of the GDL, goods produced by enterprises can create value, and consumers are the users of the value of those goods. However, the SDL takes a different perspective. SDL stresses “resource integration” (FP9) and “creation of value” (FP6) where the customer is considered an operant rather than an operand resource. The SDL implies a process-oriented logic. The emphasis is on generating value-in-use rather than the traditional value-in-exchange viewpoints. Therefore, the SDL stresses that each value is unique and determined by the beneficiary (FP10). When an enterprise is able to integrate operant and operand resources, the environment can in turn produce value. This signifies the existence of a variety of

transactional relationships (FP8). The enterprise is unable to control value, but it can provide the orientation of value (FP7).

These foundational premises revealed the existence of value in a complex and operant service system environment, and that the subjects not only include enterprises and customers, but also environmental groups and other relevant personnel. Moreover, Vargo and Lusch also emphasized that services possess different characteristics to physical products, including intangibility, simultaneity, heterogeneity, and perishability. Services can be considered a subjective interactive process between provider and receiver, involving the transfer and use of knowledge and skills, as well as early and later stages of the operation. Traditionally, quality services involve highlighting customization and avoiding standardization. However, advances in digital technology have enabled customized service and standardization. Particularly, quality services enable breakthroughs in traditional service characteristics (e.g. intangibility, simultaneity and perishability).

The insight of SDL contributes to the research in the development of service economy. In this research, SDL provides the theoretical foundation about how the value creates. The concept of value-in-use indicates that the service value is driven by customers after their service experience. Service providers should keep improving their services based on customer's feedback and design excellent services for competitive advantages. In addition, the improvement of service design depends on not only the efforts from service providers but also their partners. Traditional supply chain in GDL primary emphasizes on the resource integration and management. The synergy of supply chain among business cooperation mainly contributes to the service delivery process which is only part of the entire service processes. SDL, on the other

hand, concerns about the new resources created to benefit customers (*e.g.*, innovative services, distinguished service experiences) based on value co-creation (including business cooperation) which can enhance the entire service processes. With the increasing complexity of business cooperation under SDL, value chain accordingly is evolved into service value network. Therefore, service value network instead of traditional supply chain becomes crucial to compose attractive value propositions for customers.

2.2.2 Service Value Network

In SDL, businesses offer service to customers rather than products. A service integrates both operand and operant resources and service value determination is from service experiences. In other words, a service provision combines both intangible value (*i.e*. knowledge, competence) and tangible value (*i.e*. financial capital, physical resources) from suppliers and is measured by customers after delivery. The increasing complexity in business to business relationships and business to customer relationships reconfigures the economic system. Therefore, the changes from products to service make firms to extend the traditional value chain focused on manufacturing to value network. A value network is defined as "a set of roles and interactions in which people engage in both tangible and intangible exchanges to achieve economic or social good" (Allee, 2008). The participants in a service value network are independent but have complementarity (Peppard and Rylander, 2006). Characteristics of a value network contain "co-produce service offering", "exchange service offerings" and "co-create value" (Lusch *et al.*, 2009). In other words, a service value network comprises more than one value chain.

The roles in a service value network contain consumers, service providers, tier 1 and 2 enablers, and auxiliary enablers (Basole and Rouse, 2008). The relationships in

a service value network are divided into B2B, B2C and C2C relationships. These relationships are influenced by social, technological, economic and political context. Figure 2.1 shows the conceptual model of service value network.

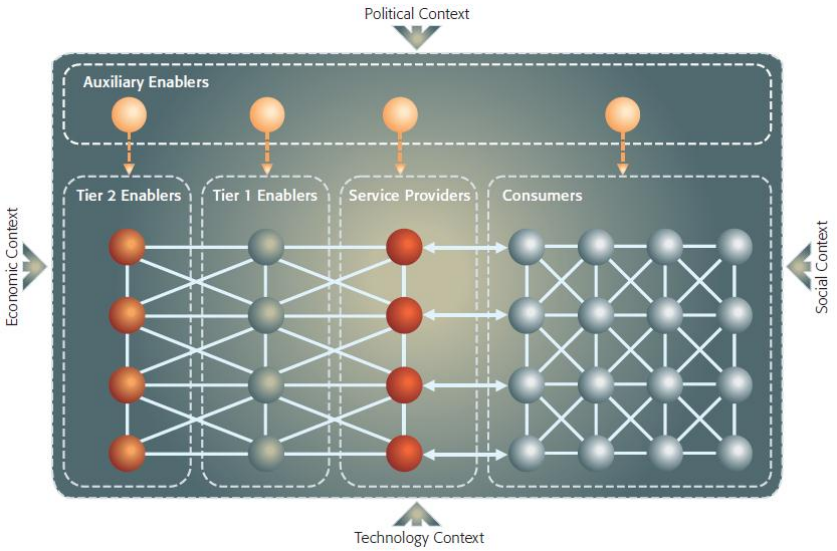

Figure 2.1 Conceptual Model of Service Value Network

(Basole and Rouse, 2008)

In the service value network conceptual model, the role of service providers is the integrator and provides service which customers expect. Customers consume service and determine service value. Service providers depend on enablers to supply resources and help service design. Tier 2 enablers provide resources to tier 1 enablers and tier 1 enablers directly supply resources to service providers. Auxiliary enablers such as government and information technology and four contexts influence the entire ecosystem. Under SDL, service providers in a value network deliver service to customers and receive benefit after service experienced by customers. Service providers and enablers in a value network convert their operant and operand resources to value proposition to customers together. Then the value proposition is converted into service value via customers. In other words, service providers, enablers and

customers co-create service value. In a broader sense, the B2B relationships enable B2C service value and B2C relationships determine B2B service value (Basole and Rouse, 2008). As soon as customers decide the B2C service value, the B2B service value between each service provider and enabler is also determined.

The network structure highly influences the firm performance and industry evaluation (Madhavan *et al*., 1998; Todeva and Knoke, 2005). Value network analysis (VNA) offers a viewpoint to comprehend the roles, relationships and interactions in a value network for value creation (Allee, 2008). Peppard and Rylander (2006) proposed a five stages network value analysis to show where the value created in a value network. The five stages are described in Table 2.2.

Table 2.2 Stages for Network Value Analysis
Adopted from Peppard and Rylander (2006)

Stage	Description
1. Define the network	Define boundaries and the focal business unit in a value network
2. Identify and define network entities	Identify the role of focal businesses unit and their influence (value proposition) to customers (both direct or indirect)
3. Define the value each entity perceives from being a network member	Identify the delivered value and value dimensions for each participant in the value network
4. Identify and map network influences	Identify the value linkages between participants. The value in each linkage is concerning about the value dimensions in the previous step
5. Analyze and shape	Analyze the value dimensions / role of participants / network dynamics in the network

In all NVA stages, understanding what kind of value delivered precisely to each participant in the value network is the most important (Peppard and Rylander, 2006).

Due to value propositions which consume operant and operand resources having functional and emotional types (Sandstrom *et al*., 2008), the value creation after service experience has functional outcome and emotional outcome. Therefore, the value consists of intangible and tangible part and the measurement of value for different customers become dynamic and complex.

From organization theory viewpoint, a sustainable network which is an analogy to an organization must be effective to achieve the wanted results and efficiency to maintain itself (Jarillo, 1986). In other words, the existence of a network among business relies on the performance (*e.g.*, lower transaction cost, profit) and shares outcome to network members for their satisfaction. Components in a network include links (relationships) and connection nodes (businesses). From effectiveness and efficiency viewpoint, the network design seeks for both the lowering of transaction cost and the growing of profitable among network members (Jarillo, 1986). In the analysis of network, economic researchers focus on appropriate allocation of cost to evaluate the network efficiency (Economides, 1996). The service value of the network then depends on the creation of network externalities which bring more transaction between businesses and customers (Economides, 1996; Lazzarini *et al*., 2001). Network externalities occur when innovation happens to benefit the nodes or the expected numbers of customers buying increases (Lazzarini *et al.*, 2001). Therefore, from the economics perspective, customer increasing in a network means the raise of service value to other customers (Stabell *et al.*, 1998). The design of network from the economics perspective then seeks for the network efficiency and effectiveness by achieving allocation efficiency (Jackson and Wolinsky, 1996; Conte *et al.* 2010) or Nash Equilibrium under game theory (Lederer, 2001).

On the contrary, from the social psychology standpoint, the source of value is not the same with the economic viewpoint. Service value in value network is from the connected business relationships which aim for the growth of network performance (Holm *et al*., 1996). In this sense, the social exchange theory and social network theory is applied for measuring service value from relationships (Holm et al, 1996; Allee, 2000; Lazzarini *et al*., 2001). This approach measures value from the social exchange theory which integrates psychology, sociology and economics (Homans, 1958). Social exchange theory views social behavior as an exchange of material and non-material goods. Holm et al (1996) indicated that a set of connected businesses relationships made value creation possible in a network. For the value definition in service value network from the social psychology aspect, Allee's work in 2008 converted all intangible value such as customer satisfaction, relationships or influence in a value network into deliverables In other words, both tangible and intangible value can be expressed as the deliverables (*e.g.*, document as a tangible deliverable and psychological counseling as an intangible deliverable) which are the actual received value of participants in the value network (Allee, 2008). In this viewpoint, intangible value is generated from the difference between benefits which are the favors extended from others and their cost while tangible value is from the difference between revenue and cost.

Tian *et al.* (2008) and Caswell *et al*. (2008) further extended Allee's work by integrated game theory to model the interactions and relationships in a service value network. They tried to integrate both economic and social psychological related theories to construct a service system model and calculate the service value by formulating the relationships among entities in the service system for understanding the value offering and transferring. By observing service system behaviors about

value, customer's satisfaction and the gaps between expected value and perceived value can be compared for increasing value and reducing cost.

Allee in 2000 argued about the creating of value from value network instead of value chain which is close to the idea in SDL. Among these research, Allee (2008) and Caswell et al. (2008) concerns intangible value, especially in Allee's research which primary focused on how intangible and tangible value merge for value network analysis. On the other hand, Conte et al. (2010) and Tian *et al.* (2008), emphasized on the interactions among firms in a value network. Although the game theory served as a grounding theory for Caswell's work and Tian's work, Caswell only used the game theory to address the outcome of business's choices on whether or not to cooperate with specific partners, and Tian's work applied the game theory to model the detailed preference of businesses. Caswell *et al.* (2008) viewed service value as benefits including tangible value (revenue) and intangible value (value of relationships) minus opportunity cost. Tian *et al.* (2008) aimed for modeling a service ecosystem and assessed service value from revenue and cost.

Table 2.3 shows how a value is expressed in a value network from the economic or social psychology perspective in network related studies. Generally speaking, the value definition emerges from considering the increase of benefits and the decrease of cost to social relationships and intangible assets. In recent years, there are also some studies integrating both economic and social psychology perspective in value network design.

Table 2.3 Studies on Value Network from the Economics or Social Psychology Perspective

Author	Theory Perspective	Value in a network
Economides(1996)	Economics	Network externalities contribute to increase the value of goods by the expected number of unit sold.
Jackson (1996)	Economics	Value of a network depends on how agents are interconnected. Value is the aggregation of individual utilities or production.
Stabell (1998)	Economics	Service value is a function of positive network demand side externalities. Value is derived from service, service capacity, and service opportunity.
Lederer (2001)	Economics	Value of network is from lowering the total cost of satisfying all customers' demand.
Conte et al. (2010)	Economic	Design value network by using co-petition mechanism Value is from the difference between willing to pay of customers and price of service.
Holm et al. (1996)	Social psychology	Value is from the commitment and smoothness of communication of network connection. Considering the profitability (revenue – cost) associated with network relationship to access the relationship profitability.
Allee (2000, 2008)	Social psychology	Assess value in form of the tangible and intangible parts. Benefits are advantages or favors that can be extended from one person or group to another Intangible Value = benefit – cost Tangible Value = revenue - cost
Caswell *et al.* (2008)	Both Economic Social psychology	Assess value by referencing the profits from interacting with partners and expected value with buying partners. Value = profit from interacting with partners + expected value with buying partners (expected value of all the relationships - cost)
Tian *et al.* (2008)	Both Economic Social psychology	Assess value through interactions among participants by using game theory. The interactions are evaluated by considering the individual preferences and information asymmetry Value = revenue – cost

Among these research, Allee (2008) and Caswell *et al.* (2008) concerns intangible value, especially in Allee's research (2008) which primary focused about how intangible and tangible value merge. However, the implementation of Allee's approach in intangible value assessment needed the participants answering questions in a spreadsheet which contained different measurement scales. The mixing measurement scales (such as "agree" to "disagree" and high to low level) make the final value be hard to compare with each other. The investigation of each asset from filling a spreadsheet also takes time and human resource for analysis. Additionally, both Caswell *et al.* (2008) and Tian et al. (2008) referenced Allee's approach as approaches measuring intangible value. Modeling value through participant interactions also have to deal with intangible value. Caswell *et al.* (2008) and Tian *et al*. (2008) tried to calculate actual service value by using price in practice. Nevertheless, the investigation and evaluation of price in each service, relationships and the customer's feedback are not easy. Obviously, there should have an approach to implement the assessment of service value, relationships and customer's feedback in an effective way from both economic and social psychological perspective.

This research works to contribute a new approach to implement the service value assessment for estimating the service value from the customers' perspective. In this research, the service value assessment refers to both Allee's work and the foundation concept of resource consumption in economics. While SDL indicates that service value is determined by customers, the service benefits by definition should be subjective to different customer's perceptions. So, how to effectively describe the different cognitions from customers and then understand the service value is a key point for service value network design as discussed in this research. In the next section, the image theory is introduced for value representation.

2.2 Image theory for Value Representation

In economic system, businesses and customers consume the output from economic activities. There are important issues to concern. For instance, how do businesses and customers make their decisions to choose products or services? What is the value of chosen products or services to businesses and customers? Image theory describes how human images affect decision makers in terms of goals and value cognition and strategy planning (Beach, 1990). In other words, when businesses or customers participate in economic activities in an economic system, there are some goals for businesses or customers to achieve. Images can be schemata to explain the decision behaviors of businesses or customers.

Image theory defines image as a cognitive structure in human's mind which is affected by human's knowledge (Beach, 1990). There are three kinds of images: value image, trajectory image and strategic image (Beach, 1990). Among these three images, value image represents the principles of decision makers which affect the new goal generation and action to achieve the goal. Trajectory image consists of goals to achieve. Strategic image comprises plans (sequence of behaviors), tactics (actions required by plans) and forecast (projected outcome). Figure 2.2 shows the relationships between three kinds of images. For a decision maker making up his mind to do something, in image theory, a decision maker screens possible candidates first. The compatibility test examines whether the candidates violate the decision maker's principle or not. In single candidate scenario, compatibility test results in adopting the candidate or not. In contrast, if multiple candidates after compatibility test have more than one survivor, profitability test which involves different choice strategies is applied to select best candidates.

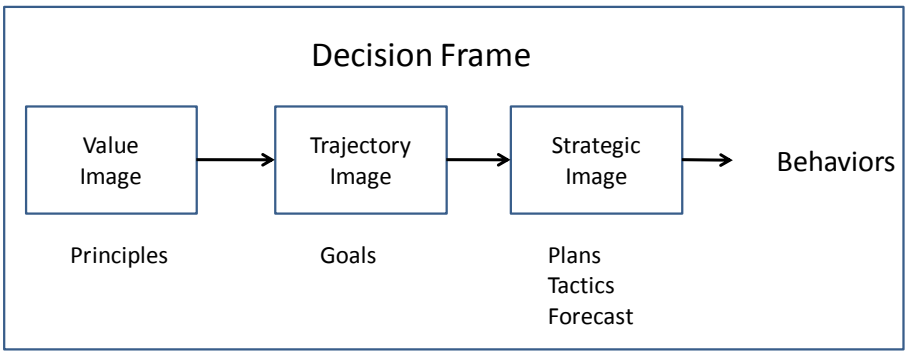

Figure 2.2 Relationships between Different Images

(Adopt from Nelson, 2004)

Researchers use image theory for studying the motivating behavior of customers and marketing strategies (Nelson, 2004). In marketing research, brand image is extended as perceptions about a brand as reflected by the brand associations held in consumer memory (Keller, 1993). Brand associations relate to service attribute, customer benefit and customer attitude toward a brand. In other words, the strength of brand images depends on the intensity of association. Therefore, brand images influence customer's mind and decision which are close to the concept of value image in image theory. In tourism research, destination image is considered as the destination branding which includes products, communities, cultural and natural attractions (Prebensen, 2007). The causal relationship between positive images which construct the branding for destination identification to the willingness to pay more was also identified (Han, *et al.*, 2009). Images can represent the benefits of customer perceived (Nelson, 2004). In this research, service value can be represented by using images analyzed and created from customers' feedbacks. With appropriate analysis of customer's experiences, images can disclose service features and value for each entity in a service value network. Imagery-based service value network design is believed to have potential to fulfill specific customer's needs related to images.

2.3 The Cluster SMEs

SMEs and MNEs can be service providers or enablers in a value network. The role of SMEs is the complementrity to MNEs in the economic system (Bannock, 2004). For industry development, cooperation and cluster, one of B2B relationships, is essential (Pitelis and Pseiridis, 2006). Since SMEs tend to be local, cooperation among SMEs is more likely to cluster than network due to the location restriction. Porter (1998a) has defined cluster as a group of enterprises or related corporate bodies located in close geographical proximity or interrelated. Such enterprises and corporate bodies are linked by their commonality and complementarity. In other words, the agglomerations of SMEs into cluster integrate their complementary resources to enable the development of region and industry. Porter's industry cluster theory implies that cluster can increase productivity and reduce production costs, and can also drive the direction and pace of innovation.

Furthermore, Gordon and McCann (2000) have classified three types of clusters from transaction cost perspective and identified the characteristics of type. Generally speaking, the goal of industry clusters is to enable enterprises to achieve the enhancement of productivity, degree of technical innovation and, competitive performance. Table 2.4 lists the characteristics of different industry clusters.

The differences in there types of clusters are categorized into four dimensions in Table 2.4. The characteristics of relations among three types are fundamentally different due to the different access way. Pure agglomeration clusters usually have open memberships for businesses in the same region. In other words, the organization of a pure agglomeration cluster is loosely coupled like in Taiwan night market. The only criterion to join a pure agglomeration cluster is in the same location, even only

renting a little space. Therefore, the relationships among businesses in a pure agglomeration cluster may be unidentifiable, fragmented or unstable due to open membership. The model of pure agglomeration describes the relations between businesses which creates a little cooperation, low loyalty in partnerships, atomized and competitive environment (Gordon and McCann, 2000).

Table 2.4 Characteristics of Industry Clusters
(Gordon and McCann, 2000)

Characteristics	Type		
	Pure Agglomeration	Industrial Complex	Social Network
Firm size	Atomistic	Some firms are large	Variable
Characteristics of relations	Non-identifiable Fragmented Unstable	Identifiable Stable trading	Trust Loyalty Joint lobbying Joint venture Non-opportunistic
Memberships	Open	Closed	Partially Open
Access to cluster	Rental payments Location required	Internal investment Location required	History Experience Location necessary but not sufficient
Analytical Approaches	Models of pure agglomeration	Input-output analysis Location-production theory	Social network theory

By contrast, industrial complex clusters have identifiable and stable trading relations among business. The realistic example of industrial complex clusters is like a science park. Businesses in this cluster concern about the geographical location for spatial transaction cost reduction. So, businesses in an industrial complex cluster may establish a tightly supply chain for cost-saving. Economy theories such as

input-output analysis and location-production theory are used for analysis the demand, supply and final consumptions of products produced in an industrial complex cluster (Gordon and McCann, 2000). The third kind of cluster model, social network, is not only formed base on location but also trust relationships among businesses. This kind of cluster is just like an agriculture tourism region in Taiwan. The businesses in an agriculture tourism region have strong interpersonal relationships and aims for mutual benefits. The detail linkages among businesses (*e.g.*, trust, cooperation and investment) can be identified through social network analysis.

Among these three types, cluster SMEs should not be industry complex type due to the limitation of firm size. Therefore, cluster SMEs should be classified into either agglomeration or social network type according to Table 2.4. There is no differential relevance in the success of innovation among three types of clusters (Gordon and McCann, 2000). In other words, the characteristics of clusters do not affect the innovation activities in clusters. However, in service industry, the relationship among businesses changes from supply chain to service value network under the effect of service economy. The function of cluster is no longer for complementary resource sharing but also integrates for creating new resources from the SDL viewpoint. Therefore, although the characteristics of clusters do not limit innovation activities, the limitation in both capabilities and resources in SMEs restrict the development of cluster SMEs. Under this circumstance, using value network analysis for understanding the value creation from service experiences and design effective service value network may improve the performance of service innovation in cluster SMEs.

2.4 The Development of Tourism and Cluster SMEs

In tourism industry, there is also a value network formed among SMEs and MNEs. In this network, MNEs are responsible for maintain service selling channels and manage the network while SMEs are the real players that provide the actual tourists services (Gilmore *et al.*, 2008; Pansiri, 2008; OECD, 2008a). However, because SMEs have less capability on marketing, they can't attract as many tourists as MNEs by themselves. Even though MNEs which have more than 250 employees, they only take on about 0.1 to 0.2 percent of the total tourism enterprises, their entire turnover is almost as much as the sum of total tourism SMEs (OECD, 2010) (in which SMEs of less than 10 employees are about 80% of the enterprises).

Tourism SMEs earn less profit than MNEs because of their deficient roles in tourism value networks although they do have the positive impact on the development of regional niche characteristics. High flexibility, local knowledge and distinguished services are their advantages to create better tourists' experiences and then increase tourist's satisfaction (Wanhill, 2000). But low management, marketing and information technology capabilities make tourism SMEs suffer from the disadvantages of low marketing visibility and competiveness. To convert these disadvantages and exert their strength, information technology plays an important role because it can reinforce the innovation capability of tourism SMEs to generate innovative services and business model (Buhalisa and Law, 2008; Zelenka, 2009; Hjalager, 2010; Ma *et al*., 2003). For example, internet and community, destination management system and recommendation system are applied in some tourism SMEs to create new innovative business model in tourism. Therefore, in tourism ecosystem, not only infrastructure and business education, but also information technology is

needed to support the SMEs innovation for well development.

The OECD reports indicate that sustainable development is the main strategy in national tourism policy (OECD, 2008b, 2010; Connell *et al.*, 2009). There are some different details among the entire strategies and policies of OECD countries because they have diverse conditions in their tourism industries. This study is references to the national tourism development policies in Australia, New Zealand, South Korea, Italy, Mexico, Slovak, Switzerland and Turkey which have dissimilar degrees of tourism development and policies. Among these countries, two mainstream directions of tourism development policies are identified: innovative entrepreneurial guidance and destination business management assistance. Policies for innovative entrepreneurial guidance are including include encouraging the investments on innovation services, creation of job opportunities and financial support for entrepreneurship. Policies for destination business management focus on the upgrades of business management skills, distinguished service characteristics generation and reinforcement of destination management, such as cooperation among SMEs for better service journey provision.

In exercising the policies, information technology is often viewed as an auxiliary enabler in tourism development (Touray and Jung, 2010). Information systems such as destination management system help SMEs communicate with tourists and manage resources and business cooperation effectively and efficiently. Internet and online communities are important sources to understand customer needs and feedbacks. Tourism recommendation systems can also facilitate tourists to find tour services. Table 2.5 is the summary of policies from eight countries (Australia, New Zealand, South Korea, Italy, Mexico, Slovak, Switzerland and Turkey) in tourism development.

Policies for destination business management and information technology application are stressed in these countries. The application of information technology mainly focuses on the development of electronic commerce and provides information to tourists. In other words, in addition to the business to business relationships improvement in destination business management policies, business to customer relationships are also connected with the development of information technology.

Table 2.5 Summary of National Tourism Development Policies
(Burns and Corbett, 2007; ENIT-Italian State Tourist Board, 2008; Korea Tourism Organization, 2009; Mexico Ministry of Tourism, 2010; State Secretariat for Economic Affairs SECO, 2008; T.R. Ministry of Culture and Tourism, 2007; Australian Tourism Minister Council, 2009)

Country	Policies for Innovative Entrepreneurial Guidance	Policies for destination business management	Applications of Information Technology
Australia	○	○	N/A
New Zealand		○	Establish electronic commerce.
South Korea	○	○	Establish electronic commerce.
Italy		○	Build network service platforms for integrated tourism information.
Mexico		○	Provide SMEs with information, education, and service.
Slovak	○	○	Build national and regional tourism information systems for revealing tourist paths and educational trails.
Switzerland		○	Develop the national tourism portal and booking system.
Turkey	○	○	N/A

In destination tourism development, partnership and cooperation can be used for businesses to increase competiveness (OECD, 2008b). Research on tourism cooperation indicates that cooperation between businesses enables the integration of policy decisions for regional planning and the development of regional characteristics which are positive factors for both destination tourism and region growth (Huybers and Bennett, 2003; Araujo and Bennett, 2003; Baidal, 2004). Business clusters formed in regional tourism resulted in cooperation enhance business innovation and sustainability (Jackson, 2006; Jackson and Murphy, 2006). In previous research, Jackson used Porter's cluster theory for improving regional tourism competitiveness. However, existing researches are still of short of the methods to create the incentives for cooperation based on the intangible capabilities, knowledge, or creativity, and tangible resources (Russo and Segre, 2009).

Additionally, most of tourism enterprises are SMEs and the cooperation on tangible and intangible resources also has huge impact on their innovation performance (Zeng *et al.*, 2010; Kaufmann and To¨dtling, 2002). In tourism research destination image is an import concept for tourist's behavior comprehension. Tourists receive and construct their mental image from the impressions of attractions and attributes of a destination (Mackay and Fesenmaier, 1997). That is, destination images continue accumulating and updating with tourists' experiences. It also affects the effectiveness of marketing strategies (Echtner and Ritchie, 2003). Therefore, tourism business in a destination can design more attractive services for tourists by comprehending tourist' mental images.

The formation process of destination images is a feedback loop. In the beginning, tourists recall his past experience as an organic image in traveling and then search for

further information as an induced image to change their mental images. After tourists experience and finish their tour in a destination, they would update their mental images of a destination (Echtner and Ritchie, 2003). Destination image components can be divided into three dimensions as shown in Figure 2.3 The first dimension is holistic and attributes which represents different detailed levels of images. Another dimension describes the characteristics of images as functional (tangible) and psychological (intangible). Finally, unique and common can be viewed as the comparison result for the third dimension (Echtner and Ritchie, 2003). For devising the destination image representation and building, the chosen methodology is better to have the abilities to represent the attributes, the psychological and function views of images, and then be able to scale up to holistic destination images for comparison with other destinations.

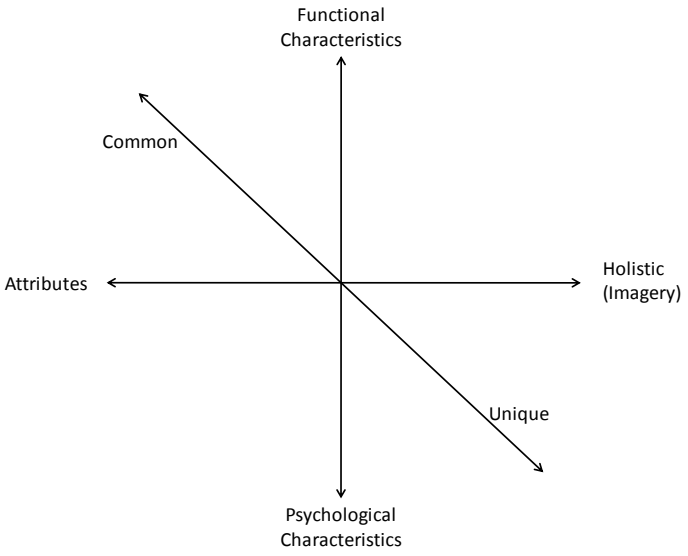

Figure 2.3 Components of Destination Images

(Echtner and Ritchie, 2003)

When tourism businesses provide services to a tourist who then creates and updates his mental image about the destination during the service experience process,

the service value creation process and the destination image formation process accordingly interact with each other. Organic images for tourists can be considered as their initial impression in a destination. Tourists compose their expectations and perceive service value propositions in a destination after gaining marketing and other information. When tourists experience services from tourism, the values created from value-in-use (Vargo *et al.*, 2008) is the basis of images adaptation. In this combination, tourism needs to provide proper services with the images that are what the tourists expected from the marking perspective. Tourists also search for the services which match their images. To represent what tourists need, components of the destination image wanted would have to be measured as well.

When viewing tourism as a service ecosystem for a tourism destination, tourism SMEs in a cluster should have service value propositions, value delivery mechanisms, provide value-in-use for customers and create attractive value propositions based on their advantages. Thus, their dilemma includes market visibility (due to inadequate marketing competence) and ineffective service delivery (due to poor human and financial resource restricting development choices). Consequently, services offered by tourism SMEs cannot be discovered smoothly by tourists, resulting in a lack of positive service experiences and generating an unsustainable tourism ecosystem. Weak SMEs at a tourism destination result in decreased employment and income potential. A tourism ecosystem then worsens in terms of both growth and productivity. Therefore, increasing the effectiveness tourism SMEs in creating value, growing markets, and improving service delivery channels are important to enhance SME tourism sustainability for destinations and achieving the objectives of tourism innovation, growth, and productivity.

In sum, service value created from a tourism SME relies on tourist's service experiences. Destination images in tourism are viewed as brands for identification (Prebensen, 2006). The value of destination images for tourism SME also depends on tourist's experiences and evaluations according to the image formation process in destination image theory. Tourism clusters in pursuit of service innovation for growth need to build own brand. Additionally, to improve value creation of tourism SMEs, the relationships among tourism SMEs are continuous and evolving from chain to network and cluster. Cooperation becomes an important strategy for tourism SME development. A well-designed service value network consequently promotes the cooperation synergy. According to the features and trends in tourism cluster development analyzed in this research, service value network design approach on the basis of SDL and image theory can have a high potential to facilitate tourism clusters in the advance of service innovation.

2.5 Summary

In this chapter, SDL is proposed within the trend of service economy. Changes in customer behaviors lead the shifting logic from GDL to SDL. The service value network related research on the basis of SDL then provides the structure, relationships and role identification of a service system. Through value network analysis and design, participant in a value network can understand the value creation process. Although there is no unified approach to modeling value in a value network, current research primary views value as the difference between benefit and cost. However, the calculation of intangible value from benefit is highly subjective and dynamic. The inefficient way of service value calculation make service value network hard to construct and analyze. There should have an approach to represent service value in

service value network formation and design process.

Image theory is unlike economic theories which primary focus on the transaction and interactions among participants providing alternative viewpoint to model value in cognitive way. In other words, image theory is also a good foundation for realizing value in both tangible and intangible part from human cognition which has been widely used in marketing and tourism research. Therefore, how to integrate image theory for service value representation and calculation is worthy to study in service value network design.

Additionally, studies of clusters, another primary focus in this research, have demonstrated the characteristics of different kinds of clusters Tourism SMEs development with the trend of service economy and globalized competition need to keep creating unique and distinguished features. Destination images as brand identification for tourism SMEs is crucial for tourist attraction. Moreover, the evolving relationships from chain to network among tourism SMEs and the stress on the cooperation strategy shows the requirement of value network reconfiguration. Value network analysis is consequently required to mitigate the resource disadvantages of SME and accelerate service innovation. Therefore, tourism SMEs is a fitted service industry for the application of imagery-based value network design. The evaluation of imagery-based value network design approach will take tourism industry as an example service ecosystem.

Chapter 3 Research Methodology

This research aims to propose a service value network design approach for cluster SMEs toward service innovation. Research methodology in the entire study will follows the IS research framework. In the IS research framework, both business needs and applicable knowledge are important for artifact design and evaluation and for theory development and refinement. Chapter 3 presents the detailed research process and design of this study according to the design science research guidelines (Hevner, 2004). In order to propose the customer-driven and imagery-based value network design approach, studying business needs from the application domain, the leisure agriculture service, should be the first step to identify the relevant business problems. On the other hand, the design artifact, the value network design approach in this research, should also be evaluated by well-designed methods to fulfill research rigor. Therefore, in addition to the detailed research process, this chapter will describe the methods including interview, single case study and system dynamics used to understand cluster SMEs in the leisure agriculture service for the purpose of problem identification. The single case study in a tourism region will describe the foundational information for the service environment and then the interview will further explore the business needs in the tourism. From the interview data and case study, a system dynamics model for tourism service can be established for simulating the influences of the service value network design which aims to improve the service cooperation, resourcing, and the uniqueness of destination images. Subsequently, the conceptual framework of the customer-driven and imagery-based value network approach will be also provided in the final section of this chapter.

3.1 The Research Process

The research process is shown in Figure 3.1. According to the design research guideline, for the problem reverence (Guideline 2), this research investigates a selected tourism region to understand the development problems of cluster SMEs (Chapter 4). Therefore, in Chapter 4 this research uses case study and interview methodology to deepen our understanding of the problem environment, and proposes three propositions to serve as our foundational exploration and understanding. That is, the case study in this research aims to provide the background of leisure agriculture development in a region and the interview further delves solid evidences including need-want analysis for proposition development to understand the cluster SMEs evolutionary path. Additionally, the case study in tourism region is also helpful to model the service ecosystem for artifact design (Chapter 5 and 6) and evaluation (Chapter 7). In short, the entities, relationships between entities and factors identified in the case study and interview would act as the primary elements for the value network design reference in Chapter 5 and 6.

Both Chapter 5 and 6 are for artifact design (Guideline 1). Chapter 5 focuses on the design of value network on the basis of the SDL and image theory. The theoretical proof of the propositions in customer-driven and imagery-based value network is performed in Chapter 5. In the foundation of the value network design, the detailed service platform development for the proposed value network design is described in Chapter 6. Chapter 6 shows the architecture of the prototype service system – uVoyage which aims to perform real use cases for the tourism region mentioned. The evaluation of the entire research is analyzed in Chapter 7 (Guideline 3). System dynamics approach for macro viewpoint is performed to simulate the possible

scenario of tourism region development. And single case study and interview for micro viewpoint are used to collect the evidences to justify the values of the artifacts. Finally, Chapter 8 and 9 synthesize the artifacts and contributions to service industry, service science and information system research in this study (Guideline 4).

<table>
<tr><td colspan="3">Research Motivation and Objects
(Chapter 1.1 and 1.3)</td></tr>
<tr><td colspan="3">The evolution of a service ecosystem
The evolutionary path of cluster SMEs during service economy transformation</td></tr>
<tr><td colspan="3">Research Process
(Chapter 3)
Guideline 5: Research Rigor
Guideline 6: Design as a Research Process</td></tr>
<tr><td>Research Question 1
(Chapter 1.2)</td><td>Research Question 2
(Chapter 1.2)</td><td>Research Question 3
(Chapter 1.2)</td></tr>
<tr><td>The cluster SMEs evolutionary path
(Chapter 4)
Guideline 2: Problem Relevance
Service Ecosystem for value creation in service dominant logic
(Chapter 5)
Guideline 1: Design as an Artifact</td><td>Customer-Driven and Imagery-based Value Network Design
(Chapter 5)
Guideline 1: Design as an Artifact</td><td>The Design of Imagery-based Service Cooperation and Recommendation Platform for Cluster SMEs - uVoyage
(Chapter 6)
Guideline 1: Design as an Artifact</td></tr>
<tr><td colspan="3">Evaluation for Research Questions
(Chapter 7)
Guideline 3: Evaluation</td></tr>
<tr><td colspan="2">Macro viewpoint</td><td>Micro viewpoint</td></tr>
<tr><td colspan="2">Evaluation Methodology
System Dynamics
(Chapter 7.1)</td><td>Evaluation Methodology
Single Case Study
Interview / Focus Group
(Chapter 7.2)</td></tr>
<tr><td colspan="3">Research Contributions
(Chapter 8 and Chapter 9)
Guideline 4: Research Contributions</td></tr>
</table>

Figure 3.1The Research Process

3.2 Case Study and Interview for Leisure Agriculture Service

This study adopts a single case design method (Yin, 1994) in both Chapter 4 and Chapter 7 micro viewpoint evaluation part. As the single case study design is intended for representative and typical case studies, the conclusions drawn from the case studies can help understand similar incidents and matters. Therefore, to understand the development of leisure agriculture, this study selects the first leisure agriculture area in Taiwan, namely the Mt. Pillow Recreational Agriculture Area, as a case study. The case study considers theory, proposition, hypotheses, testing analysis and data collection, based on in-depth interviews, observation, and documentary sources. Triangulation was used to gather data for analysis (Sarker and Lee 2003; Shanks and Parr, 2008).

Four criteria are adopted to ensure the quality of the case study: construct validity, internal validity, external validity, and reliability assessment (Lee, 1989, Yin 1994, Sarker and Lee 2003). Table 3.1 lists the four criteria.

Table 3.1 Rigor of the Study

Criteria	Case Study Strategy	Remark
Construct Validity	Multiple sources of evidence are adopted.	In this study, the sources of evidence adopted include: leisure industry related literature, government records and reports, interviews with operators, and direct observation of The leisure agriculture area.
	The provider of evidence is required to conduct the case study.	The interviewers shall inform the respondents in advance regarding the purpose of the interview. At the end of the interview, the interviewers will play the interview video for the respondents and will further ask the respondents to give comments.
	To establish a chain of evidence.	The interview is conducted for a period of three months. After each interview, the interview content will be compiled to serve as a reference for the next interview.
Internal Validity	Pattern matching	This study covers discussion of leisure agriculture through the Industry Cluster Theory and SDL.
	To establish interpretation	To establish the casual relationship of the leisure agriculture development through three hypotheses.
External Validity	The extent of the study results that can be summarized	The discussion covers the leisure agriculture area, which is divided into four stages.
	To apply the copy rules	Different problems are encountered during the development process in the leisure agriculture area. The development processes summarized from the four stages according to Industry Development Theory (Merz and Vargo, 2009) can be applied in different agricultural areas.
Reliability	To adopt a case study draft	Interview records, survey reports.
	To set up a case study date base	Interview audio recording Interview transcripts Direct observation (photos and videos)

3.2.1 Case Study: Mt. Pillow Leisure Agriculture Area

In Yilan County, agriculture has always been assigned more weight than industry and commerce in terms of its industrial development. Moreover, this situation has been aggravated by rising costs in the traditional agriculture sector and shrinking farmer income, as well as the opening up to agricultural imports following the entry of Taiwan to the WTO. The Yilan County government has thus actively promoted the transformation of the traditional agriculture into the leisure agriculture, following the "Regulations for Guidance and Management of Recreational Agriculture "promulgated by the Council of Agriculture, Executive Yuan. As of the end of 2009, a total of 13 leisure agriculture areas were established in Yilan County.

This study adopts the leisure agriculture area of Mt. Pillow as the research venue to discuss the effects of the recreational industry on overall regional development. Mt. Pillow is not only the first leisure agriculture area in Yilan County, but also the first formally announced designated leisure agriculture area in the nation. The Mt. Pillow Leisure Agriculture Area is located in close geographical proximity to four villages: Jhen-Shan Village, Tung-Le Village, Tou-Fen Village, and Yung-He Village. Jhen-Shan Village, occupying an area of 78 hectares, is the main focus of planning. The Mt. Pillow Leisure Agriculture Area boasts natural landscapes including Mt. Pillow, Ta Chiaohsi, the Big Tree, the Thunder Pond, and so on. The area contains a wealth of rich ecological resources, primarily fruit crops. The area contains over 30 kinds of fruits, making it the largest fruit supplier in Yilan County. Fruit picking services are also available to tourists all year round. Because of the natural environment and unique environmental resources, the leisure industry of the Mt. Pillow Leisure Agriculture Area has undergone rapid development. Various experiential farms and hostel theme restaurants are also available and can help tourists

experience the color of rural life. Figure 3.2 to 3.5 are the pictures in Pillow Leisure Agriculture Area.

Figure 3.2 Scenery in Pillow Leisure Agriculture Area (1)

Figure 3.3 Scenery in Pillow Leisure Agriculture Area (2)

Figure 3.4 Scenery in Pillow Leisure Agriculture Area (3)

Figure 3.5 Scenery in Pillow Leisure Agriculture Area (4)

3.2.2 Interview in Mt. Pillow Leisure Agriculture Area

The current development of leisure agriculture was based on site observation. This study adopts the Mt. Pillow Leisure Agriculture Area in YuanShan Township in Yilan County as the case study area. Site observation and interviews were conducted with officers, SME operators, owners, and local residents to determine the current situation of the leisure agriculture operation and the problems encountered in regional

development. Leisure industry operations in the area comprise two types, namely, leisure farms, and hostel restaurants. The restaurants enjoy considerably better business than the leisure farms. Meanwhile, the leisure farms can be subdivided into two types, namely, simple leisure farms and compound leisure farms.

Given the changes in industrial structure, the transformation of traditional agriculture into leisure agriculture will become a future regional development trend. This study explores the causal relationship between leisure industry development and overall regional development. This study adopted a qualitative research approach and conducted in-depth interviews and focus group with officers, proprietors, owners, and local residents in agricultural areas. Interviews and focus group were performed. The first stage was conducted from December 2009 to March 2010, and 2 regional ownerships, 14 SMEs, and 8 local residents were interviewed. In March 2010, there were total 34 SMEs in Mt. Pillow Leisure Agriculture Area and 14 SMEs are interviewed. Large leisure farm operators and Hostel operators were selected to perform interview in the first stage.

Table 3.2 lists the interview subjects and the categories they fall under. The interview contents comprised two parts: the first part related to the current situation of the leisure agriculture operation, regional leisure industrial development, regional leisure industry organization operation, and so on; meanwhile, the second part related to the overall impacts of leisure industry development on the natural ecology, environmental resources, history and culture, and area residents.

Table 3.2 Respondent Information of Interview in the First Stage

Respondent category	Number of SMEs in Mt. Pillow	Number of respondents	Interview topics
Ownerships*	N/A	2	1.To understand the situation of the leisure agriculture operation, development, and organization operation 2.To investigate overall impacts of leisure industry development on the natural ecology, environmental resources, history and culture, and area residents
Simple-type leisure farm operators	16	8	
Compound-type leisure farm operators	1	1	
Hostel operators	10	4	
Foods and Desserts Service	7	1	
Local residents	N/A	8	
Total	34	24	

* indicates ownerships such as community development associations and leisure agriculture area development associations.

In the second stage, a focus group was performed when the prototype of uVoyage service platform completed in June 2011. uVoyage service platform was introduced and experienced by all participants before the focus group. The focus group session started right after the uVoyage education training session. All participating SMEs (Table 3.3) completed their uVoyage B2B module setting. There were two topics for discussion in this focus group. The first one was about the uVoyage B2C service design - emotional feelings resulting from the tourist's service experiences having significant influences on SME's brand and images. Another topic was about uVoyage B2B service design - influences the customer-driven cooperation would impact the tourist's service experience, SME's brand and images.

Table 3.3 Respondent Information of Focus Group in the Second Stage

Respondent category	Numbers of SMEs in Education Training	Numbers of SMEs in Focus Group	Interview topics
Simple-type leisure farm operators	5	4	To understand how the B2C and B2B service design in uVoyage influences SME's brand and images
Hostel operators	3	2	
Foods and desserts service	1	1	
Total	9	7	

The third stage was performed during February 2012 to March 2012. Three officers were interviewed first. These interviewees were the members of Digital Opportunity Center in Yilan established by Ministry of Education. Their mission was to improve regional economy by developing regional ICT infrastructure and education. The regions they were responsible for were YuanShan and Nanao Township in Yilan County. Additionally, another focus group was conducted with six regional tourism SMEs in Mt. Pillow Leisure Agriculture Area (Table 3.4). Both contents of interview and focus group were about what and how the proposed mechanisms in uVoyage service platform could influence the development and growth of regional tourism.

Table 3.4 Respondent Information of Focus Group in the Third Stage

Respondent category	Numbers of Respondents in Focus Group	Interview topics
DOC members	2	To understand the effects of uVoyage design in the improvement of regional tourism development on productivity, innovation and growth perspectives
Simple-type leisure farm operators	2	
Hostel operators	2	
Foods and desserts service	2	
Total	8	

3.3 System Dynamics Approach for Macro Evaluation of Tourism Ecosystem

In the section 3.2, the case study in Mt. Pillow Leisure Agriculture Region shows the prototype of a tourism ecosystem. From this case study, the destination image theory, and image theory, this research builds a model of tourism development identifying the important factors with the system dynamics approach. System dynamics approach describes the dynamic behaviors of social systems. Researchers construct a system model in which their research questions are embedded and investigate the key variables and their relationships influencing the system behavior through the observations, analyzed statistic data, or searching references (Forrester, 1994). When key variables and their relationships are discovered, the causal loop relationships which describe the system behavior can be constructed. After setting formulae among variables based on their interactions, researchers can simulate the system behavior and observe the interactions among variables defined in the system (Sterman, 2000). System dynamics approach is suitable to study highly dynamic complexity problems. In these problems, factors and variable in this kind of systems can't separately handle or precisely measure. Researches like drug abuse (Coylea and Alexander, 1997) and the development of social health care system (Wolstenholme *et al.*, 2007) have used the system dynamics approach to understand system behaviors and evaluate alternative policies. In a tourism ecosystem development strategy, it also has a high dynamic complexity due to economic, social and environment aspect consideration at the same time. Factors concerning the development of region, tourism SMEs and environment protection need to achieve the balance of economic, social and environment system.

Figure 3.6 illustrates the system dynamics processes. In the beginning, the system we want to study should be described in step 1. The case study and interview data provide valuable information to understand the entity and relationships in the tourism ecosystem such as leisure agriculture. With the related tourism statistical data and propositions assumed in this research, the service system of SME leisure agriculture cluster development can be established. One of the research goals in this study, designing a high productivity, innovative and growth value network for cluster SMEs, is viewed as a policy and also as an assumption for enhancement of the tourism SME development. Given the service value network design in this research tries to improve the cooperation in cluster SMEs and build unique and attractive destination images. The system dynamics simulation of the tourism service system will show the policy influences and tests the assumptions for business needs. The simulation results (Chapter 7.1) can provide preliminary evaluation about how the attractiveness of destination images for tourists and the business environment may become by adapting different level of SME cooperation. The design of service value network and service system implementation then can further produce artifacts for the research goals. Therefore, in the next section, the conceptual framework for the service value network design is introduced for understanding the idea of customer-driven and imagery-based design approach and the effect to service system.

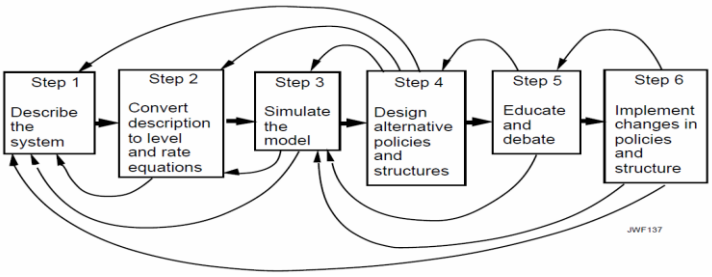

Figure 3.6 System Dynamics Steps
(Forrester, 1994)

Chapter 4 Roles of SMEs in Cluster Innovation

In tourism industry, over 90% of tourism industry enterprises are SME (Wanhill, 2000; Novelli, *et al.*, 2006). In this chapter, SMEs of leisure agriculture service in tourism are taken as the examples in this research to study the roles of SMEs in cluster innovation. According to Organization for Economic Cooperation and Development (OECD, 2008) survey, the tourism industry is an international industry; however, this industry continues to suffer problems such as low productivity, lack of innovation, and slow growth. The tourism, leisure, and travel management approach that combines history, culture, and local characteristics has gradually developed. In the face of global competition, this management model is expected to guide future development for small local businesses. Due to the resource limitation in SMEs, partnerships or cooperation is an important way to help these SMEs increase their competitiveness (OECD, 2008). The cluster SMEs including local industries and cultures require three characteristics (Cheng, 2002; OECD, 2001): uniqueness, quality, and productivity. Uniqueness emphasizes industrial goods with unique local features or rare goods produced in few places; quality emphasizes product uniqueness, which does not necessarily possess local uniqueness but is higher in quality; productivity emphasizes the higher production scale of a local region compared to others.

As stated in the Industry Cluster Theory of Porter (1998a), when a single geographic area contains a sufficient number of enterprises, those enterprises form clusters, accelerating industrial development. Therefore, business growth and

attracting new enterprises are important indicators of cluster success (Porter, 1998b). The development of the tourism industry began from local characteristics, resulting in the natural formation of industrial clusters. The natural formation of clusters is an inherent advantage of the tourism industry; however, in terms of corporate makeup, the industry is dominated by SMEs (OECD, 2008). In this regard, the evolution of SMEs and tourism development are considered inseparable. The changes of SMEs in tourism clusters then influence the network relationships in tourism industry.

4.1 Development of the Leisure Agriculture Industry

An industry comprises organizations or groups engaged in similar operational activities including offering high quality markets, products, services, and so on to meet consumer needs and desires. The industry in turn derives profits and commercial gain from service and products, and expands the business blueprint and business scale to maintain industrial growth and protect consumer rights. Industrial development clearly determines overall national economic development, and thus countries around the world are committed to developing industries with national competitive advantage. With the changing economic environment, the manufacturing based industrial structure of Taiwan has gradually transformed into a service-oriented industrial structure. The World Tourism Organization (WTO, 2010) further noted that the service sector represents the future trend in industrial development, with the tourism and leisure industries in the service sector playing a key role. The development of the tourism and leisure industry provides tourists with more entertainment choices, and the associated economic benefits can also assist in regional development, thus reducing the urban-rural gap.

In response to the growth of domestic and international leisure travel, Taiwan

government has actively promoted the tourism and leisure industry, leisure agriculture and particularly the leisure agricultural, especially that which combines regional characteristics and development. Since the establishment of the first tour farm in Taiwan in 1965 (Taiwan Leisure Farming Society, 2004), decades of dedicated effort have seen Taiwan rapidly develop its leisure agriculture. The number of leisure agriculture operators reached 5,829 as of the end of 2005, generating revenue of nearly 20.3 billion dollars. These figures indicate that leisure agriculture has become the major operational model for transforming traditional agriculture (Tuan, 2007). The leisure agriculture industry, under the vigorous promotion of Taiwan government, has flourished after 1989. The Agricultural Development Act defines leisure agriculture as follows: A form of farming management that applies landscapes of countryside, ecosystem and environmental resources, integrates agriculture, forestry, fishery and animal husbandry, village culture, peasant life for recreation and helps consumers experience agriculture and farm villages." Leisure agriculture and traditional agriculture have considerably different operational models; therefore, numerous operational problems are inevitable during the process of transforming traditional agriculture into leisure agriculture.

Traditional agriculture and leisure agriculture have different production-marketing models. Table 4.1 shows that in the production-marketing model of the traditional agriculture, packaged agricultural products are delivered for sale to wholesale markets in locations accessible to consumers. In this production-marketing model, farmers partner with traffickers and wholesalers, and so do not directly contact consumers. However, the leisure agriculture adopts a completely different production-marketing model. The products of the leisure agriculture not only include traditional agricultural products, but also service-oriented

products such as accommodation, food, tours, and experiential farms. Because many service-oriented products cannot be stored, and because production and consumption occur almost simultaneously, consumers must personally visit production locations to receive services. The trading partners of farmers therefore are the ultimate consumers, and thus direct contact is necessary. Therefore, leisure agriculture producers and consumers are inseparable in the production-marketing model adopted by the leisure agriculture.

Table 4.1 Comparison of the Production-Marketing Models of the Traditional Agriculture and the Leisure Agriculture

	The production-marketing model of the traditional agriculture	The production-marketing model of the leisure agriculture
Product trading partners	Traffickers and wholesalers	Ultimate consumers
Ultimate consumption location	The locations of the consumers.	Location of production produced
The relationship between producers and consumers	Producers and consumers are not in direct contact	Producers are in direct contact with consumers
Sale of products	Agricultural products	Agricultural products and service-oriented products

When a traditional agriculture transforms into leisure agriculture, operators generally directly transform from small-sized farmers into leisure agriculture operators. As a result, the leisure agriculture normally operates as SME. Since the leisure agriculture is a diversified and service-oriented industry that combines agricultural production and marketing with recreation and leisure, and because it transforms the production model of the traditional agriculture sector into a model with service, education, leisure functions, SMEs require various operational competencies to attract customers. Leisure agriculture development in Taiwan needs to enable

farmers to increase their income, improve living standards, and activate rural areas, while simultaneously achieving the regional development outcome and a narrowed urban-rural gap. Therefore, this following study adopts the perspective of industry cluster theory and SDL, coupled with the case analysis method and the key characteristics of the development process of the leisure agriculture. Three propositions related to the causal relationship between SME evolution and regional development is further examined and the results are presented in case study form.

4.2. The Propositions for the Evolution of SME Roles

Leisure agriculture is a unique industry that combines traditional culture with tourism. As early as 100 years ago, Australia developed models resembling contemporary leisure agriculture (Hummelbrunner and Miglbauer, 1994). Early leisure agriculture involved tourists using agricultural facilities as free accommodation, and thus gaining an experience of rural life (Oppermann, 1996). Thus, early leisure agriculture focused on accommodation (Fleischer and Pizam, 1997). Operators relied on agriculture as their primary source of income, and only operated leisure agriculture as a sideline. In recent years, the emphasis has shifted to attracting customers through offering diversified leisure agriculture related services (Sharpley and Vass, 2006; Capriello and Rotherham, 2008).

During industrial innovation development, different periods accommodate different development stages (Merz and Vargo, 2009). Meanwhile, with the advancement of technologies, SMEs should react to apply appropriate technology-based strategy for competition (Schiavone, 2011). Recently, improved traditional agricultural technologies have rapidly eroded employment opportunities, contributing to relocation and aging of rural populations. However, as the popularity

of tourism health has received increased attention, major changes have occurred in traditional economic development in rural areas (Alexander and McKenna, 1998). Historically, rural areas were production-based, but production and tourism now coexist, thus increasing rural incomes and employment opportunities, and driving regional development (Nilsson, 2002; Contini, *et al*., 2009). On the other hand, leisure agriculture transformed from traditional agricultural production to a service industry. According to the SDL proposed by Vargo and Lusch (2004, 2008), the business and interaction model among businesses and customers would be changed for the adaption of service-based economy. Service integrations among businesses and environment are emphasized to refine customer services. Resources from both businesses and environment are integrated for creating new resources with higher value than before. Diversified service can then be achieved through service integrations. Since the development of the leisure agriculture is gradual, this study establishes proposition 4-1, as follows:

Proposition 4-1: Leisure agriculture with the adaptation on service-based economy should have more service integrations to achieve regional development.

Sustainable management is only possible by enhancing the competitiveness of SMEs and integrating the natural ecologies, environmental resources, history and culture of rural areas into the lives of residents, thus forming leisure agriculture with special characteristics during regional development (Control Yuan of R.O.C. 2007). However, proper communication is a key factor during development (Contini *et al*., 2009). Since the development of leisure agriculture is unique and regional-oriented, the development of leisure agriculture naturally forms clustering effects. According to industry cluster theory proposed by Porter (1998a), enterprise cooperative strategy enhances productivity and innovation, as well as industrial competitiveness (Kuah,

2002; European Tourism Research Institute, 2003; Novelli *et al*., 2006). To achieve effective integration of SME's service and facilitate communication, the functions of local organizations are essential in achieving effective integration and communication objectives (Wanhill, 2000; Control Yuan of R.O.C., 2007; Pansiri, 2008). Therefore, this study establishes proposition 4-2, as follows:

Proposition 4-2: Regional development can be improved if organizational ownership in a region can encourage service integration among SMEs

4.3 Development of the Propositions

The development of propositions is based on the case study and interview data from the Mt. Pillow Leisure Agriculture Area in Yilan County. The interview contents comprised two parts: the first part related to the current situation of the leisure agriculture operation, regional leisure industrial development, regional leisure industry organization operation, and so on; meanwhile, the second part related to the overall impacts of leisure industry development on the natural ecology, environmental resources, history and culture, and area residents. Detail case study and the categories of SMEs interviewed have shown in Chapter 3.

Based on the actual observation and interview results, the SMEs are classified using two dimensions: operating model and customer source. The operating model can be further divided into product-oriented and service-oriented. Meanwhile, the customer sources include individual tourists and group tourists. Wants-Needs Analysis is then performed based on the current operating situation as described by the SME operators. Table 4.2 shows that leisure agriculture SMEs generally need to raise awareness raise consumer awareness of their businesses and cultivate stable customer sources. Additionally, the customer sources of SMEs differ with their operating types.

That is, service-oriented hostel restaurants target individual tourists while product-oriented leisure farms target group tourists. Both types of businesses need to establish unique characteristics, which can be achieved through cooperation with their customers and a time management platform (*i.e.* web-based calendar service) for customer reservation.

Table 4.2 Wants-Needs Analysis Chart

Tourist Type	SME with Product-oriented		SME with Service-oriented	
Individual tourists	Wants	1. To raise awareness 2. To increase sales	Wants	1. To have stable customer sources. 2. To raise awareness 3.To gain customer recognition
	Needs	1.To increase the crowds 2.To establish product characteristics 3.To find target customers	Needs	1.To establish service characteristics 2. To find target customers 3.To engage in in-depth and diversified experiential services
Group tourists	Wants	1.To increase sales 2.To raise awareness 3.To have stable customer sources. 4.To develop product recognition. 5.To meet customers' goals. 6. Time management.	Wants	1.To have stable customer sources 2.To satisfy different types of customers 3.To gain customer recognition
	Needs	1. To adjust the volume of customers 2.To establish product features 3.To provide customers with more product categories 4.Time management	Needs	1.To provide diversified services 2.To offer customers a distinguished service experience 3.To establish characteristics 4. Time management

The wants-needs analysis chart also implies the differences in the logic of SME operating model. When discussion of the causal relationships associated with the different stages of the leisure agriculture development, the characteristics of each development stage and SME in the leisure agriculture should be identified Simultaneously, by integrating the local characteristics, regional natural ecologies, environmental landscapes, and history and culture related services offered, as well as the lives of local residents, the industrial value and attractiveness of the leisure agriculture should be enhanced, thus creating more employment opportunities which in turn promote regional development.

As leisure agriculture resulted from the transformation of the traditional agriculture sector, it is a diversified service-oriented industry that integrates the production and marketing of agricultural products with leisure and recreation. The sector transforms the production model of the traditional agriculture sector into one with service, education, and leisure functions. Therefore, from an operational perspective, SMEs must consider ways to attract consumers to consume locally, select suitable products or services for sale, establish product or service features, and establish good relations with customers and word of mouth.

Since the leisure and traditional agriculture sectors employ different operating methods, SME operators must learn new business ideas and different ways of doing business. Therefore, the transformation of leisure agriculture still requires considerable improvement. Facing a changing industrial structure, as well as the influence of Taiwan joining the WTO, the production of the traditional agriculture sector, as well as related processing by the primary and secondary industries, were directly subject to the impacts of the opening-up to Taiwan of agricultural imports.

Moreover, continuously increasing processing costs undermined the competitiveness of the traditional agricultural production area, seriously affecting the livelihood of farmers. Consequently, the government actively promoted leisure agriculture, upgrading it to tertiary industries.

This study argues that leisure agriculture involves the transformation of the traditional agriculture production model into a provision of service model utilizing agricultural experience. Leisure agriculture develops gradually, and its transformation from traditional agriculture can be considered as an evolutionary process based on SDL. SMEs which adapt the trend of service economy then encourage the service integration through competition and cooperation for the boost of productivity and innovation. For instance, a new product development for innovation is progressively involving from one company to alliances (Cantarello *et al*., 2011), and the linkages among SMEs based on fulfilling the identified customer's needs can impact the value creation in inter-firm partnerships (Cambra-Fierro *et al*., 2011).

The objective of transforming the traditional agriculture sector into leisure agriculture is to create rural travel related business opportunities based on the ideas of sustainable development including natural ecology, environmental resources, humanity and history, and lifestyle. Increasing farmer incomes would create more employment opportunities in rural areas. In addition, leisure agriculture also promotes the activation and development of rural areas, and narrows the rural-urban gap resulting from the industrial and commercial development. In proposition 4-1, this study argues that with the adaptation of service-based economy in leisure agriculture, service integrations should happen according to SDL and progressively change the business model through competition and cooperation in a region for regional

development. Therefore, we argue that there should be different sages for achieving service integration in a region. Proposition 4-1-1 is accordingly proposed to distinguish the different level of service integration for regional development.

Proposition 4-1-1: According to the evolution of the consumer market, the development of leisure agriculture comprises four stages with the different levels of service integration, namely, the production and marketing transformation stage, individual operation stage, integrative operation stage, and community development stage.

The development of leisure agriculture would be divided into four stages and two phases. The early phase comprises the production and marketing transformation stage, and the individual operation stage. Meanwhile, the advanced phase comprises the integrative operation stage and the community development stage. Table 4.3 highlights the contents of each stage and connects to relate FPs in SDL. According to SDL, customers and leisure services are viewed as different types of resources in different stages. The value of leisure services is also determined based on the evolution from the value-in-exchange to value-in-use stages. Figure 4.1 then summarizes the relationship between the key factors in different stages listed in Table 4.3 The following sections will discuss the early two and last two stages by analyzing the interview data for Proposition 4-1-1's evaluation.

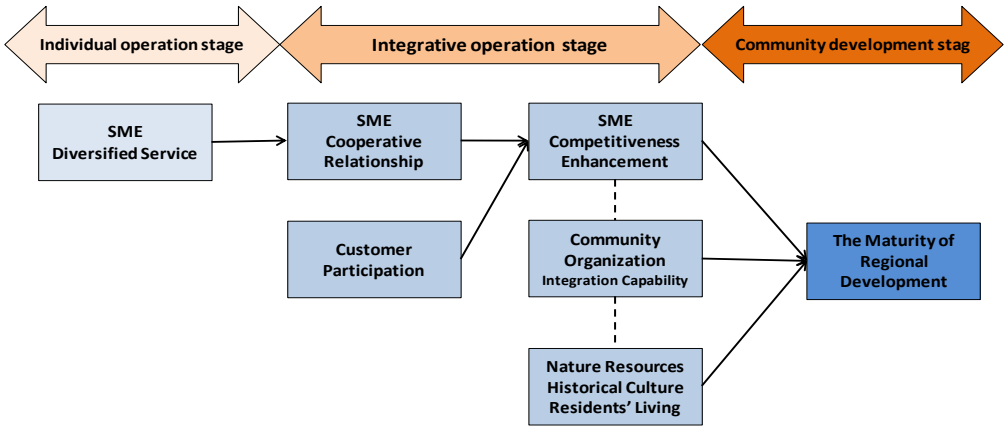

Figure 4.1 The Relational Diagram of the Tour Regional Development

Table 4.3 The Development Process of the Leisure Agriculture Sector

Stage	The changes in the leisure agriculture sector	Remark	Relationship with SDL
Production and marketing transformation stage	In this stage, the tour farm model is adopted in the operation. The purpose is to open the orchard to the public to provide customers' fruit picking services in order to cut down manpower, attract customers, and increase farmers' income. Customers and leisure are operand resources. The value of leisure is attached to the picking and sale of agriculture products. The leisure agriculture sector's value is determined by the value-in-exchange.	In this stage, agricultural product trading is the most important mission while the leisure agriculture sector adopts the viewpoint of the GDL.	None
Individual operation stage	Leisure is functional; the SMEs provide various services including agricultural product sale, accommodation, meals, tour guide, and experiential services. The SMEs operate independently, and provide individual leisure services based on their areas of expertise. Customers are operand resources while leisure is	The leisure agriculture sector underwent rapid development from the provision of agricultural product picking services to provision of other services such as accommodation, food, and tour guiding.	FP1 FP2 FP7 FP3

	an operant resource. The value of the leisure agriculture sector is determined by the value-in-exchange.		
Integrative operation stage	The setup of the leisure agriculture area and the different characteristics in the area. The SMEs established their characteristics through cooperation, giving emphasis to customer participation. Customers are operant resources while leisure is an operant resource. The value of the leisure agriculture sector is determined by the value-in-use.	The regional clustering effect enabled the SMEs to be grouped in nearby regions. The SMEs integrated their specialties and established their characteristics through cooperation in order to meet the different needs of the customers.	FP10 FP8 FP6 FP5 FP4 FP3 FP2 FP1
Community development stage	The leisure agriculture sector not only provides services to the customers, but also blends the natural ecologies, and the community development in the residents' lives. All the community development related SMEs, customers, residents, natural environments, and history and culture are operant resources.	Leisure emphasizes the creation of value through the interaction between the SMEs, customers, residents, natural environments, and history and culture.	FP10 FP9 FP8 FP6 FP5 FP4 FP3 FP2 FP1

4.3.1The Production and Marketing Transformation and Individual Operation Stag Stage

Leisure agriculture has been practiced in many parts of Europe and America for many years. Initially, leisure agriculture involved offering accommodation in surplus farm buildings. Leisure agriculture in Taiwan began with the first tourist orchards in 1965, which saw farmers spontaneously, try to increase farm income by opening their farms to allow tourists to pick fruit. Recently, the signing of the WTO has opened Taiwan to imports of foreign agricultural products and reduced farmer incomes. In traditional agricultural production and marketing, farmers sell agricultural products to retail markets through dealers or wholesalers. This marketing process obviously squeezes farmer profit margins. Therefore, to increase their income farmers have changed traditional marketing methods by opening orchards for tourists to pick fruit.

"Like the case of the guava, frequently, if you do not open, you do not sell. It is cheap in the market and costs in the south only NT2.00 a catty. When asked if I opened, I said, "Well, NT5.00, 8.00, or 10.00 is OK when you go pick or eat by yourself."

I open the peach orchard when it is ripe. Although good to eat, peaches that go to the market cannot sell at a good price. And when it relies on wholesalers, the price is really low because California peach is available. Well, it hit us that we could not compete, but theirs are sour, ours are sweet. Well, it's just like that."

During the production and marketing transformation stage, SMEs primarily are transforming from small farmers involved in traditional agricultural production to managing tourist orchids, aiming to open their farms to allow tourists to pick and thus save labor, and also aiming to attract tourist interest and thus increase output value and sales volumes of agricultural products. During this stage, SMEs primarily deal directly with buyers of agricultural products, and can directly visit and consume at the source of those agricultural products. Obviously, SMEs devote themselves to

increasing their productivity. Customers are viewed as an operand resource to reduce labor, transportation and sale cost. The production and marketing transformation stage clearly shows that leisure value is attached to the picking and marketing of agricultural products, so SMEs considered leisure an important means of increasing agricultural product income, and tourists derived satisfaction through picking and trading agricultural products.

However, the management of leisure agriculture operations cannot meet customer needs solely through purchases of agricultural products and visits. SMEs investing in leisure agriculture must leverage farm features to offer various services. In addition to sell traditional agricultural products, management should utilize resources owned by individual operators, including accommodation, catering, tour guiding and numerous other experiences, to maximize added value and provide services that satisfy customers.

"Here fruit picking is mainly done. For instance, in some adopted courtyard for growing pears, the tourist can experience the whole process from grafting, development, bagging, to harvesting; also, the children can have an outdoor education.

The main reason to be here is for the experiences; you can do whatever you want to do: making bamboo rice, golden rice dumplings, bamboo weaving, or just eating here. We have enough space here for whatever the guest requires.

To make the guests feel at home, I have lived here with the guests, who are made to feel at home here and eat, chat, and appreciate the plants and flowers. The tourists come to experience life here."

Advances in the leisure industry have rapidly increased numbers of SME operators, taking leisure agriculture into the individual operation stage. In the individual operation stage, a rapid increase in the number of SME businesses has intensified competition among SMEs. To increase their competitiveness, the SMEs

targeted their own customer groups and provided various functional services focused on their needs). The leisure services provided by SME during this stage emphasize functionality, and tourists select appropriate SMEs according to their needs in terms of travel spending. Since SMEs provide a functional service, a competitive relationship is formed with SMEs providing similar services or functionalities. To deal with competition, SMEs must each create features to attract tourist spending and strive to meet customer demand to improve customer satisfaction, making customers an important resource and source of competitive advantage. Ideas of innovative services germinate with competitions.

However, traditional agriculture is limited by ownership restrictions that leave the bulk of arable land in the hands of small farmers. Most SMEs involved in leisure agriculture developed out of small-scale farms and have limited resources. Leisure agriculture is a diversified service industry, combining the production and marketing of agricultural products and leisure, and transforming the production patterns of traditional agriculture to include service, education, leisure, *etc.* SMEs thus require various operating capacities to attract customers. Nevertheless, resource restrictions cause SMEs to face many obstacles in managing leisure agriculture. Therefore, when SMEs in the individual operations stage face a lack of financing, human resources, farm size, and management capacity, the needs of tourists become increasingly difficult to meet through functional services, creating a bottleneck in the development of leisure agriculture. The regional development in the production and marketing transformation stage and individual operation stage face the challenges as reported in OECD (2008) in productivity, innovation and growth. To make the development of leisure agriculture sustainable, SMEs could evolve into the integrative operation stage for service integration after transforming from production-based to service-based

economy.

4.3.2 Integrative Operation and Community Development Stage

Tourists expect travel to enable them to access a large and diversified range of services in a single area (Gunn, 1994). Therefore, whether an area contains sufficient and diversified services is an important reference in tourist selection. To meet diverse tourist needs, various constraints prevent SMEs involved in leisure agriculture from adopting an individual operation approach. To provide complete products and services, leisure agriculture could enter the integrative operation phase.

"As for leisure, the spirit of solidarity will never work, and it just will not do. It takes the team spirit to get the job done. For example, in our area, everyone says it has a lot to offer, and everyone seems to be looking out for his own benefits. This simply will not do. If customers come to me, I will tell them great places to go, and cheap places to eat delicious food. I am not a restaurant owner; I am not in the restaurant business, but I am an operator in the leisure sector and I can tell them where to go. This is the team spirit. I inform the customers that coming here places they can go to fetch clams, catch grabs, and so on."

Leisure agriculture in Taiwan developed out of traditional agriculture, and SMEs involved in leisure agriculture are mostly small-scale farmers and local residents in rural areas who transformed their old businesses, leading to natural clustering of the industry. Furthermore, in 2000, the government amended the "Regulation for Guidance and Management of Recreational Agriculture" to encourage regions characterized by local agricultural features, rich in landscape resources, abundant ecology and valuable cultural assets to plan to establish regional leisure agriculture areas. This government policy also accelerated clustering of the leisure agriculture industry.

"Inside the leisure agriculture area there are many types of businesses. For example, besides production, we have the tourist orchard, hostel, flowers,

agricultural products, homemade vinegar, and homemade soy sauce."

The fact that individual SMEs have limited resources and capacity to meet the diverse needs of tourists reduces the attractiveness of leisure agriculture. The development of innovative service hence is also limited. To meet differing tourist needs and improve the attractiveness of leisure agriculture, SMEs in the integrative operation stage can fully utilize the characteristics of industry clusters in located region by overall planning, complementarity of resources, differences in characteristics, co-operation and co-marketing, and other advantages, and can cooperate to offer tourists diversified services to increase tourist satisfaction. Different SMEs adopting the integrative operation model to combine different SMEs resources to produce unique products and services can solve the resource constraints facing SMEs. Additionally, customer participation helps understand customer needs and improve the capabilities of SME managers to build their reputations via customer satisfaction enhancement. SMEs in the integrative operation stage pursuit both productivity and innovation and the growth of region in the economic aspect is on the right track.

"I have a keen interest in education. I prepare data, including the medicinal plants. I prepare information that is easy for most to understand. For students, especially those who are on fieldtrips, we usually have a number of picture cards to show them and then go back inside the plantation area to actually find the plants and give a prize to the fastest. This is usually how it is done for elementary school students. College students on the other hand normally come here for research. In the 1990s, students from Department of Traditional Chinese Medicine, Taipei Medical University came to us to do Chinese medicine related research."

In leisure agriculture, not only cooperation but also competition drives service integrations. For some compound-type leisure farm operators, they still operate along, because they think some SMEs are lack of capabilities to cooperate.

"I operate along because some (SMEs) cannot be a plus for me. …… Their concept is in an old fashion, not advanced. … … They thought you are long-winded when you asked them to improve their service. … How can I cooperate with them? Some SMEs understand they should have these (service) concepts, and I get along with them very well. …… So, they (SMEs) are not in the same level. If they are the same, it is easy for cooperation. …… I operate the first hostel here, do you think I am successful? I am not very successful because integrations (with other SMEs) are very hard."

Therefore, compound-type leisure farm operators which transform from pure hostel operators integrate varieties of services (e.g. accommodation, fruit picking and food service, etc.) alone for tourists. The integrated "one-stop" service hits other SMEs by "locking" tourists in their farmstead. When integrated services provided by compound-type leisure farm operators become attractive to tourists, the income of SMEs with few services would be affected. This situation then motivates cooperation among SMEs with few services to mitigate the hit influence of "one-stop" service. In other words, there are two types of service integration from individual operation stage to integrative operation stage. One is a SME integrating diversities of services in a region as "one-stop" service. Tourists can experience most services in the region within a single SME. The other one is the cooperative services among different SMEs that integrate their distinguished services for tourists. Tourists can have different service experiences in their entire tour journey.

"My business was greatly impacted by those one-stop service providers. About seventy percents of customers were gone. They had both marketing, operating capabilities and new facilities and large space. ……. But, we are better now. We, smaller leisure farmers, are united. When tourists come, we recommend each other."

"Most hostels are not willing to recommend their customers to other SMEs. But we, farmers, are united. …… We have our own network, and those one-stop service providers have, too. We should help each other. However, they are not willing to do so……."

Based on the interview results, some SME operators have a consensus regarding cooperation. In actual operations, mutual recommendation replaced cooperation in integrative operation stage. The main reason for this phenomenon is that the SME has not yet integrated the shared vision of region. However, the mutual recommendation to replace cooperation can still be seen as involving progressive cooperation.

"Strategic alliance inside a region is good, but sometimes it is still a little bit difficult to reach a common vision according to our past experience.

I recommend some farmsteads which I feel reliable in my personal experience. I recommend them and also check their conditions. I communicate with them about how much their services cost and what services they provide. I then tell customers the information. If customers want, I would recommend customers to go there. I don't take customers there directly but I would design a travel plan for my customers."

On the other hand, customer participation can provide customers with experience of rural life, thus shortening the distance between operators and customers. Customer participation also helps clarify customer needs, thus enhancing service competiveness of SMEs.

"I should focus on students. Teachers may bring students here for education and experiencing rural life. Elementary school students have outdoor education classes. I know a teacher who has great enthusiasm. He has brought his students here per month in recent six months. He has adopted a pear tree for one year and knows the details about pear growth.

Some students also adopt my pear, but not an entire tree. Because students do not have much money, they can only adopt one branch or pear flower. Then, I put their names on the sign hung in that tree branch and students can have a sense of accomplishment."

Leisure agriculture uses the advantages of industry clusters to accelerate integration, and uses mutual cooperation to allow SMEs to provide more diversified services to meet tourist demand, thus increasing revenue. However, in addition to

increase farmer incomes and rural employment opportunities, the ultimate goal of leisure agriculture development is to develop traditional rural communities and reduce the growing gap between urban and rural areas. Therefore, the final stage of leisure agriculture development involves using community consensus as a basis to properly use and integrate local ecologies, environmental resources, and cultural assets into the lives of community residents, creating a memorable and attractive intellectual trip. During the community development stage, both SMEs and customers are important for community development and can cooperate to create business opportunities and regional rural labor employment opportunities to establish common community values.

"Take the hostel for instance, a hostel is a hostel. For the food experience, let's do it together. Old people are also welcome to join the story-telling activity. If we link these activities, we all can make profits in the fun. Doing this way, our people will not become selfish; this is a state of mind.

Here in the rural villages, you can experience the rural life bit by bit. The rural villages are culture-oriented because the formation of culture in every village is not all alike, neither is the historical background. We have to pack and market one by one for urban people coming to this village, in addition to staying for one night. We also make them understand the sights, here and there, that we appeal so in order for them to have a common view with us. This and that, so we just develop ourselves toward such a direction. That is the way it is.

We have good water resources, and this water is the lifeblood of the Mt. Pillow; without the water, Mt. Pillow may be of no use because the irrigation without water does not work.

The water in fact can be used for a wide range of applications such as the creation of a fresh water space, water purification, and appropriate use by local residents. As long as water is not wasted, everything else will be ok. For the downstream of the river, we also hope that this water can be directed all over to the village so that these water resources will be shared to the entire village."

Leisure agriculture should integrate natural ecology, environmental resources,

history and culture, and the lives of residents, and moreover should incorporate local features maintain sustainable regional development, since the natural environment is important in attracting tourists. However, a beautiful natural landscape alone cannot ensure sustainable regional development. History, culture and continuous innovation are also needed. The SMEs' executions of innovation to create new services are crucial to SME's performance (Lee et al., 2011) and residents could be considered as important sources for both SME innovations attempted and sustainable regional development. When residents recognize that a region is suitable for sustainable development, they help integrate the natural environment, environmental resources, history and culture and lives of residents in that region, thus helping the overall regional development. Additionally, with regard to community development, regional development organizations are directly related to the policies, laws and regulations, guidance measures, and real-building of the competent authorities.

4.3.3 The Role of Organization Ownership in Regional Development

Proposition 4-2 involves the influences of organization ownership in regional development. This study argues that if organization ownership such as community development associations and leisure agriculture area development associations can encourage service integration among SMEs, regional development would be improved. In the integrative operation stage, SMEs with few services face the competition from one-stop service providers in the same region. For the long-term sustainable regional development, organization ownerships would have chances to help the service cooperation among SMEs to avoid the conflicts from the economic and social aspects. Therefore, proposition 4-2-1 refers to the role of organization ownership derived from proposition 4-2.

Proposition 4-2-1: The devotion of organization ownership in a region would facilitate the service cooperation among SMEs.

The basic functions of organization ownership refer to the building and maintaining public facilities (e.g. road, toilet and trail). With the advance of public facilities, there will be more operant type of tourism resources arriving in a region. For example, road and toilet make tourists feel more convenient than before. A new trail may connect to ancient forest for new tourism attraction. The destination image for a region may become more attractive for tourists. On the other hand, the public facilities also connect the relationships between SMEs. In Mt. Pillow, the new public toilet acts as a center for tourists. SMEs near there have to maintain the public toilet and they would have more chances to cooperate in advance through increasing mutual trust. However, the foundational issue for the organization ownership is the creation of profits. When the organization ownership tries to interconnect SMEs in a region for service integration, efficiency and effectiveness should be considered (Jarillo, 1998). Therefore, the enabling of creating and sharing profits are believed to be an important role for organization ownerships to play and make SMEs be willing to cooperate with.

The benefit of the leisure agriculture area establishment is good at the atmosphere creation. …… Public facilities are not bad and they are clean enough. However, I think it is hard for a leisure agriculture area to establish an organization ownership due to different interests from each member.

For a group, if you cannot create and share profits, it's hard to continue, ……. It's all profit. Sometimes, we will become cooperative and stronger when the profits exist.

The key factor in a community development organization is its abilities to integrate. Once the SMEs in a leisure agriculture area can benefit from the help of the organization ownership, SMEs in a region would become cooperative due to the profitability. In other words, when organization ownership facilitates the operation of

the SMEs, service integrations would manifest as a kind of value co-creation behavior. Since regional development involves many complicated issues, such as inter-SME business consultation, environmental protection, and resource conservation, the maintenance of history and culture and resident communications, all require the organization ownership to be capable of assisting in integration. Smooth community development can be achieved when the ownership is capable of integrating SMEs, the natural environment, environmental resources, history and culture, and residents.

"We, directors and secretaries, are elected from this region. We should cooperate with each other. Although sometimes one or two members do not cooperate, we have to persuade them to cooperate instead of excluding them. We are all doing for this community. Frankly speaking, we do not get paid but spend our own time and money for the good of the community.

We can work from this small place and then expand to the region progressively. …… We may have many missions such as education, marketing, the packaging and certifying of our products. …… Since we are living in this region, we understand this region and this community and we can communicate our development plan with public authorities if the government has budget for us. The plan can also be discussed by residents. …… However, there should be a priority list. We should discuss our vision and development goals together."

4.4 Summary

In this chapter, the model of four-stages of cluster SMEs evolution indicates the problem relevance of tourism business environment. The evolution path of cluster SMEs in leisure agriculture service implies that value creation and improvement involves complex network relationships in a region. Regional development in the transformation of GDL to SDL should seek for the balance in economic, social and environment system. So, it leads to the further artifact designs to be described in Chapter 5 and 6. Study results demonstrate the circumstances in which SMEs create

partnerships to provide customers with diversified services to meet diverse customer needs. Cooperative SMEs can thus provide innovative services. SMEs can use the establishment of partnerships and customer participation to enhance the competitiveness of service. As SMEs evolve, they improve productivity to create more value than during their early stages. Service value created by SMEs during early stages primarily focuses on functional services that face high competition in offerings and delivery. With the evolution of the SME roles, the service value of SMEs created by diverse service experiences progressively integrates their service characteristics with customer needs, understanding and participation, thus achieving a high quality and innovative value proposition.

Moreover, in the final stage of community development, when the regional ownership is capable of effectively integrating SMEs, the growth resulting from productivity improvement and innovation in the economic aspect could connect with the development of the social and environment. Sustainable community development could be achieved when balancing the growth in economy, society and environment. To summarize, the evolutionary stages of SMEs in leisure agricultural service provide strong supporting evidence regarding the roles of SMEs in service industry innovation based on the shifting paradigm from GDL to SDL. This also implies the necessity of the future endeavors and developments required on related service management and design research, service technologies, governance incentives and policies, *etc.* in order to empower SMEs and then accelerate the transformation of service industries.

Chapter 5 Value Evolution and Value Network Design in Service Ecosystem

In Chapter 2, the previous research shows the relationships between economics and social psychology in the network design. The goal of this research in value network design part is to improve cluster SMEs in productivity, innovation and growth through an ICT-based service system implementation. In the beginning, the design work should address the basic economic environment for network work design. According to the findings in Chapter 4, the logic shifting from GDL to SDL makes existing value networks reshape from product-based to service-based to investigate the problem relevance in design science framework. In this chapter, the design artifacts – the service ecosystem for value creation in service dominant logic and the proposed value network design approach are detailed.

A network by definition is composed by links and nodes to represent the business environment and exchange complementary resources (Economides, 1996). Consequently, from a macro standpoint, businesses in the economic system consume the resources to provide and deliver goods and services for consumers. The transformation of resources to goods or services is not a hundred per cent according to the thermodynamics. A value network formed by cluster SMEs shows the roles and relationships among SMEs. During the evolution of cluster SMEs, roles and relationships among SMEs continue changing with the increasing awareness from customer needs. From the service design perspective, a well-designed service should have its service value and features been identified on the basis of customer's needs

and create customer service experiences. However, famous service design methods such as TRIZ (Chai *et al.*, 2005), Fraunhofer and IDEO methods concern about the customer's needs and generate the idea or problems for service design from observation. Businesses can apply these methods to get ideas from outsides to construct innovative business model or services with their partners. Briefly, these methods contribute a systematical way to development innovative services for the outside (customer's needs).

In contrast, in value network design, roles, interactions and influences (value propositions) among members should be understood first. Then the value delivery from every member to customers should also be identified. The improvement of service value in a value network primary depends on the rise of synergy which integrates and creating new and innovative service value for customers in the beginning. Afterward, service experiences from customers are the valuable feedback for the sophisticated adjustment in the value network. The interaction between customers and network members will co-create the customer-centric service value. In comparison with service design methods, a value network design begins from the inside (among partners) and concerns about the effectiveness and efficiency of the entire network. For the growth of a network in a region, all SMEs should benefit from the network outcome (*e.g.*, attractiveness for customers, profits) and then share the outcome. Therefore, the design of value network for cluster SMEs is crucial for their development.

5.1 The Service Ecosystem for Value Creation in Service Dominant Logic

For a basic economic system interaction with the environment, the Material

Balance Principle (MBP) (Lauwers, 2007) characterizes the relationships between an economic system and its residing environment (Figure 5.1). An economic system, in general, outputs goods and service from production. Materials from the natural environment provide the fundamental input for economic activities. Due to the limitation of materials from the environment, the relationship between the environment and an economic system needs to be clearly identified for the sustainable development of an economic system. MBP provides a foundation to represent the stocks and flows in an economic system. In MBP, material input (M) from the environment is transformed into throughput (Rd) and the recycling part (Rr) to the environment. Material input (M) which can be viewed as operand resources is primarily defined as natural resources from the environment such as oil or gas. Throughput (Rd) includes products, services, and the recycling part (Rr) and other balance from material transformation. The efficiency of economic activity is determined by the amount and value of Rd. That is, to increase the efficiency of economic activity, one way is to increase Rd and another is to increase Rr and decrease the non-recyclable balance in economic activities.

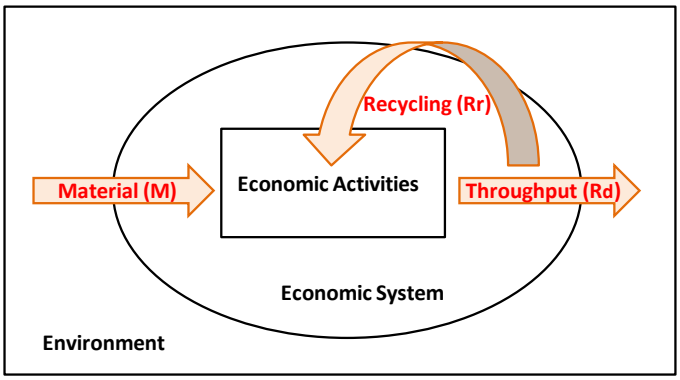

Figure 5.1 The Material Balance Principle
(Lauwers, 2007)

For example, a cook in a restaurant cooks ingredients from the natural environment to produce a dish for customers. Customers eat the dish and pay for it.

During this economic activity, some balance such as leftovers or waste may be created. The waste and leftovers may be disposed of directly to pollute the environment or recycled to become fertilizers. In the viewpoint of MBP, this restaurant may be efficient if it can reduce waste or recycle its waste to gain some profits because reducing or recycling waste can benefit both the environment and the economic system from a long-term perspective.

In the board sense, the feedback loop in MBP implies a network relationship among businesses in an economic system. Because when business wants to increase the efficiency of waste disposal or recycling, other business may be helpful. For example, cookers in a restaurant can recycle their leftovers and make fertilizers. A machine for cookers to make fertilizer more efficiency than before may be provided by other manufactures. That is, when the efficiency of the economic activities in a business is growing, other businesses may benefit from this increased efficiency and growth directly or indirectly.

The concept of MBP implies a foundation to understand the interactions between the economy and the environment. The balance of economic and environment development may be in a direction to achieve ecological sustainability. In addition, sustainomics proposed an integrative framework seeking balanced development in economic, social and environmental systems for “Making development more sustainable (MDMS)” (Munasinghe, 2002). The social dimension is emphasized in sustainomics for vulnerability reduction and equity improvement to meet basic human needs (Munasinghe, 2002). The concept of triple bottom line also describes a similar idea. Economic systems aim to maximize the net benefit while social systems are responsible for social integration and communication and the environment system

creates and preserves biodiversity to allow future changes (Brown *et al.*, 2004). In this sense, the output from the economic, social and environmental systems influences one another. The valuation of the output is also changing with the dynamic evolution of each system. Therefore, when the market behavior changes from being production-oriented to service-oriented, the evolution of economic activities should affect the output and value determination of each system involving the social and environmental systems.

To represent a product or service from an economic activity, input resources and materials should be transformed into output product or service and other balances. To relate MBP to SDL, materials and resources in an economic system could be classified into operant resources (*e.g.*, knowledge, skill and capabilities) and operand resources (*e.g.*, mineral, oil or gas). Additionally, SDL also indicates the value of output from economic activities is determined by customers. The true value of output cannot be estimated precisely before being experienced by customers. Therefore, an economic system evolving from GDL to SDL could be respectively conceptualized into Figure 5.2 to Figure 5.3 in the context of MBP.

The balance and recycling part indicated in Figure 5.2 and Figure 5.3 could also be interpreted differently. In a service economic system, because the input part consists of both tangible and intangible resources, the output in the balance part could have both tangible and intangible forms. When businesses recycle their balance from output, another value proposition could be created for themselves or other businesses. For example, oil companies drill for oil which is viewed as an operand resource, to produce gasoline for cars and create value. Gasoline is viewed as a product in GDL. The production of gasoline inevitably separates asphalt and other materials in the

balance part. For creating additional value, oil companies sell asphalt to other manufacturers for road construction.

Furthermore, food service is the integration of both operand resources (*e.g.*, ingredients) and operant resources (*e.g.*, cooking skills and atmosphere). In SDL, food service creates value only if customers feel good about the entire service. In this sense, the entire food service may not all satisfy every customer due to different tastes. If the dessert in the entire set does not fit some customer's taste, it may create non-value. However, this dessert may be liked by customers in other service sets or sell separately. In other words, customers determine the value of a service under different contexts. The balance part in GDL and SDL differs in terms of who classifies the balance from output (producers in GDL, producers and customers in SDL). Additionally, the recycling value of the balance part is also in the same logic with the determination of the balance part.

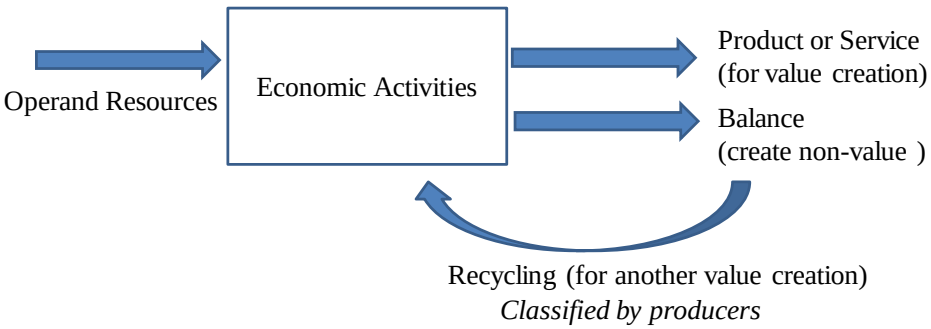

Figure 5.2 Input and Output of Traditional Economic Activities

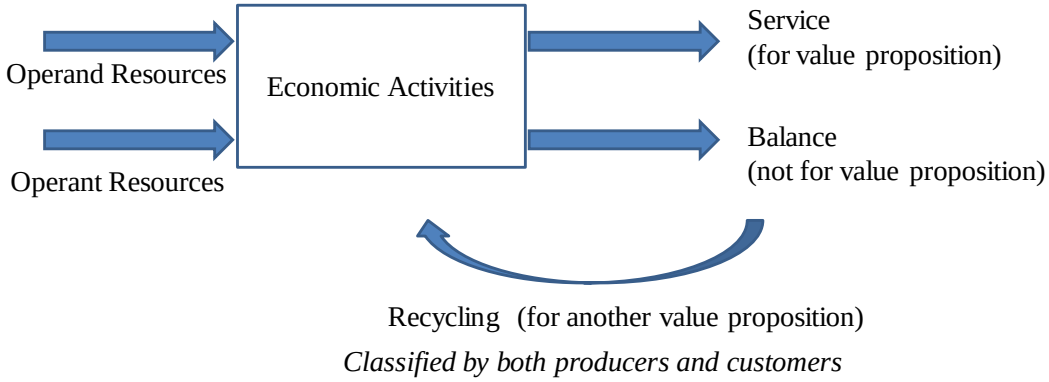

Figure 5.3 Input and Output of Economic Activities under SDL

To extend Figure 5.3 related to not only the economic but also the social and environment system, Figure 5.4 shows the extended framework to describe the service value evolution. Both operant and operand resources are consumed by economic activities and output the service value and balance in the beginning. The balance refers to those not regarded in the inclusion of service provision (*e.g.*, waste produced during cooking), and after service delivery customers will assess the service values. According to image theory, before the decisions are made by customers, service value is evaluated by customer images. This process concerns not only monetary value in economic systems, but also value from a psychological perspective related to the interactions with other people in the social systems. Service value and non-value balance could then be identified following service experiences.

All non-value balance filtered by the provider and customer could be collected for recycling. On the other hand, the recyclable non-value balance can be described by images to mark their potential value from the customer psychological perspective involving the consideration of diversity, selection, innovation and bounded rationality. Through identifying the potential value of the balance, the provider could create another value proposition by themselves or share the balance with other partners. The

balance may be in tangible (*e.g.*, residue during production process) and intangible forms (*e.g.*, knowledge and skills) and might be useful in other contexts. For the value network interconnected in economic, social and environment systems, resources and capabilities recycled and discovered from the balance could add diversity to the whole system. The benefit of the potential value identification encourages the recycling process and the efficiency of the entire economic system could then be increased.

Additionally, from the customer's perspective, customers in economic systems give monetary value to exchange the output from economic activities. The social and environment system in which customers live could also affect the value evaluation of the output from economic activities. Therefore, both the customer's and the related stakeholders' service experiences could become useful references when determining the service value from economic activities. However, the service value perceived by customers in social systems is not only determined by monetary value but also the by the benefit to meet customer's needs. The experience value could be the results the customer perceives from service experiences. Interactions among customers will create new needs in the whole service system. Resources for the former value proposition may be reallocated to satisfy the new needs from customers and new balance will result from this process. Under this circumstance, both the consensus of service value identification in social systems and activities in economic systems are evolving with the increasing diversity of the environment system. Accumulations and integrations of the value evolution in the long term may influence human society and the inheritance of future generations.

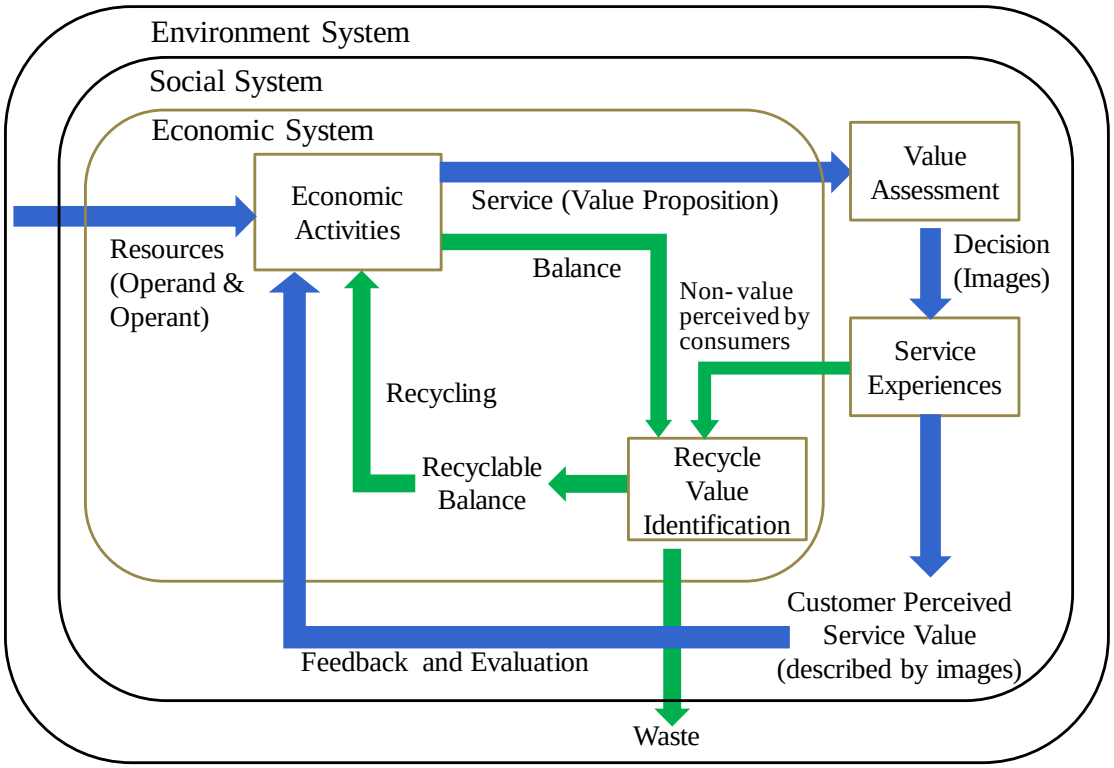

Figure 5.4 The Service Ecosystem for Value Creation in Service Dominant Logic

In this service ecosystem (Figure 5.4), service value assessment for service and recyclable balance from customers perspective is based on images. Cooperation in a value network consists of businesses for service proposition and provision can be formed on the foundation of images such as “the images which this service wants to provide for customers”. Consequently, businesses are enabled to develop their own value network corresponding to customer’s needs through image combination. The customer-driven cooperation among businesses then has high potential to increase productivity. In addition, businesses consume materials from the natural environment more efficiently than before. The environmental impact from business development could be decreased. The balance between the environment and business development can be achieved through the service ecosystem.

In this sense, there should be three propositions underlying this conceptual framework. First, in MBP, only economic and environment systems are involved.

Since the value of products and services from economic systems could influence the understandings of ethics, morals, laws, knowledge, cultures and so on, social systems cannot be ignored with the shift in value determination from producers to customers. The changes of human cognitions in a social system could also influence human behaviors, decision-making, and value assessment. Therefore, the development of a value network for value creation should also involve social systems.

Proposition 5-1: The development of a value network for value creation evolves with economic, social and environment systems.

On the other hand, in the conceptual framework, customer service experiences are assumed to be the references for businesses to allocate their resources for cooperative service design. The imagery of cooperative service design could positively affect customer perceived service value following service experiences. The two propositions imply the recourse consumption of a single SME for value creation may not be as efficient as cooperative services involving multiple SMEs. In other words, single SMEs may create less value and more non-value than cooperative services. Cooperative services may recycle the non-value part and identify recycle value through appropriate service design.

Proposition 5-2: Customer service experiences are the references for cooperative service design.

Proposition 5-3: The imagery of cooperative service design positively influences customer perceived service value following service experiences.

In the following section, this service ecosystem is the foundation of the customer-driven and imagery-based service value network design development. The three propositions above (Proposition 5-1 to 5-3) will be discussed based on three stage interviews and focus group data in Chapter 7-2.

5.2 The Design of Customer-Driven and Imagery-Based Value Network

When SMEs cooperate to design their cooperative service, each SME has its own role and input heterogeneous or homogeneous resources to form the initial features of the cooperative service design. The service features are subsequently verified and adjusted from the feedback of customer experiences. For example, a farmstead and a coffee shop design a village atmosphere for coffee service to create a village coffee service experience for customers. If their customers feel the designed village atmosphere when drinking coffee, the service design will achieve its goal. However, during the value co-creation process, how do SMEs describe the service features, value, and the underlying tangible and intangible resources appropriately? And how do SMEs find suitable partners to design a value network delivering the attempted service features? In addition, what kind of cluster SMEs has higher chances to find suitable partners to design the value network?

From the conceptual framework (Figure 5.4), the features of value proposition and value in experiences can be described by images on the foundation of the image theory. In decision science, Beach proposed image theory to describe the decision processes of a decision maker (Beach, 1990). The image theory uses cognitive approach to understand the value which meets decision maker’s desire. From the insight of the image theory, the goals and related strategies, plans and tactics can be described and tested by image forms. Therefore, in previous example, how does a coffee shop choose a farmstead to create a village coffee service experience? In the beginning, both operant and operand resources of the coffee shop and farmstead are utilized to offer service value propositions to customers. Customers make their

decision on whether they accept service value propositions or not. So, service value propositions from the coffee shop and farmstead can be transformed into images to measure the value from customer's perspective. The cooperation goal here is a designed service experience and can be also transformed into images. In this sense, the criteria for the coffee shop to choose partners based on the degrees of achieving the attempted cooperation goal given the combination images of the coffee shop and different partners' candidates. If the combination image is similar to the cooperation goal image, the partner choice of the coffee shop may be correct if customers think that the value of goal image is high to them. From this example, the value of each image is determined every individual customer. The aggregation of the value driven by customers for a business is its service value and the representation of the value is the images of a business.

In this research, the value network design approach, customer-driven and imagery-based value network design approach (CIVNDA), is on the basis of SDL and image theory. The foundation elements and structure of CIVNDA is explained first and then the propositions of CIVNDA and the proof of each proposition is described details in the following sections.

A value network consists of entities and relationships. The entity in a value network can be a business which has valuable operant and operand resources or a customer which gets the benefit from service. Relationships among entities in a network describe the cooperative behaviors (*e.g.*, partnership, alliance, or resources sharing) (Williams, 2005) and service value delivery among entities (*e.g.*, service delivery from business to customers) (Basole and Rouse, 2008). Business entities produce service to serve other entities. During the service provision from one entity to

another, service value occurs from the benefit perceived by other entities. In this research, from the conceptual framework (Figure 5.4), the service value in customer-driven and imagery-based value network is accessed by images from image theory perspective. The images are used to describe the entities and calculate service value. Table 5.1 and Figure 5.5 shows the components defined in CIVNDA.

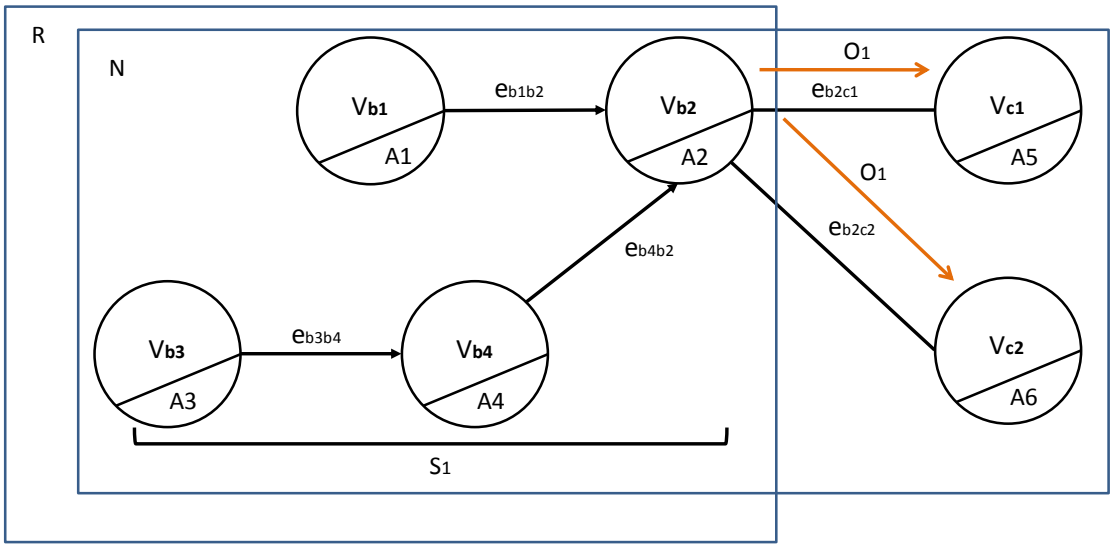

Figure 5.5 Relationships of Components in CIVNDA

Table 5.1 Components in Customer-Driven and Imagery-Based Value Network

Component	Description
R	a business region or platform which contains business entity
V_b	a business entity, V_b^i is a business entity for a service set i
V_c	a customer entity
A	a set of image attributes of an object. $A=\{a_1,a_2,a_3,\ldots,a_n\}$, a_n is an adjective A_i is a set of adjectives which describes V_b , V_c and R A_i contains at least one adjective a_y in A, $A_i \subseteq A$

E	a link relation among V_b , V_c For a region R has $V_b = \{V_{b_1}, \ldots V_{b_i}\}$ and $V_c = \{V_{c_1}, \ldots V_{c_i}\}$ $e_{b_m b_n}$: service integration from V_{b_m} to V_{b_n} , V_{b_m} , $V_{b_n} \subset V_b$ $e_{b_p c_q}$: service delivery from V_{b_p} to V_{c_q} , $V_{b_p} \subset V_b$, $V_{c_q} \subset V_c$ $E = \{e_{b_m b_n} \cup e_{b_p c_q}\}$ E_r means
N	a service value network in a region R, $N = (V, E) = (V_b, V_c, E)$
S_i	service set formed by at least one V_b object In a service value network N, a set of service $S=\{S_1,S_2,S_3,\ldots,S_k\}$, for each $S_i \in S$, S_i is formed by V_b^i.
SV_c	Service value of customers SV_c = Benefit (B) / Willingness to Pay (WP_c)
O_r	a service offering in value network from V_{bi} to V_{cj}. $O_r = (C_r, E_r)$, C_r is the cost of O_r to V_{cj} $C_r = P(S_r \mid V_b^r,\ e_{b_i^r b_j^r} \in E_r,\ S_r \in S)$, P is a cost function for V_b^r all service offering in a value network N can be defined as $O^N = \{O_1,O_2,\ldots,O_h\}$
I(R)&I(V)	I(R), $I(V_{b_i})$, $I(V_{c_j})$ is an image vector composed by different adjectives to describe V_{b_i}, V_{c_j} and R Each image vector is a set of CIE XYZ color coordinates. $\forall\ V_{b_i}$ and $V_{c_j} \in V$, image of $V_i = I(V_i) = I(A_j^i)$, $A_j^i \subseteq A$ $I(R) = I(A_r)$, $A_r \subseteq A$

In Chapter 4, the development of regional tourism is discussed. Fundamentally, in a value network in a tourism region may have many SMEs. For a leisure agriculture area, it can be across more than one community. SMEs in a leisure agriculture area may be classified into different clusters due to the geographical reason. So, CIVNDA

supposes that there is in a business region R which has numerous of V_b and V_c represented by images. The V_b in a business R can be further divided into different business clusters. The connection set among V_b and V_c is called E which contains relationships of service integration between V_b and relationships of service delivery between V_b and V_c. A service value network N in a region R is consisted by V and E as N = (V, E). Every R, V_b and V_c has its own set of image attributes A_i which includes in the set of $A=\{a_1,a_2,a_3,\ldots,a_n\}$and a_n is a a psychological word. According to the color image scale proposed by Kobayashi (Kobayashi, 1992), images can be represented by using adjectives as psychological words. The combination of a set of image attributes for every R, V_b and V_c is an image vector called I(R), $I(V_{b_i})$ and $I(V_{c_j})$ separately. So, the image of V_i is represented as $I(V_i) = I(A_j^i)$ given $A_j^i \subseteq A$.

On the hand, there are varieties of service provided by V_b. In a service value network N, there is a set of service $S=\{S_1,S_2,S_3,\ldots,S_k\}$. For each $S_r \in S$, S_r is formed by V_b^r and the features of S_r are deservedly from $I(V_b)$. That is, the images of each service from a specific V_b is $I(V_b)$. When V_b offer S_r to V_c, a service offering $O_r = (C_r, E_r)$ refers the cost and service delivery to specific V_c. The cost of an O_r is according to the price function P. Therefore, C_r equals to $P(S_r \mid V_b^r,\ e_{b_i^r b_j^r} \in E_r,\ S_r \in S)$. Service value of each service offering O_r is resulted as service value SV_c after perceived by V_c. The calculation of SV_c is on the basis of perceived benefit (B) and adjusted by the amount of willingness to pay (WP_c) by V_c which implies the comparison of total gain and paid of V_c.

To estimate customer's perceived benefit, this study concerns two factors including customer's need and service uniqueness. Both customer's need and service uniqueness are measured by using images to represent the value perceived by

customer. According to image theory, customers have their goals in image form when making decision. When a service is close to customer's needs, the images of specific service would close to customer's goal images. Additionally, previous studies also indicated the importance of uniqueness (Nguyen and Leblanc, 2001; Lai *et al*., 2009; Han *et al*., 2009). The uniqueness means that the distinguished features of business or service images in comparison with existing business groups in a region and creating a special identification and proposing additional value to attract decision makers. Customers may choose the uniqueness alternatives when other alternatives have similar images. Consequently, customer's benefit can be defined by using the Image Similarity (IS) function between customer's goal images and $I(V_b)$ and the images of service provider V_b to rate their image distances.

The Image Similarity (IS) function indicates the degree of difference between two images which compares their image attributes (A). If an image is almost the same with another image, the degree of images similarity is 1. Otherwise, the degree of images similarity is 100 in contrast. The degree of Image Similarity (IS) is an integer from 1 to 100. If there are more than one V_b to conduct the service, the final service images are the mix of each $I(V_b)$. In contrast, the uniqueness by definition indicates the degree of the difference among customer's choices. By using the designed Image Similarity (IS) function, the uniqueness can be further measured on the image distance between specific V_b and its belonging cluster.

For every V_b provides service for V_c, benefit perceived by V_c is considered as the Image Similarity between V_b and V_c and the uniqueness for V_c. On the other hand, the total service value of a V_b (business value of service) is defined as $SV_b = \Sigma WP_c$ (the total customers' willingness to pay) - C_b (service costs) to reflect the actual service

value in customer's perspective. The upper bound of SV_b is not more than the total service value for V_c. So, SV_b can be also measured through Image Similarity and uniqueness from customer's perspective.

5.3 The Propositions and Proofs in Customer-Driven and Imagery-Based Value Network Design Approach

SDL and image theory are the fundamental of CIVNDA. The basic concepts of SDL indicate that businesses can only offer service value proposition to customers and that the determination of service value is from customers. The customer's decision whether accepts the service value proposition from businesses or not is affected by his images from image theory perspective. In order to conform to the insight of SDL and image theory, once the images of a V_b are closer to customer's need and are more unique than others, the service value of V_b should be higher than others. CIVNDA also tries to encourage value co-creation among businesses to meet the research goals in this study. By investigating the desired images of customers, businesses are empowered to configure their value network to evolve their service. In this case, the value network design though CIVNDA attempts to enable that athe average business service value resulting from a configured network will be high if their images are close to customer's needs and have high uniqueness.

Additionally, from the macro point of view, different business regions can attract customers with different kinds of images. For the development of a business region, the service value in a business region may be influenced on the richness of images due to the different fulfillment of the dynamic customer's needs. The CIVNDA concept uses images to describe the service value. However, when there are few

images in a business region, performance of CIVNDA which configures different service value propositions from customer perspective in may be reduced. In other words, if the diversity of images in a region is low, the possible configuration of images is relatively fewer than that of a high image diversity region. The value network in low diversity situation configured by using CIVNDA may not be superior to the original value network. Diversity here refers to the perceptible heterogeneity of business images in a region. With a higher diversity among business clusters in a region, there should be more chances for the region to create differentiated service than lower ones. In this sense, when CIVNDA is applied in a high diversity region, there should be more possible image configurations. All image combinations would be manifested as services that may meet customer's needs or not in practice. Some of them may disappear due to customer's choices, but the survivals may bring more service value than before. Region owners such as community development associations would be also empowered by CIVNDA. According to the regional and businesses' images identified in CIVNDA, region owners can set the goal for regional development. Afterward, the change in the image diversity of a region may be useful to evaluate the policy effectiveness. Generally, the image diversity as a part of regional context will affect the performance of CIVNDA.

The aforementioned leads to proposition 5-4 and 5-5 separately. Proposition 5-4 primary focuses on the fundamental concept of CIVNDA while proposition 5-5 tries to characterize the influences of diversity of business clusters in a business region.

Proposition 5-4: If the images of business is close to customer's needs and the uniqueness of business service is high, than the average business value of service will be high.

Proposition 5-5 If the image diversity of business clusters in region A is higher than region B, CIVNDA will make the diversity of service higher in Region A

than Region B.

5.3.1 Proposition Proof for Proposition 5-4

To prove the proposition 5-4, in the beginning, image similarity function (IS) is introduced to calculate the similarity between two businesses. The IS function measures the distance between two image vector (*e.g.*, $I(V_b)$, $I(V_c)$) and scales the image similarity from 1(the most similar) to 100 (the most different) in an integer form. Suppose there is a region R which contains a business cluster G. When there exists a business V_b and customer V_c, from the definition of benefit, the benefit can be formed by the following formula 5-1a:

$$B\,(O_r|V_b) = \text{Image proximity between } V_b \text{ and } Vc * \text{Uniqeness}(V_b, G)$$

$$= \frac{100}{IS(V_c,V_b)} * \text{Uniqeness}(V_b, G) \qquad (5\text{-}1a)$$

The uniqueness of V_b measures the distinguished features of V_b and G from definition, but uniqueness is not equally important to every V_c. If a V_b is unique in a business cluster G, $IS(V_b, G)$ would be high. When a $I(V_c)$ is close to I(G), it means that V_c's need is close to I(G), but not $I(V_b)$. Therefore, the uniqueness part in formula 5-1a should add a weight modifier called weight of uniqueness (V_c). Weight of uniqueness (V_c) describes what is the importance of uniqueness of V_b for the customer. From the viewpoint of image similarity, the more different images between V_b and G are, the more unique V_b becomes. On the other hand, if there are more different images between V_c and G, this then implies the customer would appreciate the uniqueness more.

$$B\,(O_r|V_b) = \frac{100}{IS(V_c,V_b)} * \text{Uniqeness}(V_b, G) * \text{Weight of Uniqueness } (V_c) \qquad (5\text{-}1b)$$

After using IS function to describe

Uniqeness(V_b, G) and Weight of Uniqueness (V_c), formula 5-1b is equivalent to formula 5-2 and the service value of customer is defined as formula 5-3a.

$$B\ (O_r|V_b) = \frac{100}{IS(V_c,V_b)} * IS\ (V_b, G) * \frac{IS\ (V_c,G)}{100} = \frac{IS(V_b,G) * IS\ (V_c,G)}{IS(V_c,V_b)} \qquad (5\text{-}2a)$$

$$SV_c = \frac{B\ (O_r|V_b)}{WP_c} = \frac{IS(V_b,G) * IS\ (V_c,G)}{IS(V_c,V_b) * WP_c} \qquad (5\text{-}3a)$$

If there is n business cluster (G) in a region, formula 1-2a and 1-3a can be further elaborated into formula 5-2b and 5-3b.

$$B\ (O_r|V_b) = \frac{100}{IS(V_c,V_b)} * \sum_{i=1}^{n} IS\ (V_b, G_i) * \frac{\sum_{i=1}^{n} IS\ (V_c,G_i)}{100} = \frac{\sum_{i=1}^{n} IS\ (V_b,G_i) * IS\ (V_c,G_i)}{IS(V_c,V_b)} \qquad (5\text{-}2b)$$

$$SV_c = \frac{B\ (O_r|V_b)}{WP_c} = \frac{\sum_{i=1}^{n} IS\ (V_b,G_i) * IS\ (V_c,G_i)}{IS(V_c,V_b) * WP_c} \qquad (5\text{-}3b)$$

Because IS measures the distance between image vectors, this research names IS(V_c, V_b) = *x*, IS(V_b , G) = *y*, and IS(V_c, G) = *z*. Figure 5.6 shows the possible locations of V_c , V_b and G.

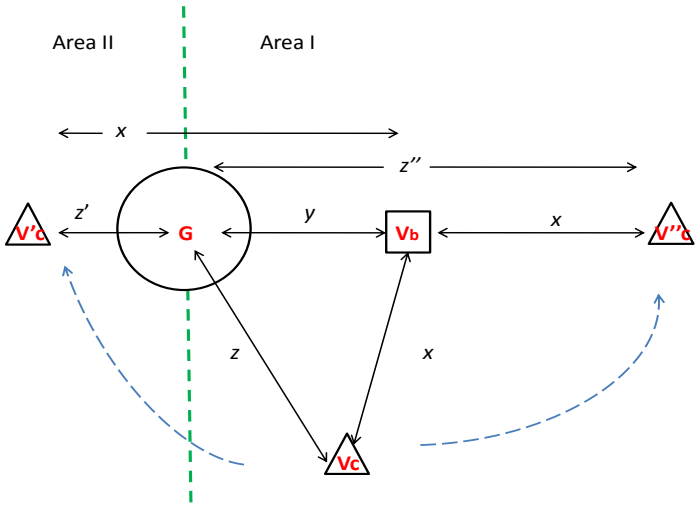

Figure 5.6 Relationships of Images between Different Businesses and Cooperation Goal

From Figure 5.6, since the distance between V_b and V_c is *x* and the distance of image similarity between G and V_b is *y*. With the given x and y, V_c can move from V'$_c$ to V''$_c$. Therefore, *z* can vary from *z*' to *z*''. In other words, the three points, G, V_b and V_c can construct a triangle which means *z* is less than *x*+*y* and more than |*y*-*x*| except they are in the same line. Therefore, the upper and lower bound of *z* is *x*+*y* and |*x*-*y*| respectively. The formula 5-4 can be derived into formula 5-3(a).

$$SV_c = \frac{IS(V_b,G) * IS(V_c,G)}{IS(V_c,V_b) * WP_c} = \frac{yz}{x * WP_c} = SV_c \leq \frac{y(x+y)}{x * WP_c} \quad (5\text{-}4)$$

In a value network, because business value is determined by customer value, the upper bound of SV_b is SV_c. If there are two business objects V_b^1 and V_b^2 in the same region and face the same V_c, x and y are the IS degree of V_b^1 to its customer and a given cluster and x' and y' are the IS degree of V_b^2 to its customer and the cluster. First, we need to exanimate if $x < x'$ and $y > y'$, SV_c from V_b^1 would have better upper bound and lower bound than SV_c' from V_b^2 in terms of showing that the averaged SV_c proposed by V_b^1 would be greater than the averaged SV_c' proposed by V_b^2.

Assuming the region R has two services provided by V_b^1 and V_b^2 separately and WP_c for V_b^1 and V_b^2 is the same, this means that customers of V_b^1 and V_b^2 would pay the same money but have different value outcome for comparison in proposition 5-1.

$$\frac{y|y-x|}{x * WP_c} \leq SV_c \leq \frac{y(x+y)}{x * WP_c} \quad (5\text{-}5a)$$

$$\frac{y'|y'-x'|}{x' * WP_c} \leq SV_c \leq \frac{y'(x'+y')}{x' * WP_c} \quad (5\text{-}5b)$$

In the formula 5-5b, since $x < x'$ and $y > y'$, for simplicity the minimum $x' = x+1$

and maximum $y'=y$-1.

Because,

$$Max\left(\frac{y'|y'-x'|}{x'*\mathrm{WP_c}}\right)=\frac{(y-1)|y-x-2|}{(x+1)*\mathrm{WP_c}}\leq\frac{y|y-x|}{x*\mathrm{WP_c}} \quad \text{and} \quad Max\left(\frac{y'(x'+y')}{x'*\mathrm{WP_c}}\right)=\frac{(y-1)(x+y)}{(x+1)*\mathrm{WP_c}}\leq\frac{y(x+y)}{x*\mathrm{WP_c}}$$

So, SV_c has better upper bound and lower bound than SV_c' when the number of cluster is 1 (n=1). When businesses have better upper and lower bound of service value from customers, it means that the average service value for businesses can be higher than lower ones.

If when the numbers of cluster = m, $SV_c \geqq SV_c$' stand, Formula 5-7a and 5-7b would also stand by using mathematical induction approach. So, if $SV_c \geqq SV_c$' under cluster = m+1 stand, the proof for proposition 5-1 will also stand.

$$\frac{\sum_{i=1}^{m}(y_i)|y_i-x|}{x*\mathrm{WP_c}}\leq \mathrm{SV_c}\leq\frac{\sum_{i=1}^{m}y_i(x+y_i)}{x*\mathrm{WP_c}}$$

$$\frac{\sum_{i=1}^{m}(y'_i)|y'_i-x'|}{x'*\mathrm{WP_c}}\leq \mathrm{SV'_c}\leq\frac{\sum_{i=1}^{m}y'_i(x'+y'_i)}{x'*\mathrm{WP_c}}$$

$$\frac{\sum_{i=1}^{m}(y'_i)(x'+y'_i)}{x'*\mathrm{WP_c}}\leq\frac{\sum_{i=1}^{m}y_i(x+y_i)}{x*\mathrm{WP_c}} \qquad (5\text{-}7a)$$

$$\frac{\sum_{i=1}^{m}(y'_i)|y'_i-x'|}{x'*\mathrm{WP_c}}\leq\frac{\sum_{i=1}^{m}(y_i)|y_i-x|}{x*\mathrm{WP_c}} \qquad (5\text{-}7b)$$

When the numbers of cluster = m+1, assuming WP_c of each region is the same, then:

$$\frac{\sum_{i=1}^{m+1}(y_i)|y_i-x|}{x*\mathrm{WP_c}}\leq \mathrm{SV_c}\leq\frac{\sum_{i=1}^{m+1}y_i(x+y_i)}{x*\mathrm{WP_c}}$$

$$=>\frac{\sum_{i=1}^{m}(y_i)|y_i-x|+(y_{m+1})|y_{m+1}-x|}{x*\mathrm{WP_c}}\leq \mathrm{SV_c}\leq\frac{\sum_{i=1}^{m}y_i(x+y_i)+y_{m+1}(x+y_{m+1})}{x*\mathrm{WP_c}} \qquad (5\text{-}8a)$$

$$\frac{\sum_{i=1}^{m+1}(y'_i)|y'_i-x'|}{x'*\mathrm{WP_c}}\leq \mathrm{SV'_c}\leq\frac{\sum_{i=1}^{m+1}y'_i(x'+y'_i)}{x'*\mathrm{WP_c}}$$

$$=> \frac{\sum_{i=1}^{m}(y'_i)|y'_i - x'| + (y'_{m+1})|y'_{m+1} - x'|}{x' * \mathrm{WP_c}} \leq \mathrm{SV'_c} \leq \frac{\sum_{i=1}^{m} y'_i(x' + y'_i) + y'_{m+1}(x' + y'_{m+1})}{x' * \mathrm{WP_c}}$$

(5-8b)

In any condition, the minimum $x' = x+1$ and maximum $y' = y-1$.

Because

$$Max\left(\frac{(\sum_{i=1}^{m}(y'_i)|y'_i - x'|) + (y'_{m+1})|y'_{m+1} - x'|}{x' * \mathrm{WP_c}}\right) = \frac{(\sum_{i=1}^{m}(y_i - 1)|y_i - x - 2|) + (y_{m+1} - 1)|y_{m+1} - x|}{x * \mathrm{WP_c}}$$

$$\frac{(\sum_{i=1}^{m}(y_i - 1)|y_i - x|) + (y_{m+1} - 1)|y_{m+1} - x|}{x * \mathrm{WP_c}} \leq \frac{(\sum_{i=1}^{m}(y_i)|y_i - x|) + (y_{m+1})|y_{m+1} - x|}{x * \mathrm{WP_c}} \quad (5\text{-}9a)$$

and

$$Max\left(\frac{(\sum_{i=1}^{m} y'_i(x' + y'_i)) + y'_{m+1}(x' + y'_{m+1})}{x * \mathrm{WP_c}}\right) = \frac{(\sum_{i=1}^{m}(y_i - 1)(x + y_i)) + (y_{m+1} - 1)(x + y_{m+1})}{x * \mathrm{WP_c}}$$

$$\frac{(\sum_{i=1}^{m}(y_i - 1)(x + y_i)) + (y_{m+1} - 1)(x + y_{m+1})}{x * \mathrm{WP_c}} \leq \frac{(\sum_{i=1}^{m} y_i(x + y_i)) + y_{m+1}(x + y_{m+1})}{x * \mathrm{WP_c}} \quad (5\text{-}9b)$$

So, when the numbers of cluster equals to m+1 in a region and assume WP_c of each region is the same, SV_c has better upper bound and lower bound than SV_c'. Customers of V_b^1 have better average service value than V_b^2 which means that V_b^1 can have more business value from customers than V_b^2. Since SV_c has better upper bound and lower bound than SV_c', we can assume that the upper bound and lower bound of SV_c are αand β respectively, and the upper bound and lower bound of SV'_c are γ and δ. So, the average of SV_c is (α+β)/2 and SV'_c is (γ+δ)/2. The average of SV_c and SV'_c means that in general cases, if there are large amount of V_c experiencing the service offering from V_b^1 and V_b^2, the average service value for V_c is (α+β)/2 and (γ+δ)/2 respectively. Because α>γ and β>δ => (α+β)/2 > (γ+δ)/2. So,the average of SV_c > the average of SV'_c, and proposition 5-4 can be proved.

5.3.2 Proposition Proof for Proposition 5-5

To prove the proposition 5-5, the diversity function needs to be defined according to its attempted meaning. In proposition 5-5, there are two kinds of diversity. The first one is the diversity of business clusters in region (regional diversity, D_r) which shows the image heterogeneity of the business clusters in a region. The second one is the diversity of business services in a region (service diversity, D_s) which show the image richness of all possible business service configurations in a region. Therefore, given a region A which contains m business clusters, the operational definition of regional diversity D_r is as formula 5-10.

$$D_r(A) = \frac{\sum_{i=1}^{m} IS(G_{ai}, R_a)}{m} \quad (5\text{-}10)$$

According to formula 5-10, with increasing difference between business cluster images and regional image, the regional diversity D_r is also increasing. Suppose region A and B both contain m clusters, the regional images are the same and formed by the m business clusters and customer choices combined the common images from business clusters. If $D_r(A) > D_r(B)$, it means that business clusters in A are more heterogynous than region clusters in B.

$$D_r(A) > D_r(B) \Rightarrow \frac{\sum_{i=1}^{m} IS(G_{ai}, R_A)}{m} > \frac{\sum_{i=1}^{m} IS(G_{bi}, R_B)}{m} \Rightarrow$$
$$\sum_{i=1}^{m} IS(G_{ai}, R_A) > \sum_{i=1}^{m} IS(G_{bi}, R_B) \quad (5\text{-}11)$$

In formula 5-11, because every possible business services are from these m clusters, if $D_r(A)$ is high, there are more different image attributes in business clusters in region A than region B. When a service configuration happens in a region, possible business image combinations (D_s) from service combination would not be out of the image attributes of business clusters. In other words, if business clusters in region A

contain more image attributes than region B, possible business image configurations in region A are more than in region B. Here, the image list function (IL) is to list all image attributes in an image vector.

$$IL(R_A) \supseteq IL(G_{ai}|_{ai=1\sim m}) \quad (5\text{-}12)$$

$$IL(R_B) \supseteq IL(G_{bi}|_{bi=1\sim m}) \quad (5\text{-}13)$$

While $\sum_{i=1}^{m} IS(G_{ai}, R_A) > \sum_{i=1}^{m} IS(G_{bi}, R_B) \Rightarrow IL(G_{ai}|_{ai=1\sim m}) > IL(G_{bi}|_{bi=1\sim m})$

Because

$$IL(D_s(A)) \subseteq IL(G_{ai}|_{ai=1\sim m}) \text{ and } IL(D_s(B)) \subseteq IL(G_{bi}|_{bi=1\sim m}) \Rightarrow D_s(A) > D_s(B) \quad (5\text{-}14)$$

So, $D_r(A) > D_r(B) \Rightarrow D_s(A) > D_s(B)$

From Formula 5-12 to 5-14, the proposition 5-5 can be proved. The proof of proposition 5-5 indicates also implies that CIVNDA is more suitable to apply in a high image diversity region than lower ones. For the usage of D_r, when the region A keeps evolving through a period of time, the diversity in a region can be further used to analyze the long-term regional development from image changes. The initiate regional $D_r^0(A)$ would be compared with the most recent one $D_r^n(A)$ in order to analyze the image change. When $D_r(A)$ changes, image attributes also changes in the region. The difference of $D_r^0(A)$ and $D_r(A)$ shows the image evolution in a region. On the other hand, calculate the $D_r(A)$ of the region in each period of time and analyzes the difference between every two periods. The diversity analysis of each two periods can then reveal the evolutionary path of the region.

5.4 Customer-Driven and Imagery-Based Value Network Design

The customer-driven and imagery-based value network design is on the foundation of the components listed in Table 5.1. A value network design adopting CIVNDA presumes the existence of a cooperation goal and takes on the steps below to configure the value network. The key idea is to use a greedy strategy to ensure tourists or customers would experience the majority of the images of cooperation goals the sooner the better, In other words, if customers cancel the final one or two service in the entire journey due to any reason, customers can still experience most of the cooperative service from the earlier visited SME partners that fulfill the majority images of the cooperation goals.

The main steps then include:

(1) Identify the cooperation goals:

The goals are the intended the service experiences in the form of images (e.g., happy paradise, childhood memories) for customers.

(2) Search the possible cooperation candidates for alliance:

Given there is a database which records related business images, search the possible candidates which have potential to achieve images of cooperation goals.

(3) Evaluate the possible candidate sets.

Evaluate the possible candidate sets based on their image similarity to goal images.

(4) Configure the candidate set into a service value network

The business and selected candidate set are configured to a service value network.

In practices, if there is a focal SME in cluster SMEs and try to build up a value network according to the customer's needs as the cooperation goals, the focal SME can get recommended SMEs to achieve the goal image in (2). The alliance candidate set (AC) contains recommended SMEs for focal SME (V_{b_f}) to achieve its goal image (GI).

$$AC = \{V_{b_1}, \ldots.., V_{b_n}\ \}$$

The cooperation among focal SME and AC tries to refine their service image to get close to goal image using the greedy strategy, in which an SME in AC with is considered as the current best candidate to be added into the value network if the joined service image gets more close to the goal image.

In other words, the focal SME may fulfill only part of goal image but not well enough originally. When the focal SME cooperates with one of the SMEs in AC, their combined service image is more close to goal image than before. That is, the value of goal image would be increased when SMEs in AC join. So, the value network formed by focal SME and AC through value co-creation is based on service refinement instead of pure resource complement. To construct the value network for V_{b_f} using AC in (4), we need to know that the effect of each SME in AC for achieving GI is different. So, in the beginning, the contribution for goal achievement should be calculate to rate the importance of each SME in AC. Given IC as the image combination function to combine the image attributes from two different images, the first step is as below:

STEP 1: Initial Step

CI = I(V_{bf}) /* current image */

For each V_{bi} in AC, i = 1 to n

CO[i] = IC(CI , V_{bi}); /* combination results */

EFF[i] = IS (CO[i], GI) /* image similarity between combination image and GI*/

After completing the EFF array, we choose SME in AC which has lowest IS when combination. Then CI becomes to the combination of the chosen SME and V_{bf}, and the chosen SME is deleted from AC. So, in step 2, we will find another best SME in AC for GI achievement.

STEP 2: Recursive Step

Select best CO[i] -> CI

Delete seleted V_{bi} in AC

For each V_{bi} in AC, i = 1 to n-1

CO2[i] = IC(CI , V_{bi}); /* combination results */

EFF2[i] = IS (CO[i], GI) /* image similarity between combination image and GI*/

Then, through this recursive process to reduce the SME in AC, if there are four SME in AC, the value network after this process is like Figure 5.5. There are four circuses in the value network which represents the different level of goal image fulfillment. The partner who is in the innermost circus has the best influences on the

achievement of goal images among all candidates. Then, the second circus has the second best candidates. For example, if there are five tourism SMEs who provide different service for tourists in a tourism region, Figure 5.7 is their service value network to achieve their cooperation goal. The best service journey for tourists is {V_{bf}, V_{b2}, V_{b4}, V_{b5}, V_{b3}}.

There are also other possible sets of innovative service journey in Figure 5.7 The cooperative businesses can dynamically compose their service journey for customers by understanding the degree of achievement to cooperation goals. On the basis of CIVNDA concept, in the next chapter, the implementation to assist the search of cooperation goal from customers, the search of cooperation candidates and the composition of service value network will be introduced.

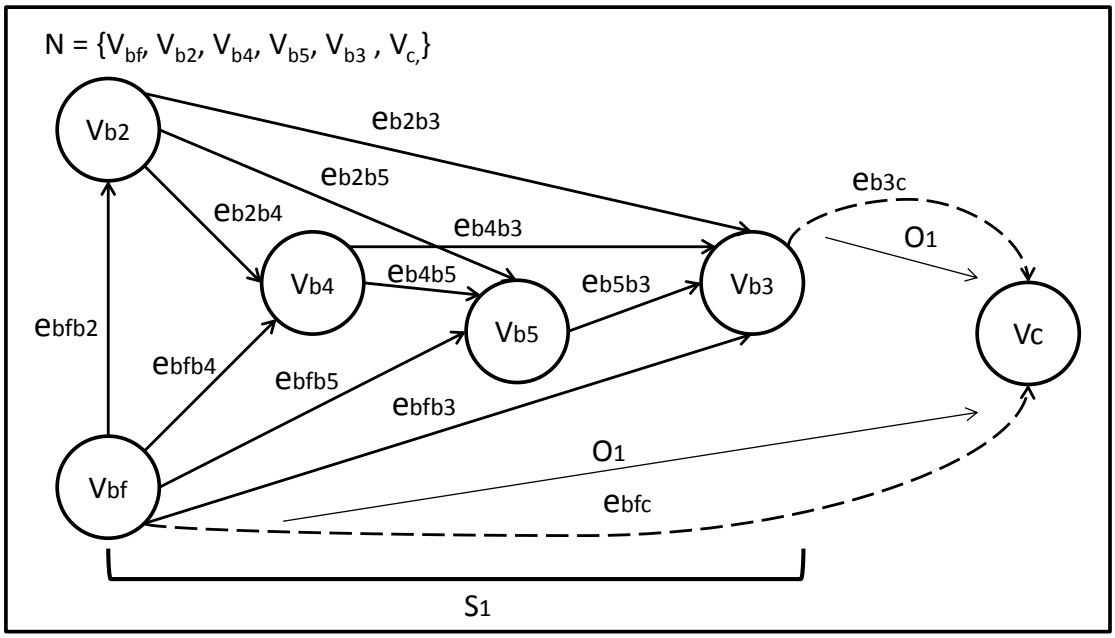

Figure 5.7 Example for Customer-driven and Imagery-based Value Network

5.5 Summary

Two design artifacts, the service ecosystem for value creation in service dominant logic and CIVNDA, which describe service value evaluation and a value network design approach proposed and detailed in this chapter. Both design artifacts in this chapter aim to provide a solution for the problems found in Chapter 4. The primary features of CIVNDA include three parts. First, CIVNDA uses images as the basic elements to represent the service value proposed by businesses and experienced by customers. Secondly, businesses which form a value network can understand their possible synergy from the images of their service value propositions. Finally, businesses can also design a value network for create innovative service which have some specific images for their target customers. The components, definitions and propositions are explained and used to prove two important propositions about CIVNDA. The proofs of the two propositions conclude that businesses can improve their value when their images are unique and close to customer's needs. Moreover, the development of a business region can focus on diversification to encourage new image creation through value co-creation among businesses. Therefore, how to make businesses know their images from customer's perspective and find suitable partners to configure valuable value network in practice is significant. The next chapter will present the service system design method to apply CIVNDA in real businesses.

Chapter 6 The Design of Imagery-Based Service Cooperation and Recommendation Platform for Cluster SMEs

According to the service ecosystem proposed in Chapter 5 (Figure 5.4) and the approach of customer-driven and imagery-based value network design mentioned, this chapter will focus on the service platform implementation to realize the CIVNDA the tourism industry for their development. In this research, tourism industry is taken as the study field for the study of the cluster SMEs evolution. The investigation in Chapter 4 presents a single case study in tourism industry and proposes a four-stage evaluation in the leisure agriculture service to indicate the problem relevance of this research. To achieve the fourth stage in the leisure agriculture service, Chapter 5 demonstrates two design artifacts, the service ecosystem for value evolution in service dominant logic and value network design approach – CIVNDA, for the value co-creation among business clusters. In this chapter, uVoyage service platform, the third design artifacts, is introduced for engineering CIVNDA.

The implementation of uVoyage service platform aims for realizing the service design on the basis of CIVNDA. In the beginning, we will introduce the the relationships among the underlying theories uVoyage conceptual framework including SDL, image theory, destination image theory and metaphor theory. Destination image theory as described in Chapter 2 involves the creation and feedback of tourist's service experience. Metaphor which is a conceptual map from one mental domain to another in a conceptual system (Lakoff, 1992) is used to comprehend and generate

images for cooperation goals between businesses. Traditionally, metaphors are considered rhetoric in the linguistic disciplines. Richard separated metaphors into two parts, tenor and vehicle, which are also called target domain and source domain, respectively, in cognitive linguistics (Lakoff and Johnson, 1980). The ability for conceptual abstraction and meaning analogy from a vehicle to a tenor allows a metaphor to work in numerous domains. A metaphor can solve problems by allowing people to think in different ways and uncover additional features of things (Casakin, 2007; Morgan, 2006). In the business domain, some enterprises have applied metaphors as representations of visions or goals (Hill and Levenhagen 1995). Thus, destination images that represent impressions of humans can also serve as vehicles for tourism SMEs to create innovative services. By using a destination image as a vehicle, metaphor has the potential to help SMEs understand the goals of cooperation. The value network in a region can then be configured dynamically in order to satisfy customer's needs through understanding cooperation goals. Then, the conceptual framework and the system architecture of uVoyage are detailed for service platform development.

In the following section in this chapter, the details include uVoyage conceptual framework and its underlying theories. Following the uVoyage conceptual framework, the system architecture of uVoyage service platform is developed for subsequent platform implementation.

6.1 Conceptual Framework of uVoyage Service Platform

uVoyage conceptual framework is developed based on the integration of SDL, image theory, destination images, and metaphor. Figure 6.1 shows these interactions within the seven theoretical components of the uVoyage conceptual framework and

their relationships. First of all, value creation and value sharing are the two things emphasized by SDL. So, value creation and value sharing components are identified. For the value creation part, the value created from service experience is related to both image theory (value cognition) and destination image theory (service experience). The idea of image theory is included in value creation and destination images component for the foundation of value cognition. As to value sharing part, operant business cooperation should be involved when the value sharing between businesses happens. The metaphor here is used to link the cooperation goals in order to improve customer's service experiences and customer satisfaction.

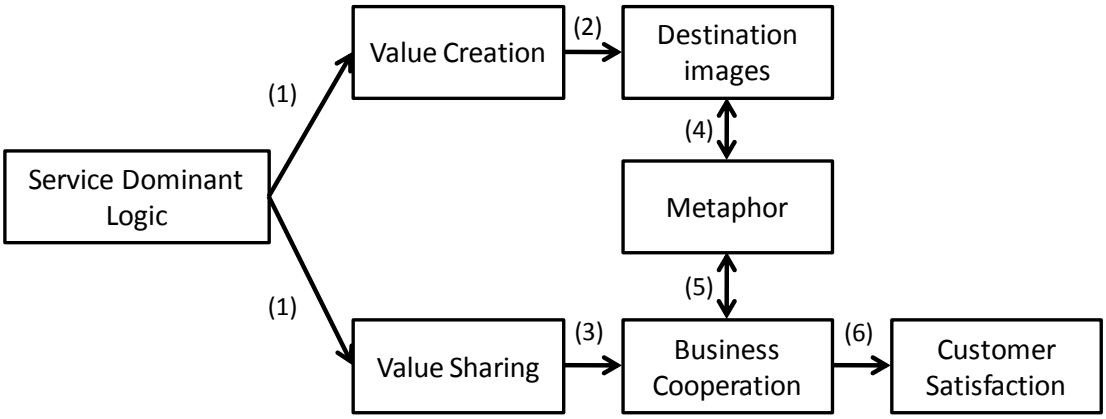

Figure 6.1 Relationships among the Underlying Theories uVoyage Conceptual Framework

Detailed relationships among the seven components are as follows:

- Link (1): Link (1) represents SDL content. Value creation and value sharing are the two kernels in healthy ecosystem development.
- Link (2): Link (2) shows the relationship between value creation and destination images. Destination images bridge customer impressions associated with organic images, expectations, and the induced image and value after experiencing services from SMEs. SMEs offer cusotmers values (drawing upon

assets of the centric platform) that characterize destination images.

- Link (3): Link (3) describes the strategic choice of value sharing in terms of sharing resource on the centric platform, which can drive cluster SMEs to cooperate. Cooperation is subsequently considered as a means of sharing and integrating mutual values to enhance value propositions. Cooperation synergy then increases the effectiveness of ecosystem operation.

- Links (4) and (5): Metaphor is middleware that connects destination images and business cooperation through links (4) and (5). When a customer receives value that has been described by images, the holistic view of images of a destination can be regarded as customer preferences. Thus, the goals of business cooperation can originate from images tourists prefer for niche market creation by SMEs. Restated, goals are analogous to images in terms of customer perspectives. Metaphor works for search reasonable concepts mapping from goals to business partners.

- Link (6): When destination images and business cooperation are linked, businesses can design very attractive and unique services based on mutual capabilities. Customer satisfaction, which results from a service experience, would therefore improve.

For the competitiveness and survivability of cluster SMEs associated with innovation, growth, and productivity, these theories are the underlying fundamentals of uVoyage conceptual framework. There are four tiers in uVoyage conceptual framework illustrated in Figure 6.2. Among the three basic elements in the first tier, a destination is the target environment where SMEs reside. The environment has some embedded technologies (only a web browser or cell phone for some SMEs) and

relationships among businesses and consumers, which enable different B2B and B2C models. To encourage business development, the second tier consists of image modeling and sheltering operations, which are mechanisms for frontline service provisions of the centric platform. Image modeling is an automated and adaptive mechanism for modeling features of destinations, customers, and businesses. According to attributes of customer impressions, image modeling can be used to compute business and destination images. Customer images are based primarily on their preferences, whereas images of businesses are measured by customer experiences.

Conversely, sheltering operations provide the management and marketing functions needed by SMEs to increase tourism business for operations that can be fulfilled by Information technology (IT). Information technology nowadays is often viewed as an auxiliary enabler in tourism development (Touray and Jung, 2010). For example, destination management system using IT helps SMEs communicate with tourists and manage resources and business cooperation more effectively and efficiently. Internet and online communities are good sources for understanding customers' needs and feedback. Tourism recommendation systems can also facilitate tourists to find better journeys for better service experiences in their tours. Notably, SMEs can utilize some platform services to increase operational productivity.

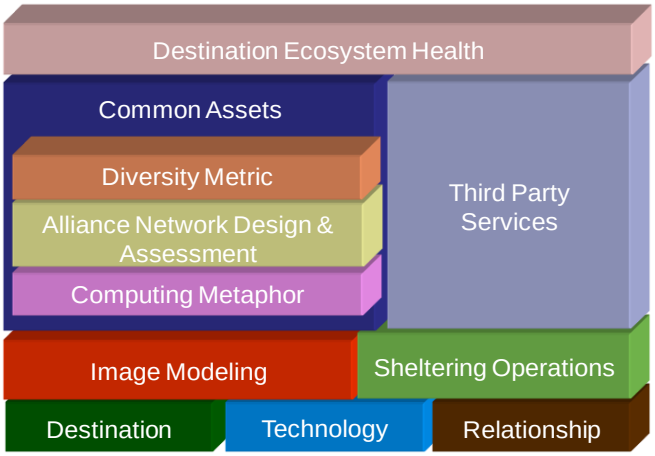

Figure 6.2. uVoyage Conceptual Framework

The diversity metric, alliance network design, and assessment and computing metaphors are component assets of uVoyage (left side of the third tier). With an understanding of customers and management functions in the second tier, these common assets can be used to create incentives for business cooperation. These incentives include partner recommendations and selection for business cooperation to achieve given goals (*i.e.*, the desired image as a metaphor vehicle), evaluate possible alliance value network formation, compute alliance value network feasibility, and measure service diversity in an ecosystem. Third-party service providers, such as transportation firms, logistics services, or raw material suppliers, act as auxiliary enablers supplying services for value network operation. Destination ecosystem health, which is on top of all three tiers in the conceptual model, assesses the growth and diversity of service development through the prosperity of business and their cooperation.

The unique properties of uVoyage conceptual framework are as follows.

- Proactive implies that businesses can remain alert to changes in an environment and customers based on the image modeled. Once changes are identified, the

common technological assets help businesses create niches and identify complementary partners for growth.

- Prosperity is the outcome of value co-creation in an ecosystem. The proposed framework encourages businesses to develop improved value propositions for different value networks. Therefore, an ecosystem containing many value networks will also receive benefits from business development.

- Productiveness highlights the features of industrial cooperation for customers to enhance overall productivity of a regional industry.

Briefly, the first two tiers are implemented to identify and understand customer needs and business relationships in an environment based on destination image theory for the value creation process in a tourism ecosystem. For value sharing, a metaphor based on metaphor theory along with other componets in the third tier of the proppsed conceptual model supports businesses sharing value with partners.

6.2 uVoyage Service Platform Architecture

uVoyage service platform is a centric platform which can apply for innovating regional tourism. When viewing tourism as a service ecosystem for a tourism destination, all tourism SMEs should have service value propositions, value delivery mechanisms, provide value-in-use for customers (Vargo and Lusch, 2004) and can create attractive value propositions based on their advantages. Thus, their dilemma includes market visibility (due to inadequate marketing competence) and ineffective service delivery (due to poor human and financial resource restricting development choices). Consequently, services offered by tourism SMEs cannot be discovered smoothly by tourists, resulting in a lack of positive service experiences and generating

an unsustainable tourism ecosystem. Weak SMEs at a tourism destination result in decreased employment and income potential. A tourism ecosystem then worsens in terms of both growth and productivity. Therefore, increasing the effectiveness tourism SMEs in creating value, growing markets, and improving service delivery channels are important to enhance SME tourism sustainability for destinations and achieving the objectives of tourism innovation, growth, and productivity.

The uVoyage platform has six modules (Figure 6.3)[1]. The modules for image modeling and image mixing are related to the first two tiers of uVoyage conceptual framework, which are responsible for sensing dynamic environments and customers' needs using color image scales. The sheltering service management module realizes sheltering operations for SMEs. The other two modules, the SME alliance service formation module and the alliance feasibility management module, are designed to correspond to the common assets in Voyage service platform. The aim of SME alliance service formation module based on metaphor theory is to facilitate business cooperation and value sharing. SME cooperation strategies are achieved through the six modules of uVoyage, ranging from facilitating business value creation to value sharing in an ecosystem.

Both tourists and regional tourism SMEs are target users in uVoyage service platform; in other words, tourists search for services associated with desired images, whereas regional tourism SMEs cooperate to offer the services in specific images. Data for tourist preferences, regional SMEs and environments (e.g., search output from Google and tourist feedback) are used as the primary input for the image modeling module, which constructs images of a destination, businesses, and tourists.

[1] For the details of uVoyage models, please see appendix A and B.

For tourists using a complex search term (*i.e.*, a sentence or phrase instead of a noun or adjective only), the image modeling module decomposes the search term into details and delivers blended images as the outcome. Additionally, the image mixing module processes interaction among tourists, tourism SMEs, and destinations and supports processes in the uVoyage B2B and B2C service modules.

To fulfill the goals of tourists using uVoyage, groups of services in different regions should match tourists' images. Therefore, regional tourism SMEs can cooperate and combine their services to meet the changing needs of tourists or create new services via the alliance service formation modules. When cooperative intention increases, images from services offered by different SMEs or for different destinations will be generated by the image mixing module. Each cooperation suggestion generated from the alliance service formation module is evaluated by the alliance feasibility measurement module to assess the possibility of cooperation success. The destination service matching module then recommends services to tourists by matching tourist images with tourist needs and SME services. The sheltering service management module fulfills electronic cooperation management and marketing functions, such that tourism SMEs can deliver services with increased effectiveness. Last, feedback from tourists about SME service experiences affect environmental data (i.e., discussions on the Web or a blog) and tourist impressions.

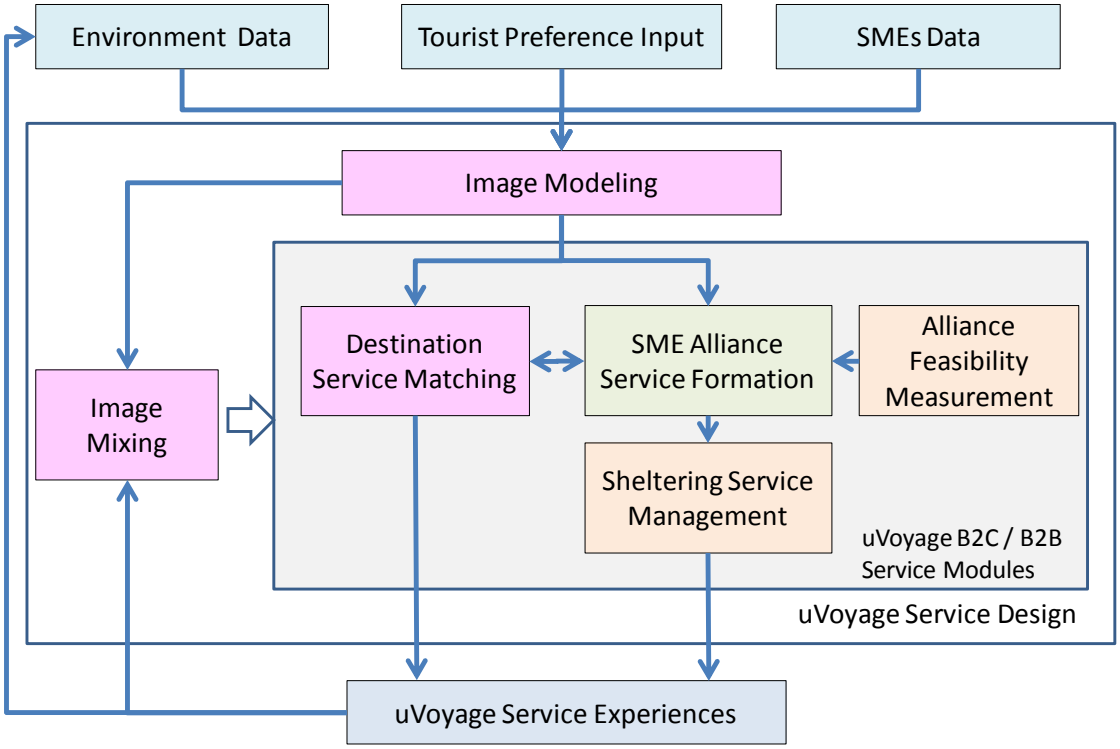

Figure 6.3 uVoyage Service Platform Architecture

The following subsections discuss additional details of each module, except for the sheltering service management module, which was elucidated when discussing electronic marketing and cooperation management functions. For the details of image modeling, image mixing, destination service matching and SME alliance service formation model, Appendix A and B provide further information and related references.

6.2.1 Image Modeling Module

In this work, a representation of images is composed of a set of psychological words defined in the Color Image Scale (Kobayashi 1992), in which each image attribute is represented by a psychological word and has several properties (e.g., RGB values). The image modeling module transforms words/data into image matrices using this color image scale (given that an image of a destinationn or SME can be described by a set of psychological words). Tourist preferences search terms, and

destination and regional SME data are used to construct image matrices. The image modeling module transforms those psychological words into image matrixes modeled using RGB values and their intensity values (count of particular psychological words divided by the total number of psychological words in percentages).

For the tourist image construction process, this work classifies different tourist types—Organized Mass Tourist, Independent Mass Tourist, Explorer, and Drifter (Cohen, 1972)—using a simple questionnaire. Each tourist has short-term and long-term images. Long-term images represent tourist behavior in the proposed platform (*i.e.*, destination browsing history, travel experiences, feedback, and interaction with other tourists). Conversely, short-term images identify tourist expectations when planning to travel. These two tourist images are applied for service matching in the destination service matching module.

Additionally, tourism SME images are initiated from SME settings initially. Feedback from tourists and destination images influence SME images over time. Therefore, an image matrix of an SME is the combination of an SME's self-positioning, environmental factors, and feedback from customers. Conversely, destination images are constructed by emotional words from regional tourism SMEs and tourists. These data were collected from Internet at the very beginning (*i.e.*, a Google search) and from the proposed our platform. To comply with destination image theory, destination images for a large region can be decomposed into sub-region images. Destination images are scaled up into holistic images and scaled down into detailed sub-images and attribute images.

6.2.2 Image Mixing Module

In this work, we assume tourists, SMEs, and the environment influence each

other. Therefore, images change with interactions among tourists, SMEs and the environments. For instance, when a tourist with a red image chooses a destination and an SME with a yellow image, the image color gradually becomes orange. This also occurs when red and yellow SMEs cooperate. The interactions among tourists, SMEs, and a destination are appropriately incorporated to weigh different influences. The aim of the image mixing module is to compute mixed images after interactions to support the uVoyage B2B/B2C service modules.

This work designs two image mixing processes for different aims. Both processes obtain RGB values from images and convert them into the CIE XYZ color space. The center of gravity law is applied to calculate the mixing result and fuzzy logic is applied to lookup corresponding words (*i.e.*, dazzling + cheerful = bright). The first process computes mixed images more precisely than before by selecting image elements (psychological words) from both image with high intensities. These selected elements are then combined and normalized into a new image. The second process produces surprising results for SME alliances. Elements within both images are categorized into five groups—Evaluative, Sensitive, Emotional, Dynamic, and Scale (Kobayashi, 1981). Mixing is performed within each image to produce five new image elements as additional attributes for combined images; this leads to the creation of very surprising results for SME cooperation.

Events that influence an entire ecosystem always occur. In the tourism ecosystem, the number of destination attributes may increase because special events occur. For instance, when a destination organizes a new festival or is chosen as a film location, its images may change. However, such changes can be dramatic or slow. The color mixing module also adopts these changes by applying text mining technology and

Web 2.0 content analysis.

6.2.3 SME Alliance Service Formation Module

The SME alliance service formation module is mainly for tourism SMEs seeking attractive and unique cooperation using image matrices (which are obtained from the image modeling module and image mixing module). Metaphor theory can be applied to drive the creation of innovative services based on SME cooperation. Given an SME with its own goal associated with a specific image to build that can be represented as a metaphorical sentence, the SME alliance service formation module first analyzes gaps between the actual state and goal state. The goal statement is decomposed into essential lexical units and the tenor and vehicle parts can then be identified. A case-based approach is used to identify the properties of each lexical unit from Internet search results (*e.g.*, Google). Relevant meanings following filtering are retained as the adjectival form and are compared with image matrices from SMEs. Gap images are then identified as a set of their complements.

Second, the SME alliance service formation module searches for partner candidates based on identified gap images. Each gap image is viewed as a "common supertype," which represents the parts common to both the tenor and vehicle. Since the tenor (SME) and supertype sets are obtained, other vehicles (other SMEs) are needed to make the metaphor reasonable. Restated, when vehicles contain image elements resembling those in the superset, the vehicles (*i.e.*, partner compositions) may be suited to cooperation. However, partner compositions generated at this time can only be utilized for business needs without tourist considerations. Third attractiveness analysis and uniqueness analysis are applied to examine tourist desirability and the degree to which each candidate differs.

During attractiveness analysis, the predicted image configuration of each partner composition is calculated by the image mixing process. When combined images closely resemble the needs of additional tourists on the platform, this composition is classified as having high potential attractiveness. Conversely, uniqueness analysis identifies the differences between images with and without selected partners. If the configuration set of new image elements is the same with that for the current set of image elements, the calculated uniqueness index will be lower than that of the configuration set of new image elements that are partially the same as or totally different from the current set of image elements. We assume partner compositions with high attractiveness and uniqueness will have excellent market potential. That is, cooperation with this partner composition may have additional market niches to serve.

Finally, the partner composition list is used by the alliance feasibility measurement module for advanced assessments of alliance feasibility, which can be referenced by tourism SMEs when selecting partners.

6.2.4 Alliance Feasibility Measurement Module

This module evaluates feasibility, which is potential cooperation sustainability with selected partner compositions for SME alliance service formation module reference. Based on SDL, businesses only provide a value proposition to customers and values are realized through value-in-use. Alliances or cooperation among businesses that collaborate for specific products or services also provide integrated value propositions. The value of value proposition cooperation or alliance is delivered based on value-in-use resulting from customer service experiences. This means that customers determine the value of a value proposition through service experience (Sandstrom *et al.,* 2008) and co-create value with businesses via a feedback process.

To improve a value proposition], a business can adjust its value proposition based on customer feedback. To propose value in a service system, all roles are resource integrators. Businesses integrate the necessary resource for a service provision for customers. Resource can be gathered internally outside suppliers or partners in a value network. Existing relationships with partners help businesses obtain the necessary resource. Businesses utilize the unique capabilities to transform operand and operant resource into products or services to realize a value proposition.

Resource, capabilities, and relationships are discussed to determine whether a partnership has good cooperation. The resource, including both operand and operant resource, are used to deliver a value proposition and transform it into customer value after value-in-use. Enhanced resource utilization for an SME means that additional resource is transformed. Regardless of the amount of value created by both kinds of resource, an SME with high utilization has many opportunities to deliver its resource for itself or other SMEs. Restated, additional customers or partners are willing to utilize both kinds of resource. Therefore, an SME resource with high resource utilization is a good resource supplier in a value creation process in the tourism service system.

After an SME makes its value proposition (*e.g.*, a trip plan) using its capabilities (e.g., knowledge in the region, and organizational competence in different services), tourist satisfaction resulting from the service experience reflect the SME's capabilities. During cooperation, an SME integrates its resource and those of its partners and coverts these resource (*i.e.*, rooms, services, and food) into a value proposition. In addition to tourist satisfaction, an SME's resource and its partner's resource utilization of operand and operant resource during cooperation prove the capability of a business

to convert resource into value. The last feature for a business in evaluation of its relationships with other businesses represents the ability of a business to find excellent partners and then improve the overall value proposition via cooperation. Therefore, if an SME gains more tourist satisfaction from cooperation than by itself, we assert that this SME can provide more value via cooperation. That is, value output from resource usage is enhanced. From the perspective of its partners, if value enhancement can benefit all firms cooperating, partner satisfaction will be positive and the effect of utilizing a partner's resource via cooperation will be effective.

In the uVoyage platform, alliance feasibility can be treated as a score. The feasibility score of an alliance comprises the scores of SMEs involved. Table 6.1 proposes a method to calculate the alliance feasibility score. First, resource utilization of each SME and service satisfaction associated with a specific cooperation image is determined for partners and customers over time. Each aspect has two or three sub-indicators for computation.

Tourism SME has a score for each aspect; this score is the outcome of comparison with other SMEs at the same destination. For example, if a tourism SME has a higher resource utilization rate than other SMEs at the same destination and average resource utilization when cooperating, it receives resource a high score for resource utilization. Notably, SMEs may be assigned different roles in different alliances. When a tourism SME acts only as an enabler and is not the main contact window in the alliance or cooperative relationship for tourists, the tourism SME shares it value mainly on recourses and relationships part. The enabler role emphasizes resource and relationships. In contrast, when tourism SME is an initiator and the main contact window for tourists, all three scores are considered for the alliance feasibility

measurement. At the end, an alliance composed of tourism SMEs with different roles can obtain its alliance feasibility as the sum of member scores. Evaluation results will be sent back to the SME alliance service formation module for selection of partners for cooperation.

Table 6.1 Alliance Feasibility Measurement Index

Aspect	Meaning	Index
Resource	Asset utilization	Average own resource utilization
		Average own resource utilization in co-operations
Capabilities	Value conversion	Average customer satisfaction under specific image
		Average resource utilization in co-operation in a specific image (both own and partners)
		Co-operation hit rate and actual transaction happened
Relationships	Value enhancement	Average partner satisfaction
		Average partners' resource utilization in co-operations
		Average customers' satisfaction in co-operations in compared with average own customer satisfaction

6.2.5 Destination Service Matching Module

The aim of this module is to match tourist expectations and tourism services available on the platform based on images from tourists, SMEs, and a destination. To meet tourist expectations, the desired images from tourists and recommended services at a destination must be as close as possible. The modeled colors with high intensity in tourist images (both long-term and short-term images) are selected and compared first with destination images. Based on the concept of color harmony (similar colors

on the color wheel) (Cohen-Or *et al.*, 2006) and the color image scale, image similarity between these two sets of images is computed. If similarity is acceptable, the module takes images of SME services from the SME alliance formation module at this destination and adds them to pre-recommendation service sets. With these pre-recommendation service sets, tourists can be engaged to a filtering based on functional preferences, such as time and budget, for final recommendation outputs. Feedback about tourist choices also influences future SME alliance formation at a destination.

6.3 The Service Journey in uVoyage Service Platform

The service journey in uVoyage service platform includes three roles. They are business, tourists and destinations. Figure 6.4 and 6.5 demonstrate the interactions between businesses/tourists and destination/tourist. Destinations, businesses and tourists should register their accounts in uVoyage service platform and then can initiate their image models. After the initialization of image models, uVoyage service platform starts to records the interactions between destination, businesses and tourists and updates image models. The service match for appropriate businesses and destinations is performed when tourists do image-based search. Tourists can select their favorite choices according to the recommendation from uVoyage and then order services or products. The interactions between tourists, businesses and destinations (*e.g.* tourists experience services from a specific business in a destination, or tourists comment their experience services in a specific business) will update the image models in uVoyage.

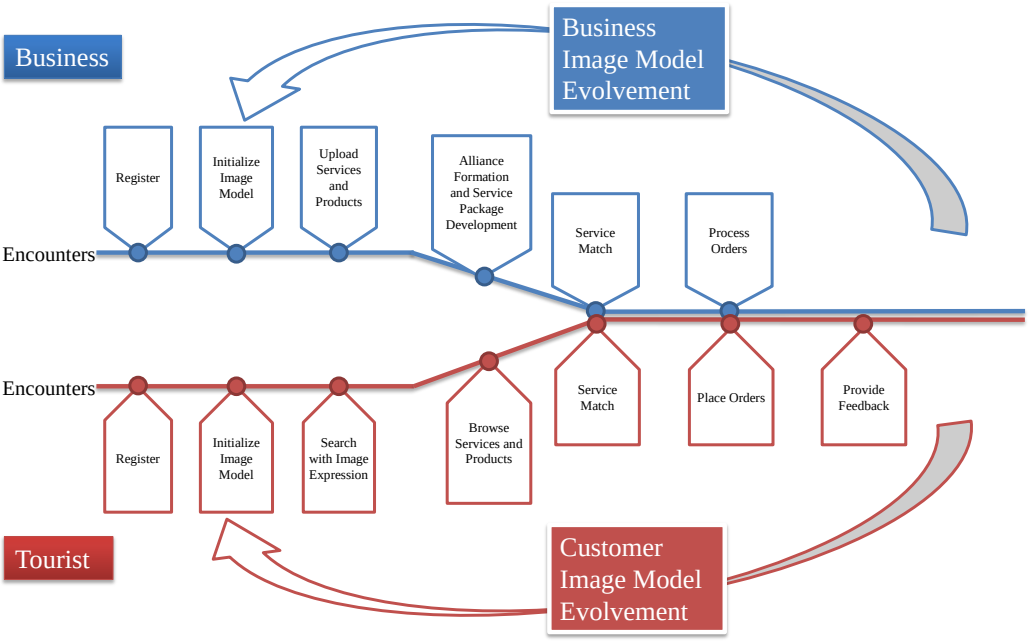

Figure 6.4 The Service Interactions and Journey between Businesses and Tourists

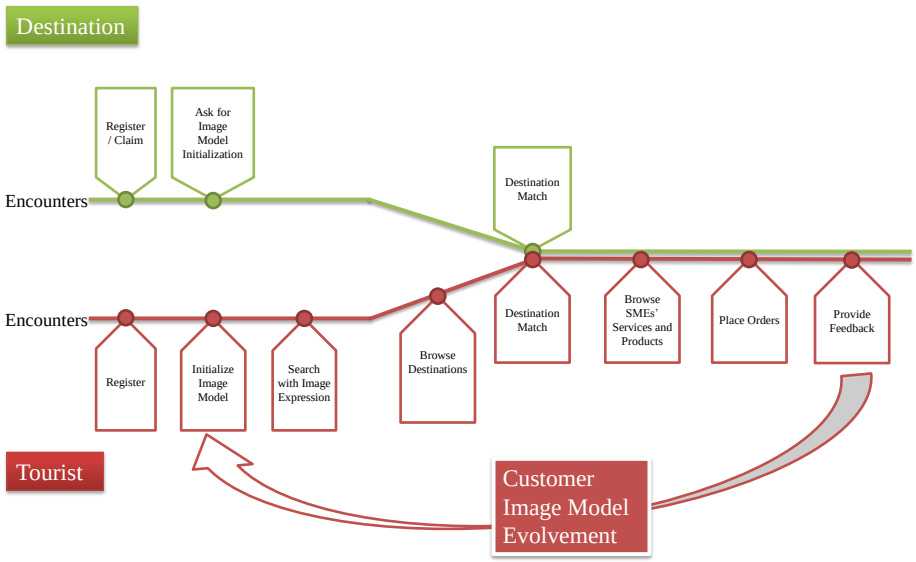

Figure 6.5 The Service Interactions and Journey between Destinations and Tourists

Figure 6.6 and 6.8 shows three uVoyage snapshots. Tourists can use uVoyage tour service recommendation search engine and input their preferred imagery. uVoyage will recommend services or SMEs according to the image mixing of the tourists' image models and their input. On the other hand, businesses in uVoyage can not only sell their products or services in uVoyage platform, but also propose

cooperation to other businesses. uVoyage will recommend cooperation partners to fit the cooperation goals according to the cooperation uniqueness and attractiveness. After businesses select partners, a cooperation proposal is made and businesses can sell cooperation services in uVoyage platform when the selected partners agree the proposal.

Figure 6.6 uVoyage Snapshot – B2C Search and Recommendation

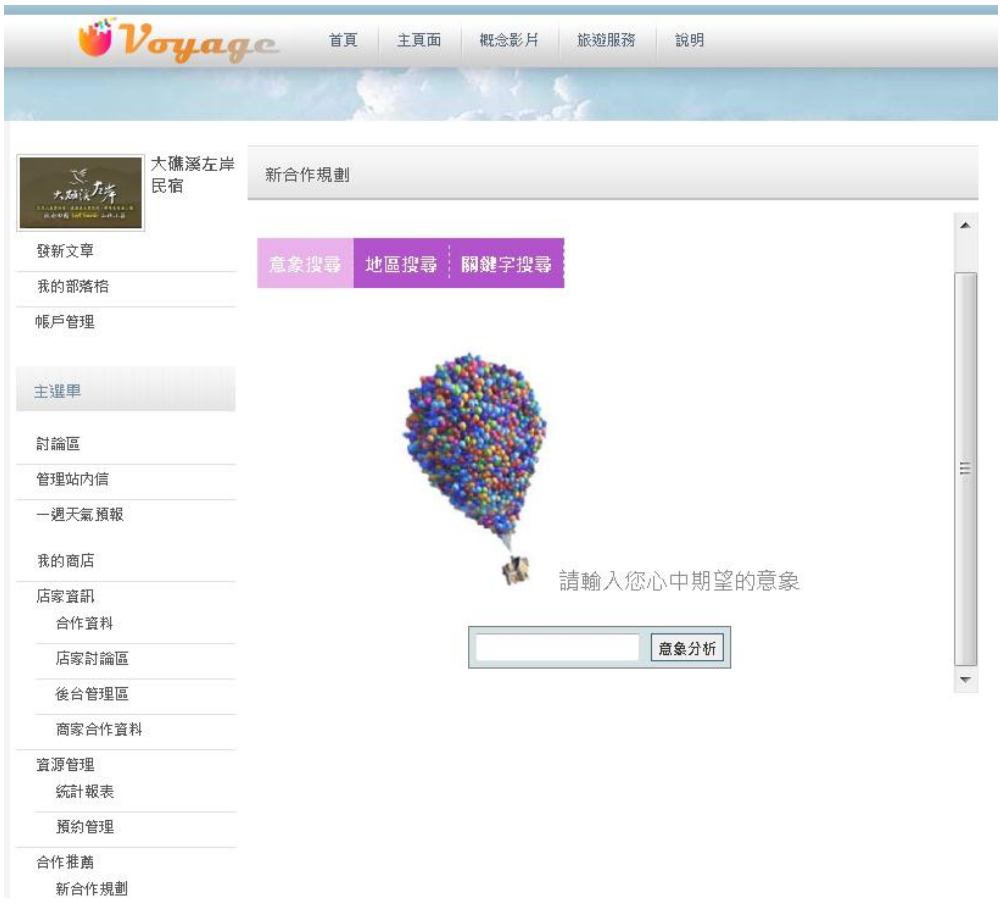

Figure 6.7 uVoyage Snapshot – B2B Cooperation Proposal (1)

Figure 6.8 uVoyage Snapshot – B2B Cooperation Proposal (2)

6.4 Summary

This chapter demonstrates uVoyage conceptual framework and service platform design architecture. The uVoyage service platform tries to realize the service design from CIVNDA through ICT. The relevant business problem investigated in Chapter 4 and the design artifacts to solve problems in Chapter 5 are implemented by using uVoyage design. Cluster SMEs of tourism are enabled to create attractive services using cooperation services to fulfill tourist images and obtain sheltering services from the uVoyage platform. Tourists can also easily identify services that are closely related to their needs and design a desired journey. Tourism SMEs on the uVoyage platform obtain feedback from tourists and find potential partners for cooperation. The development stage of tourist cluster SMEs can then move forward from the benefit of uVoyage service platform.

Chapter 7 Evaluation of Artifacts

In Chapter 1, the research methodology in this work follows IS research framework. There are three research questions mentioned in this research. The first research question refers to the evolutionary path of cluster SMEs in the trend of service economy. It is then followed by the second and third research question about the design and implementation for a high productivity, innovative and growth value network for SME clusters. From Chapter 2 to Chapter 6, the contents include the theory foundations (Chapter 2), relevant business problems in the environment (Chapter 4), two design artifacts, service system for value creation in SDL and CIVNDA (Chapter 5), and the service platform implementation of CIVNDA (Chapter 6). Basically, from the interview result in Chapter 4, this research assumes that the design of a high productivity, innovative and growth value network is an important strategy for the development of tourism SME clusters.

Afterward, the evolution of service value is studied (Figure 5.4). CIVNDA is proposed as a design artifact to achieve the improvement of productivity, innovation and growth in value network design. CIVNDA is viewed as not only a value network design strategy but also a solution for the business needs in tourism service according to Chapter 4. In this chapter, the evaluations primarily are in two folds. The first evaluation is about the strategic influences of our value network design to the tourism ecosystem. The aim of this evaluation is to understand whether this value network design can benefit the development of tourism ecosystem. The method used for the first evaluation is the system dynamics method. Tourism ecosystem behaviors will be simulated for further analysis.

The second part of evaluation is then to evaluate the effect of value network and service platform design by using the focus group approach. In the concepts of CIVNDA and uVoyage design, this research has addressed the importance of customer's emotion after service experiences and customer-driven cooperation. So, the second part of evaluation is to explore how these concepts can help tourism SMEs achieve the goal of tourism growth. Feedbacks from the SMEs in Mt. Pillow Leisure Agriculture Area provided the valuable insight for the underlying concept of CIVNDA and uVoyage (customer's feelings and customer-driven cooperation). Meanwhile, the combination of the two-part evaluation demonstrates the values of the uVoyage artifacts following the ideas of CIVNDA. Figure 7.1 then highlights the two-part evaluations conducted.

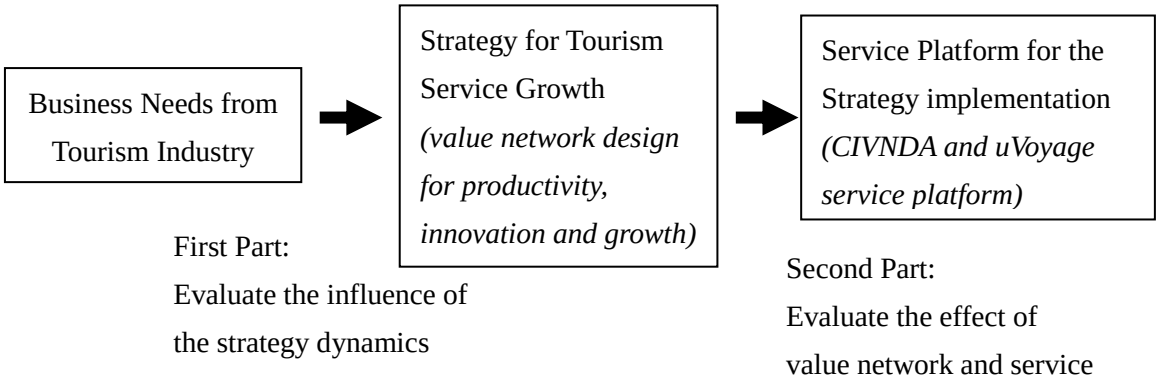

Figure 7.1 The Evaluation Design

The following sections start with the modeling of a regional tourism ecosystem and the parameters setting on which the first part of system dynamics evaluation is conducted. The results of interview and focus group exercised in Mt. Pillow Leisure Agriculture Area will also be analyzed to serve as the second part evaluation. Finally, the combination of two parts is discussed.

7.1 System Dynamics Evaluation for CIVNDA Design Concept

From literatures in Chapter 2 and interview results in the Mt. Pillow Leisure Agriculture Area, a four-stage evaluation path for cluster SMEs is constructed and lead to the detail service design of CIVNDA. In this section, the macro perspective of evaluation by using system dynamics approach aims to demonstrate the values of the CIVNDA The main idea is to understand the influences of the innovative service cooperation for unique image creation to the regional tourism ecosystem in macro scale. When a tourism region grows, more tourism SMEs should appear than before to service increasing tourists. With the increasing of tourists, the total income from tour service also rise. New tourism SMEs would have chances to sustain in a tourism region with the total tour income growth. However, nature resources in a tourism region (operand resources) are usually in a fixed amount, such as water in a hot spring, or the capacity in a landscape of a tourism region, the increasing numbers of tourism SMEs means that they can share less operand resources than before. Additionally, if new tourism SMEs provide similar services with existing SMEs to tourists, the operant resources (new and innovative services) may not increase and the distinguished features in a tourism region may be forgotten gradually.

To avoid the disappearance of distinguished features in a growth tourism region, the cooperation among tourism SMEs to create innovative services is one of the strategic choice as mentioned in previous chapter. The service cooperation among SMEs aims to develop innovative services with unique images for attracting tourists. Therefore, with the development of operant resources (innovative service) from cooperation among existing and new tourism SMEs and the changes of tourism

resources and features, this section models how the regional tourism ecosystem changes in tourism resources (both operant and operand resources), SMEs and tourists from the system dynamics perspective.

7.1.1 Model for Regional Tourism Ecosystems

The model for regional tourism ecosystem models relationships between the development and cooperation in regional tourism SMEs, tourism resources and regional development. The model is constructed according to system dynamics methodology, which is used to analyze interactions between and behaviors of variables in a system (Forrester, 1994; Sterman, 2000). The key variables and relationships are identified from the case study in Mt. Pillow Leisure Agriculture Region and uVoyage service design. On the foundation of SDL, SMEs offer value propositions to tourists by using their capabilities and tourism resources (both operand and operant resource). This research assumes that increased tourist satisfaction brings additional tourists and affects new SME startups in this region. According to destination image theory, the value proposition made by SMEs is represented within the context of destination images. When SMEs in a region have a high level of cooperation, their knowledge, capabilities, and resource can improve operant tourism resource such as a paradise-like place. Thus, increasing the number of tourism resources may increase the number of unique and attractive destination images.

Tourism resources in the any tour region are limited. Both operand and operant resources are consumed by both tourism SMEs and tourists. For instance, a ruin, such as Angkor Wat, must be protected from further tourism development (Winter, 2007). Therefore, the development tour region should balance economy, social and also environment. Additionally, if services provided by SMEs are immutable and static for a prolonged period, they may lose their attractiveness. Conversely, when SMEs offer

similar services and images, development of a regional tourism industry would be adversely affected because these images are too close from tourist's perspective (Control Yuan of R.O.C., 2007). Figure 7.2 concludes a causal loop diagram for the regional tourism ecosystem development according to the data and assumptions above.

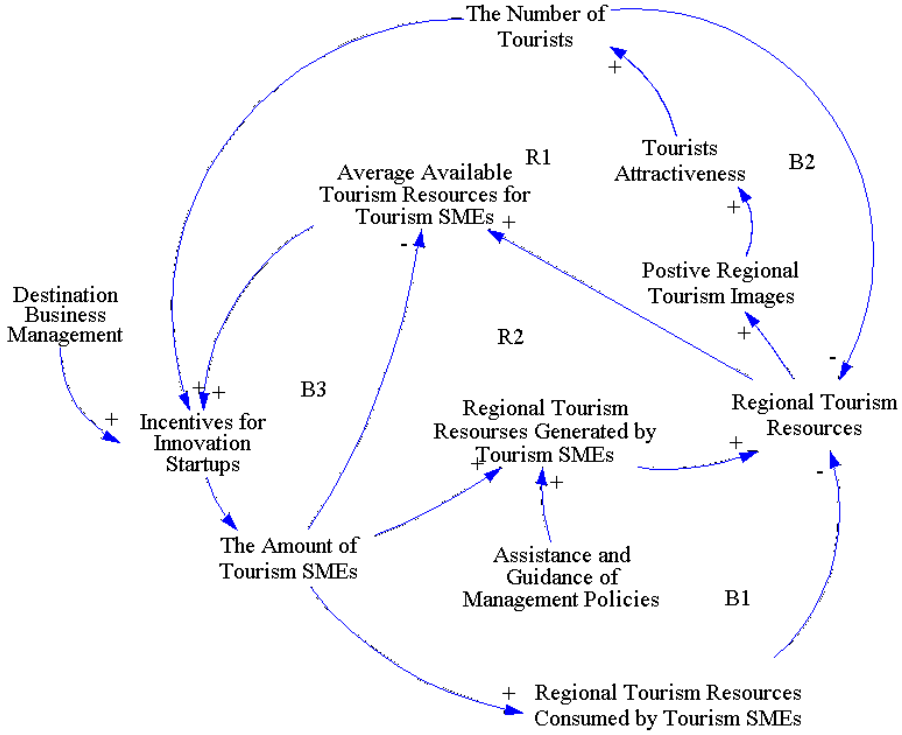

Figure 7.2 The Model for Regional Tourism Ecosystem Development

Two reinforcement loops and three balance loops can be found in Figure 7.2. Loop R1 and R2 represent when tourism SMEs develop tour region and find tourism resources to attract tourists, the increasing tourists could create more incentives for new tourism SME startups. Balance loops B1, B2 and B3 indicate that when more tourism SMEs and tourists consume tourism resources, the decrease of shared tourism resources per SME and total tourism resources in tour region could reduce attractiveness of the tour region. Destination business management and assistance and guidance of

management policies which are the different government policies referred in Chapter 2 (Table 2.5), on the other hand, can affect the incentives for innovative startup and tourism resources generation separately.

7.1.2 Parameter Setting of the Regional Tourism Ecosystem Model

To simulate the regional tourism development model, this research draws 10,200 tourists per year and initially has 10 tourism SMEs which is used to simulate the effects of cooperation on regional tourism development. The baseline for tourism SME operation is 1020 tourists per season (there are four seasons in a year). The reference mode is according to data from Taiwan's Tourism Bureau which indicate the total income of Bed and Breakfast is roughly 1,020 times of the average cost of accommodation for a tourist (Tourism Bureau, 2010a, 2010b). The other two stock variables, amount of tourism resource and attraction of unique destination images, start at 50 and cannot be <0. Table 7.1 shows each system parameter for simulation. And Figure 7.3 demonstrates the stack and flow diagram on the basis of Figure 7.2 for simulation.

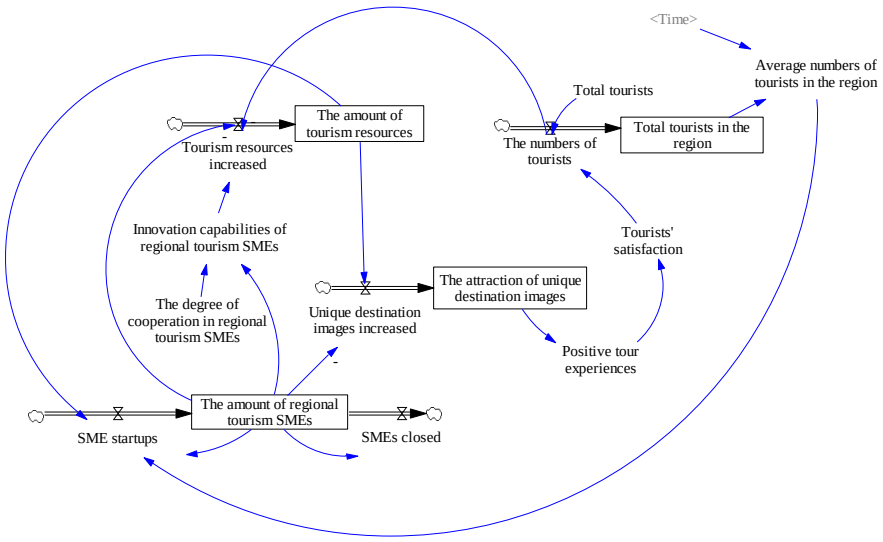

Figure 7.3 The Simulation Model for Regional Tourism Ecosystem Model Development

Table 7.1. Parameters for the Regional Tourism Ecosystem Model

Variables	Type	Unit	Remark
SME startups	Auxiliary	Numbers	N/A
The number of regional tourism SMEs	Level	Numbers	Initial value = 10
SMEs bankrupted	Auxiliary	Numbers	15% closed rate for SMEs
The degree of cooperation in regional tourism SMEs	Constant	Dmnl	Set in different scenario cases
Innovation capabilities of regional tourism SMEs	Auxiliary	Dmnl	N/A
The increase in tourism resource	Auxiliary	Dmnl	N/A
The amount of tourism resource	Level	Dmnl	Minimum = 0 Initial value = 50
The increase in unique destination images	Auxiliary	Dmnl	N/A
The attraction of unique destination images	Level	Dmnl	Minimum = 0 Initial value = 50
Positive tour experiences	Auxiliary	Dmnl	Use
Tourists' satisfaction	Auxiliary	Dmnl	
The numbers of tourists	Auxiliary	People	N/A
Total tourists in the region	Level	People	Initial value = 10,200
Total tourists	Constant	People	200,000 as default
Average numbers of tourists in the region	Auxiliary	People/season	N/A

*Dmnl means no unit discription.

The following formulas list the detailed settings for each variable in the model for simulations. In formulas related to the number of regional tourism SMEs, the number of SME startups is influenced by the average number of tourists because one SME needs roughly 1,020 tourists to survive. Additionally, if additional tourism resource were developed, the incentive for SME startup would increase. Thus, we initially, assume that each SME in the proposed system must have 5 tourism resources, and incentives for SME startup will increase if each SME can share more than5

tourism resource. A one-season delay exists for SME startups preparing for production. We assume the bankrupt of regional tourism SMEs is roughly 15% per season; thus, formulas 7-1, 7-2a, and 7-2b are as follows:

The number of regional tourism SMEs$_{(t+1)}$ = The number of regional tourism SMEs$_{(t)}$ + SME startups − –SMEs bankrupted (7-1)

*SME startups = (average numbers of tourists in the region/1020) – 10) * (1+5*(The amount of tourism resource/The amount of regional tourism SMEs)) (when the average number of tourists in the region is >10200; The initial number of regional tourism SMEs is set to **10**) (7-2a)*

SME startups = 1 (when the average number of tourists in the region is ≤ 10200) (7-2b)

The number of regional tourism SMEs is the sum of current SMEs plus new startup minus SME bankrupted. SME startups born when the average numbers of tourists in the region increase and there are enough tourism resources. So, we assume that every 1,020 tourists in a year can sustain a SME according to the reference data from Tourism Bureau in Taiwan. When the average numbers of tourists increases more than 1,020 and there are enough tourism recourses to be shared, SME startups will appear. Otherwise, there will be only one SME startup born.

Formulas 7-3–7-5 describe the behaviors of tourism resource in the proposed system. We assume the status of a tourism region is initially in an equilibrium state. Additionally, the costs of tourism resource and decay of a unique destination image decreases the number of tourists over time. Therefore, the creation of tourism resource is set at 0.4/SME in iteration, which is lower than consumption rates for SMEs (0.25/SME) and tourists (0.00025/person). If no new tourism resource is input when setting parameters, tourism resource will run out in roughly 2 years, meaning that the region is no longer attractive to tourists. The degree of cooperation is initially set at 1,

meaning cooperation does not influence the innovation capabilities of regional tourism SMEs. In the equilibrium state, the increase in tourism resource is near 0 because tourism SMEs create the same amount of tourism resource as tourists consume.

The amount of tourism resource$_{(t+1)}$ = The amount of tourism resource$_{(t)}$ + The increase in tourism resource (7-3)

*The increase in tourism resource = Innovation capabilities of regional tourism SMEs − The number of regional tourism SMEs*0.25 −The numbers of tourists *0.00025 (7-4)*

*Innovation capabilities of regional tourism SMEs = The degree of cooperation among regional tourism SMEs * The number of regional tourism SMEs * 0.4 (7-5)*

Formulas 7-6 and 7-7 are concerned with the behaviors of destination images. The overall unique destination images increased keeps unchanged when in the equilibrium state. Therefore, 50 tourism resources are needed initially to produce two unique destination images, which are then consumed by 10 SMEs. Formula 7-7 shows the increase in unique destination images. Initially, there are two unique destination images, 50 tourism resources, 10 SMEs and 10,200 tourists every year in the region. The increase in unique destination images therefore depends on the tourism resource increase (25 resources for 1 image). However, the increase of tourists and SMEs would consume the unique destination images. Tourists may not feel interesting when there are too many SMEs with similar images. If the equilibrium state is broken, every 10 SMEs will decrease the unique destination images.

The attraction of unique destination images$_{(t+1)}$ = The attraction of unique destination images$_{(t)}$ + The increase in unique destination images (7-6)

The increase in unique destination images = (The amount of tourism resource/25)− (The number of regional tourism SMEs/10) (7-7)

Finally, formulas 7-8–7-11 describe the changes in the number of tourists. The total number of tourists is set as 200,000; 4% of which are interested in the region. If tourist satisfaction is 25%, the number of tourists in a season can stay at the same level. Moreover, a one-season delay is added between the number of tourists in a season and tourist satisfaction to represent a travel-planning interval. Therefore, the number of tourists in the region is according to the number of tourists in a season which is affected by the tourist satisfaction. In the beginning, the tourist satisfaction is set as 25%. Then the tourist satisfaction is changing on the basis of the positive tour experiences created by the attraction of unique destination images.

The number of tourists in the region$_{(t+1)}$ = The number of tourists in the region$_{(t)}$ + The number of tourists in a season (7-8)

*The number of tourists in a season = Total number of tourists*0.04*(1+Tourist satisfaction) (7-9)*

*Tourist satisfaction = f (Positive tour experiences) (7-10) (*f is a designed function)*

*Positive tour experiences = g(The attraction of unique destination images) (7-11))*g is a designed function)*

7.1.3 Simulation Results for Regional Tourism Ecosystem Model

To identify the effects of cooperation, this work establishes a scenario to examine system behavior. The variable “degree of cooperation among regional tourism SMEs” differs in three different cases and other variables remain the same. Simulation duration is 60 seasons (15 years). The three cases are as follows. Case 1 indicates the ideal condition when SMEs cooperate in a region. Case 2 refers to the current situation of the tourism industry according to the data from Tourism Bureau and the assumptions in this research. Case 3 is the worst case set for regional development without any cooperation.

Case 1: The SMEs view cooperation as an important strategy and share service processes, knowledge, and resources when possible. The degree of cooperation among regional tourism SMEs is set at 1.2, which is positive for service innovation and tourism resource creation.

Case 2: The SMEs maintain neutrality for the adoption of a cooperation strategy and may share some service processes, and recommend each other to tourists. The degree of cooperation in regional tourism SMEs is set at 1, which is neutral for service innovation and tourism resource creation.

Case 3: The SMEs resist cooperation and do not share resources. The degree of cooperation among regional tourism SMEs is set at 0.8, which is negative for service innovation and tourism resource creation.

Figures 7.4 to 7.7 show system dynamics simulation results by Vensim. In this simulation, the degree of cooperation can be viewed as the processes for the regional consensus in its social system, and tourism resources and attractive destination images are the assets in the regional economic, social and environment system. From the simulation results, the interaction between ecomomic, social and enviroment system can be observed. In Figure 7.7, the differences in the numbers of SMEs further imply the condition in economic system development. The average numbers of tourists in the region (Figure 7.4) and the numbers of tourists (Figure 7.6) in case 1 is better than case 2 and case3. Especially, Figure 7.5 and 7.6 implies the higher level of cooperation would create more tourism resoures and lead to fast growth in regional development than the lower case. Although case 1 and case 2 reach the maximum capacity in the numbers of tourists per season, the fluctuation of the numbers of tourists in case 2 is much higher than case 1 which means that the stakeholders in case 2 need more time to seek consensus sustainable devleopment. Therefore, how to create opportunities for regional SME cooperation would be crucial to faciliate the progress of social consensus in a region. The imporvement of productivity, innovation and regional growth would be achieved when a region find the way to balance

economic, social and enviroment systems.

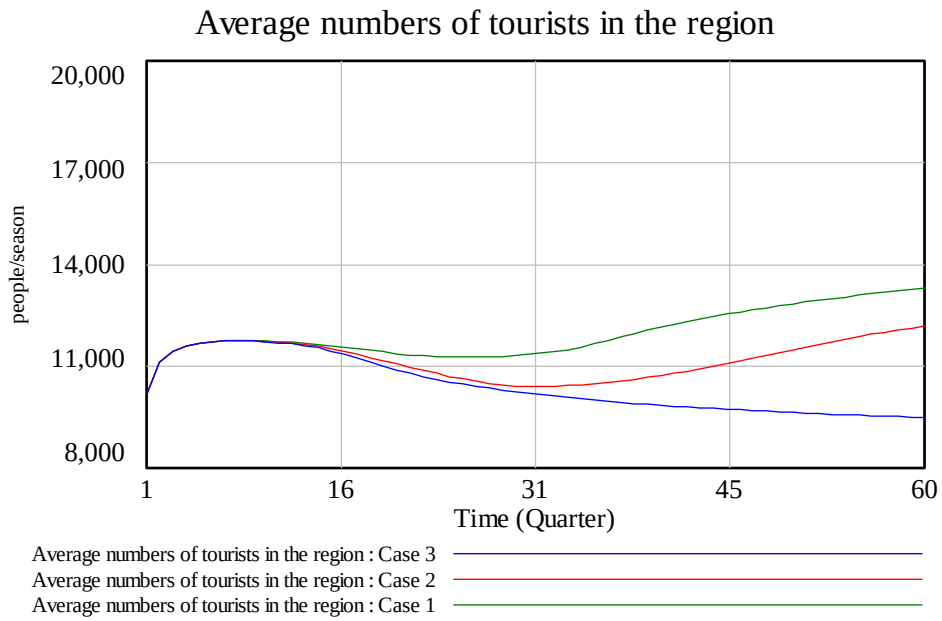

Figure 7.4 Average Numbers of Tourists in the Region in the Three Cases

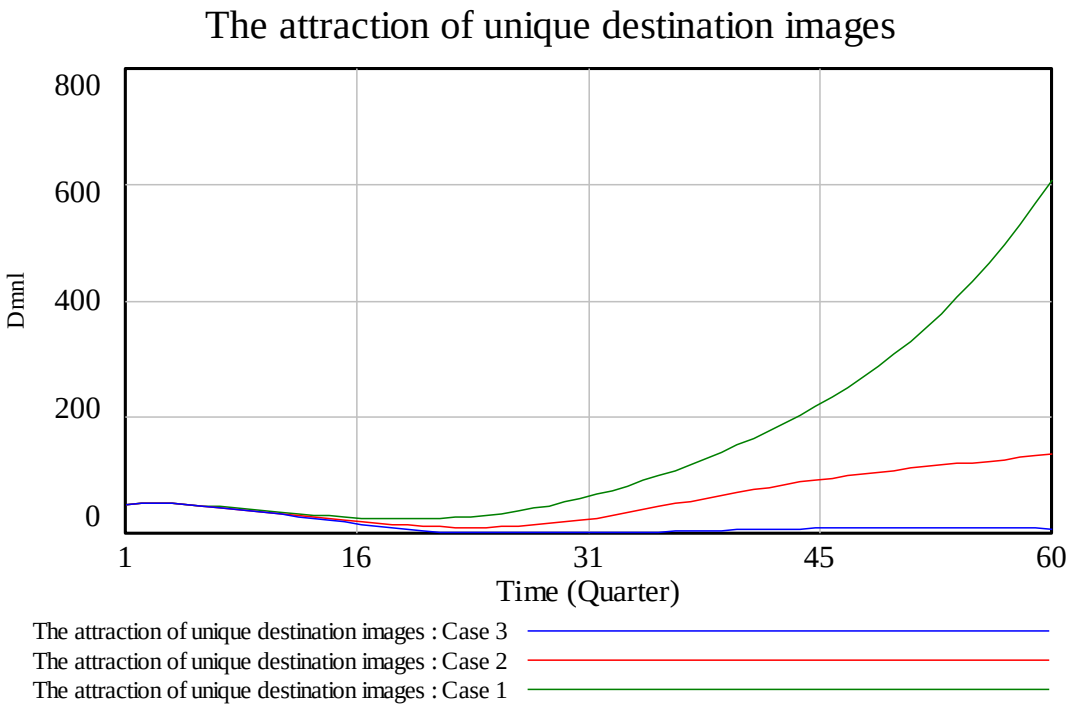

Figure 7.5 The Attraction of Unique Destination Images in the Three cases

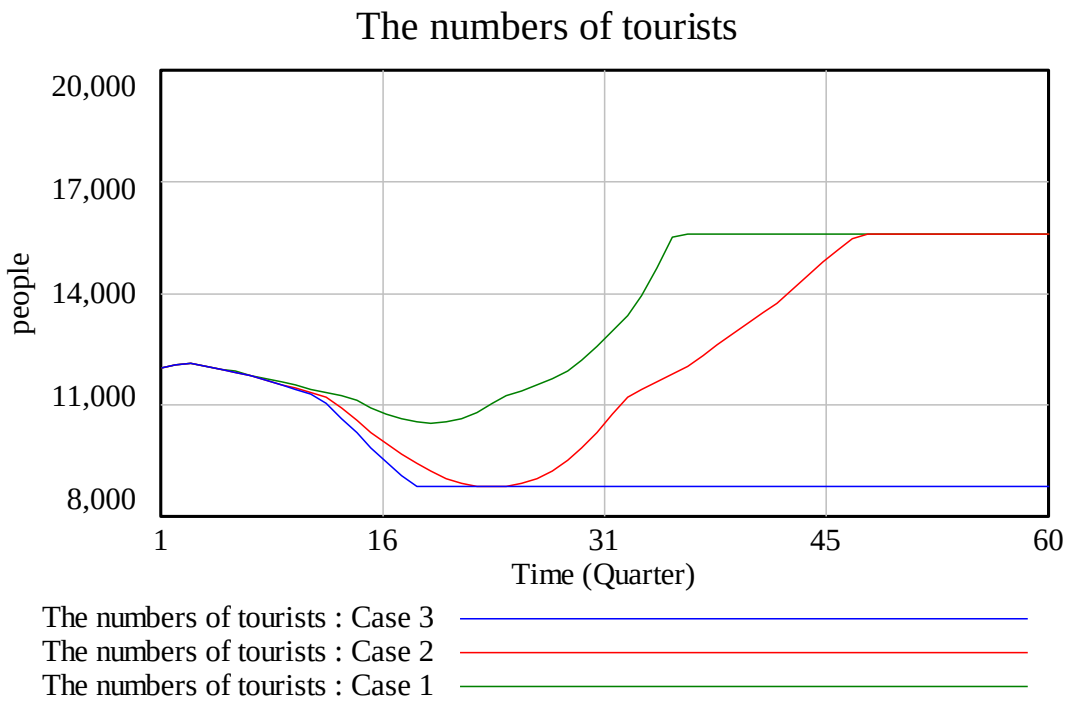

Figure 7.6 The Numbers of Tourists in the Three Cases

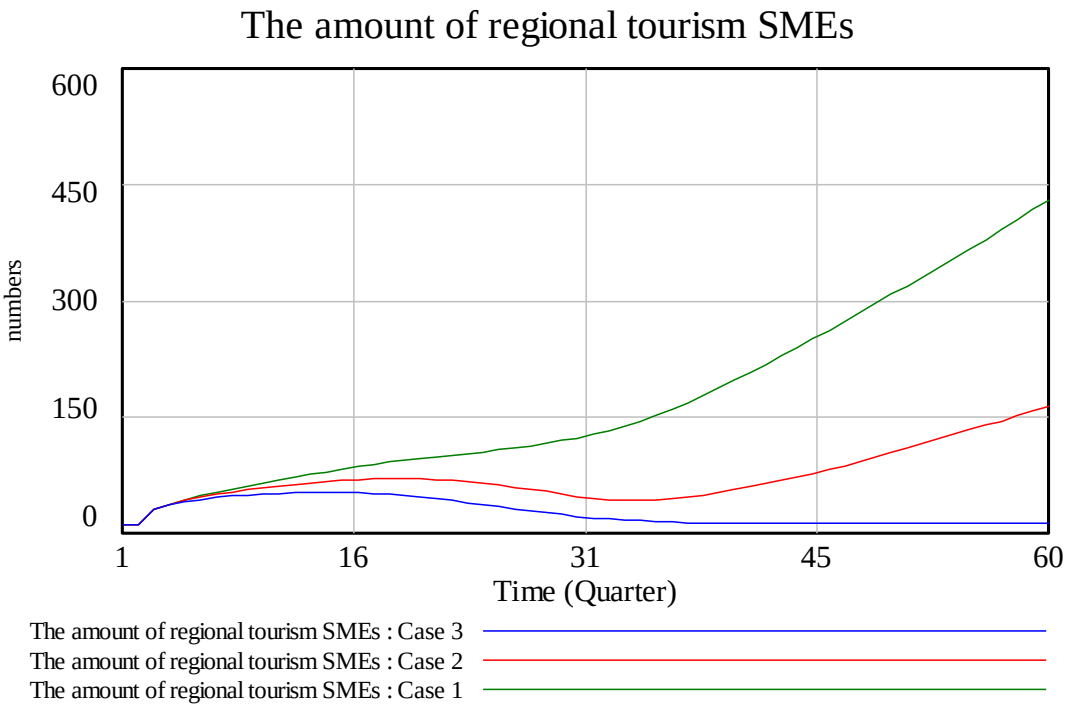

Figure 7.7 The Amount of Regional Tourism SMEs in the Three Cases

7.2 Interviews and Focus Group for CIVNDA and uVoyage Service Platform Design

To understand the effect of the proposed artifacts - service ecosystem for value creation in SDL, CIVNDA, and the uVoyage service platform, the micro viewpoint of evaluation in this part combines both interview and focus group data to uncover valuable insights. In Chapter 5, service ecosystem for value creation in SDL is proposed under three propositions. Proposition 5-1 is about the development of a value network which should not only emphasize economic and environment aspects, but also the social aspect. Second, in Proposition 5-2, service ecosystem for value creation in SDL assumes customer service experiences represented by imagery could be references for businesses to allocate their resources for cooperative service design. Third, Proposition 5-3 assumes the imagery from customer service experiences could positively influence service value creation. On the other hand, uVoyage is designed to implement the idea of CIVNDA for productivity, innovation, and growth improvement. Therefore, the three propositions and uVoyage design are emphasized in the data analysis of the interviews and focus group. Table 7.2 summarizes the information of the interviews and focus group in this study. Table 7.3 summarizes the important stakeholder in the interveiew.

Proposition 5-1: The development of a value network for value creation evolves with economic, social and environment systems.

Proposition 5-2: Customer service experiences are the references for cooperative service design.

Proposition 5-3: The imagery of cooperative service design positively influences customer perceived service value following service experiences.

Table 7.2 The Summary of the Interviews and Focus Group Data in Mt. Pillow Leisure Agriculture Area

Stage	Date	Type	Number of Participants	Participants Information	Topics of Interview
1	2009.12 to 2010.03	Interview	24	14 SMEs 2 Ownerships 8 Residents in Mt. Pillow	To understand the situation of the leisure agriculture operation, regional leisure industrial development, regional leisure industry organization operation To investigate overall impacts of leisure industry development on the natural ecology, environmental resources, history and culture, and area residents
2	2011.06	Focus Group	7	7 SMEs in Mt. Pillow	To demonstrate the uVoyage preliminary design To understand how the emotional feelings resulting from the tourist's service experiences influences to SME's brand and images To understand the influences of customer-driven cooperation to tourist's service experiences, SME's brand and images
3	2012.02	Interview	3	3 DOC members in Yilan	To understand the factors to improve regional tourism development To understand the effects of uVoyage design in the improvement of regional tourism development in productivity, innovation and growth perspectives
	2012.03	Focus Group	8	6 SMEs in Mt. Pillow 2 DOC members in Yilan	To demonstrate the uVoyage design To understand the effects of uVoyage design in the improvement of regional tourism SME cooperation

Note: Total 34 SMEs in Mt. Pillow in 2010

Table 7.3 Important Stakeholders in the Interviews

Role	Background
Ownership A	He is the pioneer in Mt. Pillow for regional development and holds many infrastructure improvement projects in Mt. Pillow. He was the former Secretary-in-Chief in regional development association and is the opinion leader in the community.
Ownership B	He is the first one who successfully develops the composited farmstead in Mt. Pillow. He is now the Chairman of regional development association in Mt. Pillow.
Simple-type leisure farm operator A	She is the pioneer in Mt. Pillow for regional development and participates many marketing projects in Mt. Pillow. She also holds cooperation with other SMEs and finds resources to improve the services in Mt. Pillow.
Hostel operator A	He is a hostel operator in Mt. Pillow. By using internet marketing, his hostel is very famous. Many idol dramas want to shoot here.
Hostel operator B	She is a senior hostel operator in Mt. Pillow. With good service quality, most tourists recommend her hostel to others.
DOC member A	She is a senior DOC member in Ilan who responses for the regional development in Nanao Township.
DOC member B	He is a senior DOC member in Ilan who responses for the regional development in Mt. Pillow. He hold many computer course to improve the IT skills of SMEs in Mt. Pillow.
DOC member C	She is a junior DOC member in Ilan.

7.2.1 The Development of a Value Network

For the development of a value network concerning the balance between economic, social and environment systems, the interview data in Mt. Pillow Leisure Agriculture Area shows the considerations when SMEs and the organization owners developed their tour services. In Chapter 4, the development stages of tour region indicate the economic activities evolve with the changing needs of customers. The role of organization owners is to facilitate cooperation between cluster SMEs. In the beginning, in the individual operation stage, improvement of the economic aspect is

the primary concern. Making people know and experience products and services in the individual operation stage is the key to transforming from the production and marketing transformation stage.

[Data Section 7-1 / Role: Ownership A]

This is a unique fruit in our region. We have superior quality to this same breed of fruit in Southern Taiwan. ……. A lot of mass media come here and make advertisements. Imperceptibly, they help us market our village. …… Once the advertisements appear, people would like to come here and then bring us income. Therefore, we keep doing this for development.

We are not like large enterprises that build large farmsteads. We can only say we have a starting point (Region) and then keep establishing new points (SMEs). Until these points are complete, we have a group and then have more things to do such as education, our marketing, product packaging, and certification. We need to establish a complete mechanism for these.

To advance from the individual operation stage to the integrative operation stage, a value network keeps finding partners and customer feedback. Expending B2B and B2C relationships in a value network is essential. However, the background of each SME owner differs in age, education, experiences, business items, and views on regional development. In Mt. Pillow Leisure Agriculture Area, some SME owners are local residents, but some SME owners are from other regions or retired from other industries and then came back to YuanShan. The different concepts of business management for SMEs may be the obstacles to their cooperation. During a value network formation, the value dimensions in identification and delivery may differ for each participant. The synergy of a value network may not be achieved when a value network fails to recognize and share common value in value network formation.

[Data Section 7-2 / Role: Ownership B]

It is because they have no values. When you work together but the performance is not good, do you want to cooperate? ……. Their concepts are old and out-of-date.

For example, we want to do industrial management, regional management and clean our environment but they do not. We wanted to upgrade our service quality but they felt it was too much trouble. It is not easy. They are from local areas and it is difficult to change their ideas. How can you cooperate with them? Why do many B&Bs comes from outside or from retired public officers? It is because they have experiences and newer ideas.

It's an education problem. Farmers need to be educated because they are used to working from dawn to dusk. …… Now they are good at communication (with customers) …… Additionally, the public administrations sometimes hold education trainings. …… The class leader was awarded the top performance prize. This person can benefit the village. …… He changed the training of the farmstead and brought new knowledge and skills to these farmers. This is not only an artistic exchange, but also an emotional exchange. This is a chance to reach a regional consensus. You know, this is priceless.

The shift from an individual operation stage to integrative operation stage involves customer participation. SMEs should integrate their features and capabilities to satisfy the dynamic needs from customers. Regional consensuses become important for value network creation, especially in the integrative operation stage. Therefore, in addition to economic development, the consensuses in social and environment aspects should also be crucial to achieving the sustainable growth of a value network evolution. In, Mt. Pillow Leisure Agriculture Area, holding education training is one way to shorten the gaps between SMEs and reach consensuses. For example, some SMEs had poor service quality and the negative service experiences from tourists had harmed the image of Mt. Pillow Leisure Agriculture Area. The education training for service quality upgrade tried to build the regional consensuses in service quality and share experiences for service quality upgrade.

[Data Section 7-3 / Role: Ownership A]

After this, the education level has been upgraded progressively. Our attitude toward services is the key. If we are ….uh… unfriendly, they will not be happy, of course. When you come here once, you will tell other people there are many impolite people

at Mt. Pillow. This is why we need to improve. For the service quality, indeed, we need to achieve a certain level…… We have a good idea, a store to ask for directions. …… We put a question mark there. It is also a good direction and local people there will kindly answer questions for tourists.

In fact, we still have long way to go. The spontaneous participation of the villagers is very important. …… In 2006, the education program for the village began, there were six quotas for us, but no one wanted to join. ……. Now, after 2010, many communities are willing to join. They are willing to devote themselves to their hometown development and find problems. Public administrations also sent professionals to teach classes. Villagers then understand how to agglomerate their capabilities to enhance the environment and seek opportunities to improve the economy.

The common goals for regional development such as service quality for tourists are formed with regional consensuses including the development of regional features, communication with government, and environment protection. Once the local residents establish the method to form consensuses, the evolution of the value network in this region can advance from the community development stage to full transformation from GDL to SDL. In this case, the value creation in the tour service system should involve economic, social and environment systems, as stated in proposition 5-1. Table 7.4 summarizes the finding in the development of a value network with different stages.

[Data Section 7-4 / Role: Ownership A]

We, Mt. Pillow, are a model community that has a convention for residents. There are not only regulations but also consensuses. In the future, not only the environment but also the buildings or the surrounding area in our life will be included in the convention. Everybody should exercise some self-restraint. Everyone can discuss the convention until everyone can agree. This is the way to build the village and community. This is not only good for us. We live here and do business. We should maintain the environment well and then tourists are willing to come. Even if our environment is awesome, but the service is not good, this is a minus and tourists will not come again. Tourists come again because of the good

environment, or good services. If I want to buy fruit, I can go to the market. What kinds of fruits can I not buy? I don't want your fruits, but maybe I just ask for a direction, and then buy some fruits for presents. This is just a feeling that residents should understand.

Table 7.4 Summary of Findings in the Development of a Value Network with Different Stages

Stage / Viewpoint	Production And Marketing Transformation Stage	Individual Operation Stage	Integrative Operation Stage	Community Development Stage
Economic	Sell product and establish sale channel. The economy is the primary focus.	Establish marketing channel and diversified products and services. The economy is still the primary focus.	Create network and find new value for customers. The development of economy is the outcome.	Develop economy for regional growth.
Social	Not focused	Not focused.	Search for consensuses.	Reach regional consensuses.
Environment	Not focused.	Not focused.	Raise awareness to environment protection.	Keep environment well for sustainable regional growth.
Evidences in the Data Sections	Data Section 7-1	Data Section 7-1, 7-2	Data Section 7-2, 7-3	Data Section 7-3, 7-4

7.2.2 Customer Service Experiences and Service Imagery as the Input for Service Design

This section attempts to understand the importance of tourist's service experiences for the SME's brand image. Here, the brand image is used as an analogy for the destination image of a tourism region. The brand image is a part of the destination image (Prebensen, 2006). In destination image theory, the tourist's organic images of a destination are affected by service experiences. Tour services from tourism SMEs experienced by customer influence their images of SMEs and the destination. Customer service experiences are the feedback to business in the service economy. In this case, customer service experiences should be an important input to tour service design. However, the theory of destination image only concerns the changes in customer perceived images, the organic images, from a customer's perspective. The induced images in the destination image theory which are the marketing information from businesses to customers or customers to customers are not related to customer service experiences in destination image theory.

In the tourism case, from tourism SME's viewpoint, the changes in tourist images following service experiences could be the important sources to improve their service design. In Mt. Pillow, there are some famous SMEs which have already built their brand, but also some nameless SMEs which have no relevant images for customers. However, for the SMEs that are not famous in a region, it is hard for them to get feedback from tourists. When nameless tourism SMEs have less chances to get feedback from tourists, their images may only be kept by experienced tourists and have less chances to be spread in the tourist network.

[Data Section 7-5 / Role: Simple-type leisure farm operator A]

We know the importance of tourist's feelings and their service experiences. However,

we do not know how to create specific service experiences for tourists. We can only focus on our profession in agriculture.

As far as I know, there are only a few tourists who want to share their service experiences to others on the Internet on behalf of us because we are only SMEs. When there are few service experiences shared on the Internet, it's hard for us to be searched.

Some tourists came here three years ago, and they are still impressed by our service. They are indeed like our service. However, no one wants to share his/her feelings after experiencing our services. I have seldom seen a blog article on the Internet praising our services. Sometimes, this is really frustrating. Unless we can give some incentives for tourists, such as a service discount, tourists may be unwilling to share their experience on the Internet. I think we need to provide incentives for them.

I know there is a bed and breakfast in our region which has lots of interactions with tourists. The owner is skillful with IT and posts articles on the Internet. They are very famous after an idol drama camera shoot at their bed and breakfast. Tourists can feel the atmosphere of that idol drama when entering the bed and breakfast. There are also many articles sharing the experiences there. Their booking is always full. Recently, they invited an actress to take a picture in their bed and breakfast. They put these pictures on Facebook. I think they can attract more tourists.

From data section 7-5, the SMEs think the tourists' feelings and emotions after service experiences are not only important for their service promotion, but also crucial for their identity. From the stories shared by SMEs, the brand images which a famous SME has may attract tourists. When the image of "idol drama" is built for the SME, tourists who desire for it would be attracted. The tourism SME with the "idol drama" image could build its brand. However, the tourism SME who has a clear brand identity could have definite customer segmentation. The enforcement of a brand strategy for famous tourism SMEs is to keep their brand images associated with their brand identity.

Therefore, a famous B&B with the "idol drama" image in Mt. Pillow says: (Data Section 7-6 and Data Section 7-7)

[Data Section 7-6 / Role: Hostel operator A]

In fact, the operator is the key to winning the decisive point of the leisure industry. The concept of the operator, your brand, and your imagery is important to your brand image. When word-of-mouth and brand images we have built reach a certain level and my market segmentation is right, I definitely drop customers who are not suitable to my segmentation.

You should clearly define your customer segmentation. …… Because that segmentation is not mine, I will not pursuit for it. It harms your products when you get it. I insist on finding my right segmentation.

The price can filter customers. I will not engage in a price war. You can see that I did not offer any discount for him for the second day reservation. If you can insist, you will find your best segment.

Clearly, when a SME has reached a certain degree of fame and built its own brand, it means its service or product design can successfully attract its desired customer segmentation. In data section 7-5, the brand strategy performed is close to the economic approach and identity approach in brand management, which is concerned with 4P (product, price, place and promotion) and service experiences from customers to create images. However, the value creation of these approaches is primarily from marketer to consumer (Heding *et al.*, 2006). In other words, the tourism SME designs it services and product for its target customers and creates its expected customer service experiences to meet its brand image.

[Data Section 7-7 / Role: Hostel operator A]

I want customers to say "Hey, Is there any room for me?" and then reserve and pay deposit. Long-winded customers will not reserve after negotiation. Believe me, it is true. It is my experience.

The image, atmosphere, and feeling are what I want to sell in my B&B. The image of the idol drama for my B&B is really helpful. Customers want to experience this atmosphere, this scenery, and this feeling.

In fact, in my operation experiences in these five or six years, there were really

many businesses wanting to cooperate with me, but I refused them all. I have never cooperated with any business. …… This is because I cannot control their customer segmentation. Recently, a wedding company in Yilan wanted to cooperate with me. …… He did not ask me for a discount. I still refused because I could not control his customer segmentation. When I cannot control the customer segmentation, I cannot control customer satisfaction. ……. I just want to protect my products. ……. We should build our brand image.

Not only for customers but also for businesses, the famous tourism SME strictly enforces its operation strategy with its strong brand. It selects appropriate customers to serve for planned and predictable customer service experiences to enhance the image of its brand. Therefore, cooperation is refused. In this sense, the famous SME spends its resources on designing service and products by itself and filters appropriate customers attracted by its images. The expected customer service experiences from the famous SME would be close to customers' perceived service experiences. The famous SMEs can not only effectively reduce non-value creation, but also create customer perceived value. The strategy of the famous SMEs can successfully reduce the non-value and waste in the service system. However, not all SMEs can apply this strong strategy. A relevant and famous brand is the key to applying this strategy, but it is not easy to achieve for all SMEs. On the other hand, the strict customer filtering and refusal to cooperate may be good for a SME, but it may not benefit the regional tourism development. Therefore, for most tourism SMEs without relevance and or a famous brand, there should be another way to develop.

In Data Section 7-5, the nameless SMEs in Mt. Pillow also worried about the lack of incentives to encourage service experience sharing among customers. The primary concern for SMEs is the effect of emotions on their brand images, which is the lack of feedback from customer interactions. To deal with this dilemma, the SMEs lack of fame encourages *ad hoc* service cooperation. Service cooperation occurs when

a group of customers contact one of them in Mt. Pillow and specify desired services under a fixed budget. The SME who is contacted by customers initiates the cooperation and find partners to meet the customer's needs.

[Data Section 7-8 / Role: Simple-type leisure farm operator A]

Customers come here. They may stay a night, go to a hot spring in Jiaosi, or ride a bike in Meihua Lake. They can enjoy many places in two days. Therefore, they may be attracted by the idol drama B&B which shot a famous idol drama. They want to go there and experience the atmosphere there. However, customers may watch TV and know it is fun to ride bikes at Meihua Lake. They want to ride a bike there. …… Therefore, they may not be interested in your service journey.

We always design service journeys according to customers' needs and it depends on the group, students, company or age. There are high, medium and low price B&Bs. For example, young people do not worry about expense, they want desired feelings. …… Therefore, everyone has different needs. Customers pay for services and they are the boss.

Everyone has different needs and so many needs have to be met. We design services according to their needs. I ask them the size of their budget, how much time they have to stay, what feelings they want to have, and who is with them.

Unlike famous SMEs, the induced images of nameless SMEs are not strong enough to attract tourists. The lack of fame makes the identities of these SMEs' features irrelevant for tourists and they cannot fit tourists' organic images. Therefore, interactions with tourists to communicate what tourists become important for service journey design and results in better customer service experiences.

[Data Section 7-9 / Role: Hostel operator B]

Usually, they will tell us when they will come, how many people there will be, and what kinds of services they want. They are happy with my arrangement. They are satisfied with the cooperative services because they don't waste time on searching through all of the SMEs in this region. Therefore, they usually tell us what they want and ask me for suggestions. I always propose different suggestions. The different suggested journeys may be suitable for an old man, young man, or free

walker. Customers will choose the best one for them. After they experience our cooperative service they selected, they feel satisfied.

They are willing to recommend our cooperative services to others. I have some customers in this month who were suggested by my previous customers. However, the needs of customers always differ, and they may have different feelings and emotions after the service experience due to the differences in age and background. We hope our cooperative service can be searched by customer according to their needs. This is our expectation for uVoyage.

The cooperative services positively influence customer interactions. SMEs gain knowledge and experiences in the design of cooperative services with customers. They learn the different preferences and needs of different customers. Then, they try their best to fulfill customer needs using their resources and capabilities performing customer-driven cooperation.

[Data Section 7-10 / Role: Simple-type leisure farm operator A]

It was difficult because I found I customized services for them. For the tourists who never come here, frankly speaking, they don't know the exact condition here. The blog or internet may not always be true. …… After they have been here some times, tourists who clearly know here would like to make a phone call to me to ask what activities are held here, how much they cost and whether I can design a trip for them?

However, they may not come here to play. This is because they want to experience other places. I can tell you tourists are capricious. They usually don't want to stay at the same hostel again, unless they have a specific imagery for you.

You know we have cooperated and worked together many times. I was worried about it. I found partners, simulated (the service processes) once, went together with customers, and monitored the entire journey. When there were problems, we discussed what we should do, should not do, should say, and should not say after the end of journey. After several run-throughs, we reached a tacit understanding. Then we designed the journey according to customer needs and preferences such as DIY or other joyful activities. We have established this model.

The cooperative services initiate a reinforcement loop for nameless SMEs to

create more service value for customers than before. In this sense, the service system for nameless SMEs which design value propositions by considering customer needs from previous service experiences differs from the famous SME. In other words, the previous feedback from customer service experiences helps SMEs understand the value of each service and the image from customers. The service value and non-value identified by customer service experiences can be reviewed as the input of future service design. Therefore, the value proposition from cooperatives services has improved to meet customer organic images, which do not point to an obvious destination.

However, the images from customer service experiences are the same as brand images, which have a clear strategy and identities for a business. Cooperative services to fulfill customer organic images in a tour region integrate different services of nameless SMEs. Therefore, the images that cooperative services created are not for a specific brand of SME. It should reflect the service journey for the specific customers for specific service experiences. The images for the customized service journey can be viewed as “service imagery” which describes the goals of these cooperative nameless SMEs after communicating with customers. Under this circumstance, the service imagery is co-created by both service providers and customers. In the service system, the service value propositions are designed to realize service imagery. When the service imagery is close to customer organic images with appropriate communication, the service value perceived by customers should be improved with customer expected service experiences. The non-value creation resulting from service experiences can be reviewed. For example, the SMEs arranged DIY tea for the teenagers but the teenagers felt bored. The review of the non-value creation in the service process according to customer feedback can be the input for future improvement of the

service journey design. In the next service encounter, the SMEs should not arrange DIY tea for teenagers and may consider DIY tea is more suitable for old people. On the other hand, the analysis of service design for the entire service process also helps understand the pros and cons of each SME in terms of the cooperation and role in the network.

In general, the results of the focus group aid evaluation by investigating two different models for tourist service provision. Table 7.5 summarizes the differences between two types of operations, the brand operation strategy from a famous tourism SME and a customer-driven cooperation strategy from nameless SMEs.

Table 7.5 Summary of Findings in the Different Operation Strategy in Yilan

Type / Viewpoint	SMEs with Brand Operation Strategy	SMEs with Customer-Driven Cooperation Strategy
Famous of Brand	Have established relevant brand perceived by customers [Data Section 7-6]	No relevant brand perceived by customers [Data Section 7-5]
Operation Strategy	Set customer segmentation and maintain brand identities [Data Section 7-6] [Data Section 7-7]	Cooperate with other SMEs [Data Section 7-8] [Data Section 7-9] [Data Section 7-10]
Service Design and Customer Interaction	Sell self-designed services for customers in predefined customer segmentation Customer interactions are the sources of the verification for brand strategy [Data Section 7-6] [Data Section 7-7]	Design services according to customer needs, preferences and interactions Customer interactions are the sources of the service design [Data Section 7-8] [Data Section 7-9]
Considerations when Cooperation	Consider the fitness of customer segmentation and brand images [Data Section 7-7]	Consider the customer needs and preferences [Data Section 7-8] [Data Section 7-9]
Customer Service Experiences	Customers experience the service designed by SMEs to fulfill their images toward SMEs [Data Section 7-6] [Data Section 7-7]	Customers experience the service designed by both SMEs and themselves to discover the images toward the services of SMEs [Data Section 7-9] [Data Section 7-10]

7.2.3 The Evaluation of uVoyage Service Platform Design in Tourism

uVoyage is designed as an ICT-enabled platform to serve the tourism industry. The main ideas, design, function, and modules are described in Chapter 6. To evaluate the design of uVoyage, this research interviewed three members of the Digital Opportunity Center responsible for digital divide education and also demonstrating uVoyage for SMEs in the third stage. Currently, YuanShan and Nanano are the working places of the DOC interviewees. They use Facebook as an electronic commerce service platform to help SMEs sell products on the Internet. However, they lack the time and business model to manage the platform on the Internet. The total turnover is far lower than they expected.

[Data Section 7-11 / Role: DOC member A]

We have tried to promote e-commerce, but the performance was not good. It was probably because our e-commerce service platform was nameless. Therefore, we used the blog first and then changed to Facebook. In addition to the statistical function, Facebook is famous and has more users than our blog platform. ……. Facebook has better visibility. I can post my messages and so do my friends. People who do not know our group can also search our information. Therefore, it is better than our previous platform.

Clearly, the current e-commerce platform in YuanShan primarily focuses on the operational level such as operational resources and platform functions and the sources of customers. When a service platform lacks operational resources, the operation of the service platform could be in a vicious cycle and be unable to benefit regional development. The number of members in the platform and service quality should be affected due to a shortage of operational resources. However, in addition to operational resources, the key point to developing an e-commerce service platform is the attractiveness of the destination. In the case of Mt. Pillow, few SMEs are famous on the Internet and most SMEs are operated by elderly people. Finding and building features and images for SMEs in Mt. Pillow are crucial for their future development.

[Data Section 7-12 / Role: DOC member B]

This is because the operators in Mt. Pillow are old. Like me, I am over sixty years old. However, another famous B&B operator is also about sixty years old. In the beginning, most SMEs here did not have any computer skills. We can use computers because DOC teaches us how to use and operate them. However, at our age, we cannot operate computer as proficiently as the famous B&B, which utilizes Facebook every day. Therefore, his visibility is good and so is his business.

In the uVoyage service platform, imagery-based search and cooperation are two main features. In brief, the goal of these two features is to help SMEs find and build their features and images in a destination.

[Data Section 7-13 / Role: DOC member C]

If customers use imagery-based search to search SMEs, it is possible for SMEs with weak images to find their position. If the SMEs already have a strong image, it may not have relevant changes for them because they have imprinted these images in customers, and customers search for them based on these images. However, for the SMEs which are unsure of their images, they could understand what feelings are perceived by customers and then consider whether or not to change.

The imagery-based search in uVoyage is considered more useful for SMEs without obvious images rather than famous SMEs. In traditional search using keywords, famous SMEs may have more chances to appear higher in the ranking than nameless SMEs. The imagery-based search can use customer service experiences to label the image attributes for each SME so the search results can reflect the true images of SMEs.

[Data Section 7-14 / Role: DOC member A]

I think in comparing imagery-based search with keyword search, keyword search has more limitations than imagery-based search. For example, when I want to search YuanShan, I should search "YuanShan" or "Mong Lung Pi" as the exact keywords. Images are fuzzier, so you can find comprehensive results. However, I think when your images are very broad; they may not match any, meaning the images contain lots of features or no features.

I think sometimes their problem is an insufficient amount of features and a lack of attractiveness. However, I think they can use uVoyage to find their own features by

themselves and then implement these features rather than improve the features from the viewpoint of other people.

The application of imagery-based search is not only to change the traditional functional-based search, but also to provide information to SMEs for innovation opportunities. When the SMEs features are revealed from customer service experiences and expressed by images, the first method for SMEs is to try to enhance their own features. Another way to use imagery information is to verify the designed imagery discovered from the interaction with customers, because the imagery for a SME changes progressively with customer service experiences in uVoyage.

[Data Section 7-15 / Role: DOC member C]

According to what you introduced, if SMEs can know everyone comes here from uVoyage because the people start to have destination images from the region, SMEs can develop in this direction. This is to meet tourist needs. When tourists want these feelings, SMEs would be like to provide these feelings. Therefore, when the images between tourists and SMEs become closer to closer, the productivity of the region may increase. For example, everyone would mention the old street in Chiufen and think about the nostalgic things. When you want this atmosphere, you would be there to find the desired atmosphere. Therefore, this is way I think there are more and more stores selling nostalgic things in Chiufen Old Street. When more people go there, the images become clearer and clearer.

While imagery-based search provides an innovation opportunity for SMEs by discovering possible imagery for growth, imagery-based cooperation aims to integrate the imagery of SMEs in a region. Therefore, when a destination already has its own images such as Chiufen, SMEs with similar service imagery may have greater chances of attracting tourists than unique ones. However, there should be some differences between SMEs in the same region. To create service imagery close to the destination image, imagery-based cooperation is helpful to achieve the goal. In addition, uVoyage can facilitate the cooperation of SMEs, which aim to design attractive and unique imagery for productivity improvement.

[Data Section 7-16 / Role: DOC member A]
For the influences (of uVoyage) on the products, it may be like that when I have agricultural products, accommodation services but no food service, food services may be worthy to develop. A new product or service development such as a restaurant with some special features may be considered. In other words, if there are different kinds of SMEs, I can know who I should cooperate with, what kinds of services I lack and develop new services for customers to feel like a resort.

In sum, the discussion in uVoyage shows the needs of the e-commerce service platform and the possible influences of imagery-based search and cooperation. In addition to operational resources, how to demonstrate and create the images of a destination and imagery of SME services are crucial for platform development. The imagery-based search which works in a different way to keyword search is also considered helpful for SMEs to identify their features and images and discover innovation opportunities from customer service experiences according to Data Section 7-13 and 7-14. Additionally, the imagery-based cooperation for SMEs is viewed as a tool to integrate imagery from different SMEs to satisfy customer expected images for a destination or journey. Data Section 7-15 and 7-16 also shows the potential of the imagery-based cooperation for the positive influences on SMEs productivity.

7.3 Discussion

From the evaluation of the three design artifacts in both macro and micro viewpoint, in the macro part, the regional tourism ecosystem model shows the competition in terms of tourism resource consumption, innovative service cooperation, and destination image changes. The results imply cooperation for innovative services according to tourists' needs is important for tourism ecosystem development to increase operant resources. The increased operant resources mean the service in a tourism region can attract tourists. When there are more SMEs to sustain an

increasing number of tourists, then the productivity of a region is enhanced and the prosperity of this region is also improved with the establishment of a service value co-creation system. In other words, to help the development of tourism services in a region, increased SME productivity and innovation capabilities significantly affect the growth of SME clusters in a system dynamics simulation.

In the micro part, the three stages conduct interviews and a focus group for evaluating the service ecosystem for value creation in service dominant logic, customer-driven and imagery-based network design concept, and an uVoyage service platform design. The three propositions 5-1 to 5-3 are shown in Chapter 5. Therefore, the evaluation also aims to study the design of uVoyage, which tries to increase productivity and innovative service for tourism region growth. From the three-stage interview and focus group, the three propositions in the conceptual framework of the service ecosystem for value creation in service dominant logic (Figure 5.4) can be explained using the tourism industry. From the different SME operation case in Mt Pillow, this study defines "Service Imagery" used during service design. Figure 7.8 shows the relationships between service imagery and the tourism service system.

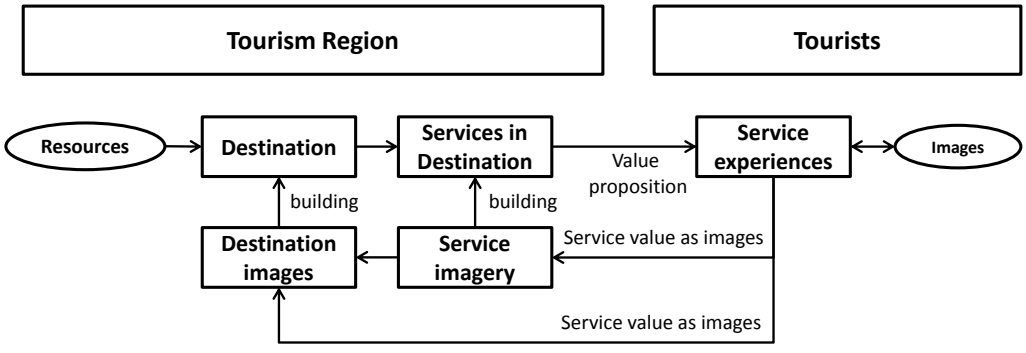

Figure 7.8 The Relationships between Service Imagery and Tourism Service System

"Service Imagery" is a description of service value from using images. Images are cognitive structures in human minds that are affected by human knowledge

(Beach, 1990). The outcome of service experiences continues to accumulate the service imageries to describe the services co-created by customers and businesses. The service imageries of services attached to a business or business network in a region can be discovered through interaction with customers. From destination image theory, images of a destination are simply influenced by customer service experiences and induced images from businesses. For Mt. Pillow, it has its own destination images for tourists, but tourists can only remember famous SMEs in Mt. Pillow. The brand images of these famous SMEs in Mt. Pillow are only parts of the destination images of Mt. Pillow because some tourists experience services from nameless SMEs. Under this circumstance, the service experiences of cooperative services of nameless SMEs are other sources to create different tourist service experiences. Since the service experiences for these customized cooperative services are perceived by different tourists, the accumulation of different service imageries can influence the cognition of the services and destination images in a destination.

For brand image creation, brand images can also be co-created with brand communities. In the evolution of a brand, four stages of brand development from unbranded, brand as references, brand as personality, and brand as icon describe the different value of a brand (Batey, 2008). The early stage, brand as reference, indicates the quality of products while brand as personality adds the emotional element to the meaning of brand and also customer involvement. In the final stage, a brand becomes an icon when it has social meaning and deeply connects with customers. Therefore, the meanings of the brand shift with the increasing influence of customers. However, a brand identity is a part of a business strategy and the brand images are used to evaluate and find associations with the brand identify (Aaker and Joachimsthaler, 2002). Service imagery, on the contrary, is not as complex as brand images from the

strategic perspective. Service imagery is triggered when service design is needed. In other words, from the service value proposition, businesses and customers keep interacting to negotiate "the expected service value outcome from service experiences". Businesses gain insights which include what they have seen and known from interactions with customers. The co-created service value proposition based on the shared service imagery between customers and businesses could effectively create service value for customers.

The relationships between the service imagery and its embedded services attempt to find how customer service experiences from co-created services influence service design. The difference between the service imagery and brand image can be primarily identified from the initiation of the process, vehicle, interaction with customers, and influences (table 7.6) (Heding *et al*., 2006, Batey, 2008; *Merz et al*., 2009). The four indexes for brand image and service imagery comparison indicate how they are created and interact with customers, where they attach, and what outcomes they result in. Therefore, the initiation of the process concerns the original brand image and service imagery and the vehicle means the objects the brand image and service image described. Interactions describe the creation and modification of brand image and service imagery and influences refer to the outcomes of brand image and service imagery.

Table 7.6 The Difference between Brand Image and Service Imagery

Features	Brand Image	Service Imagery
Initiation	Brand strategy and identify from business	Co-created value proposition by customers and service providers
Vehicle	Products, Businesses	Service, Service providers, Region, e-Service platform
Interaction	Interactions happen after experiencing products	Interactions happen in the service design, and during and after service experiences
Influences	Customers perception and interpretation of the attributes, benefits and values for products	Customers and service providers perception and interpretation of the attributes, benefits and values for the service design and experiences

For the value network design using service imagery, in the tourism industry, uVoyage is the service platform for implementation. The conceptual framework and architecture of uVoyage are proposed in Chapter 6 based on CIVNDA. To extend the CIVNDA to tourism service development, Figure 7-9 depicts the role of CIVNDA in regional tourism development. Business networks designed using CIVNDA aim to realize the goals discovered from tourists service experiences and represented by service imageries for the opportunities of regional tourism development. When tourists experience services, there would be gaps between expected services and perceived services according to the past experiences, needs, and word-of-mouth communication (Parasuraman *et al*., 1988).

In practice, the opportunities for regional tourism development cover the improvement in intangible services from tangible regional infrastructures. Therefore, from the macro viewpoint, the opportunities for regional tourism development cover not only the economic aspect but also the social and environmental aspect. The

participants in a value network can be businesses and community organizations. For example, the traffic to a tour region may affect the destination images perceived by tourists. Community organizations may play the enabling role in the value network to fight the budget for traffic infrastructure improvement. Education such as IT and business knowledge for local SMEs also play a role. The role of CIVNDA is to find appropriate partners to realize the development goals.

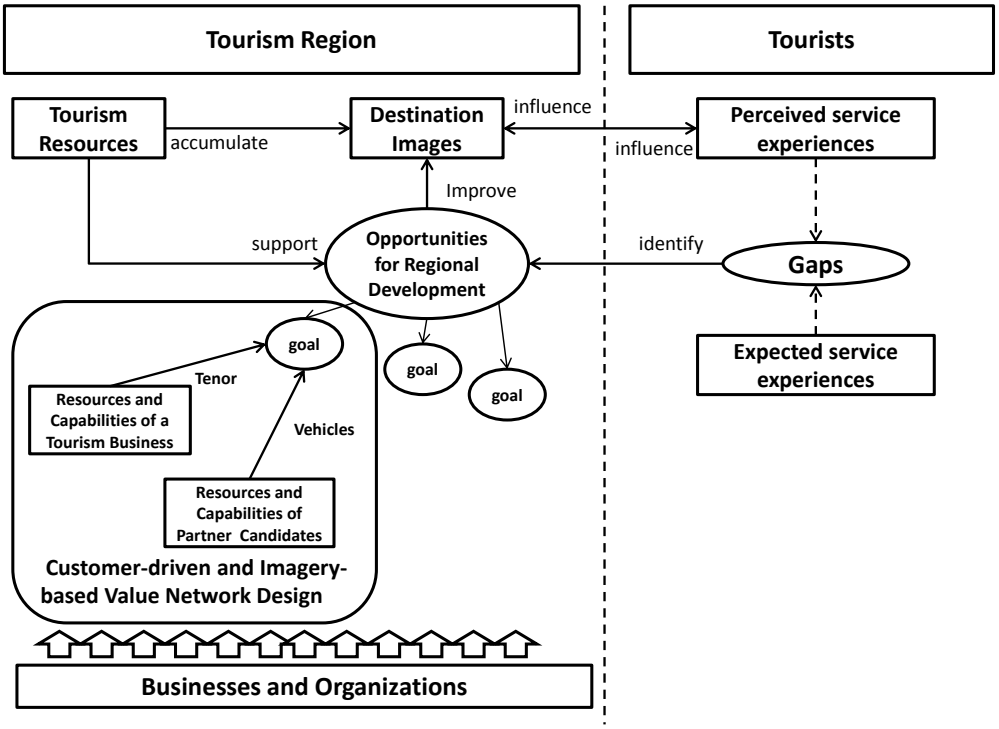

Figure 7.9 The Role of CIVNDA in Tourism Region Development

Further, in the service economy nowadays, economic activities are transforming from GDL to SDL. The proposed concept, service imagery, should have chances to be applied in different service industries due to the importance of the service design with customer interactions. When the decision of service value is shifted from service providers to customers, service providers desiring to improve their customer service experiences should review their value proposition. Therefore, CIVNDA using service imagery provides a foundation to design a customer-driven business network. In this

sense, Figure 7.9 can be further elaborated into Figure 7.10 to be a model for regional development.

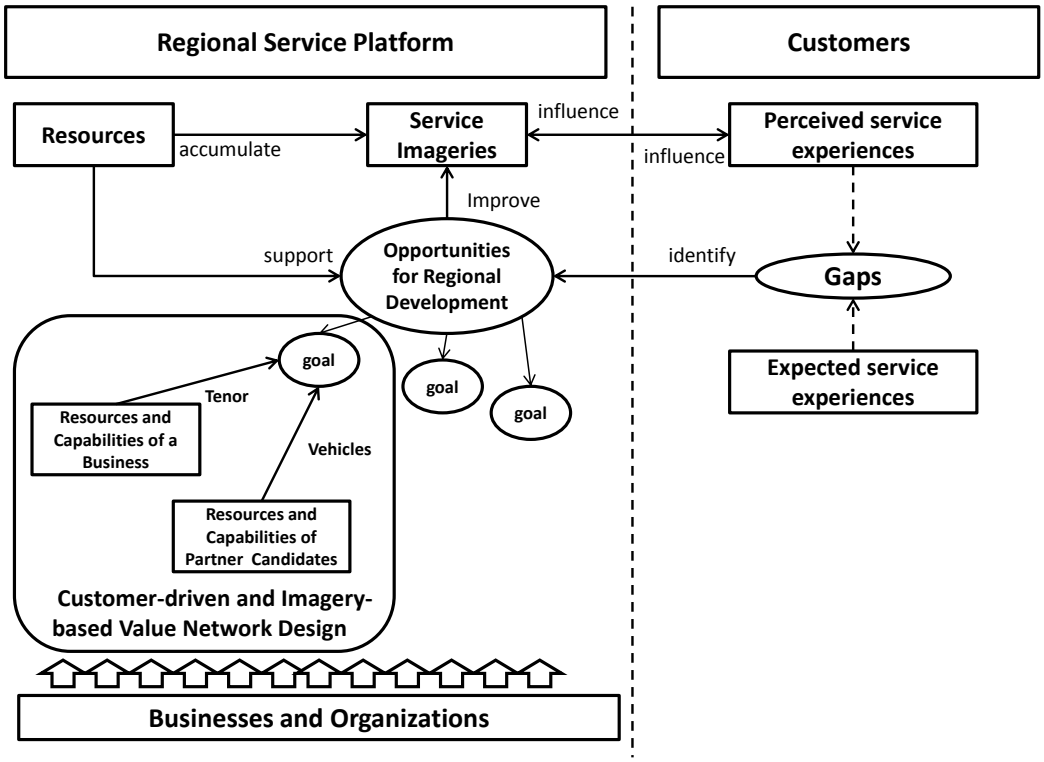

Figure 7.10 The Service Imagery-based Regional Development Model

The tourism region and destination images are replaced by regional service platform and service imagery separately in Figure 7.10. In the tourism case, a tourism region and destination are the vehicles for services. Tourism businesses develop their services using the resources from their own, social and environmental resources. Destination images are formed from the service experiences of tourists. Therefore, a region can be simply taken as an analogy to a tourism region. It can be a physical place (e.g. a city, a tour region) or an e-commerce service platform). For the destination images accumulated from customer service experiences, service imagery created from each co-created service can be used to describe customer understanding of a region.

For example, services for house sale and renting on the Internet can be a

platform. The entire service process for house sale involves different roles and complex customer requirements. House agents, escrow officers, house builders, sellers, and buyers are the members of the value network in the service. To deal with various needs from customers selling or buying houses, the interactions between agents and customers are the process to negotiate the service value proposition. Agents who understand the requirements from house buyers then try to find houses. Then, house buyers who go to see the house introduced by agents experience the service from agents and should create the service imageries to the agents and the entire service network. Finally, when different buyers and sellers experience the services from service providers on the e-service platform, service imageries should also be created for the entire service platform. Therefore, to increase customer satisfaction with the platform, service design and value network formation for service provision should be co-created with customers. Understanding the service imageries of customers with different needs and preferences would be also the key to the platform development.

In sum, for regional development, the application of CIVNDA can help bridge the gap to understand, discover and design appropriate and innovative service value propositions for customers and review customer feedback on services and regional development goals. By accumulating knowledge from the interaction with customers using service imagery, a highly productive and innovative growth value network can be expected to be formed for developing a region.

Chapter 8 Discussion and Implications

In this research, three main research questions are conducted to answer how cluster SMEs evolved with the trend of service economy. Chapter 4 concludes the four-stage evolutionary path to show the relevant business problems for cluster SMEs during the transformation from production to service economy. From the findings in Chapter 4, Chapter 5 proposes the two design artifacts – service ecosystem for value creation in service dominant logic and CIVNDA as the solution for the discovered business problems. Chapter 7 further integrates the evolutionary stages with the proposed the service ecosystem for value creation in service dominant logic to find the different characteristics of stages in economic, social and environmental perspective. For the service value evaluation, service imagery which is different with traditional value evaluation approach is proposed to represent service value in service dominant logic. The concept of service imagery as the core of CIVNDA is defined in Chapter 7. The ICT service platform, uVoyage, in Chapter 6, implements service imagery to facilitate a value network to enable value co-creation in cluster SMEs. From the evaluation in Chapter 7, the influences on productivity, innovation and growth of service imagery in the value network is further investigate. So, in addition to the three main design artifacts, the discussion in this chapter focuses on service imagery and the related concept – brand image.

8.1 Discussion

In this research, service imagery plays important role in the proposed service ecosystem in this study for value representation. For service imagery, the differences

from brand image have been addressed in Chapter 7. However, the similarity between service imagery and brand image is another issue to discuss because the study of brand is also evolving with the trend of the service economy. The discussion in depth on the relationships between service imagery and brand image can be regarded as the contributions to the knowledge base. Further, CIVNDA is proposed to apply to service system design in service industry. The current evaluation of CIVNDA is conducted in the tourism. It is also crucial to find the other possible service industry applications to show the impact of CIVNDA in the future. Finally, the development of information system in the service ecosystem for value creation in service dominant logic is discussed to understand the role of information system in value creation.

8.1.1 The Role of Service Imagery and Brand Image in Service Economy

The term “service imagery” is defined and compared with brand image. With the trend of the service economy, the meaning of brand is also evolving. In the study of brand, Heding *et al*. (2006) summarized the study of brand to seven approaches from 1985 to 2006. The seven approaches are economic (before 1985), identity (Mid 1990s), consumer-based (1993), personality (1997), relational (1998), community (2001) and culture (around 2000). The value creation of brand in these approaches are emphasized from marketer to consumer (economic, identity), consumers to marketer (consumer-based), the mutual interaction of marketer and customer (personality, relational), the interaction between marketer and community (community), and co-creation by marketer and customer (culture). Batey (2008) also proposed four stages for brand evolution which are unbranded, brand as reference, brand as personality, and brand as icon. The two taxonomies of brand management reveal the value of a brand evolves from functional and economic to social and cultural. In other

words, a brand can be assigned a socially assigned meaning when cultural contents are included.

In a service science study, Merz *et al*. (2009) argues for the evolution of the brand from an SDL perspective. Brand is viewed as an operand resource in GDL and shifts to an operant resource in the SDL viewpoint. The brand value creation also changes from value-in-exchange to value-in-use. Brand images perceived by different stakeholders in a value network become an important driver for brand value creation (Merz *et al.*, 2009). Therefore, a brand which is originally built for goods and services identification is evaluated by different stakeholders to understand its associations in attributes and benefits from stakeholders' viewpoints. Brand image in SDL plays an active role and becomes not only the foundation for brand association in the functional aspect, but is also for communication and social interaction in the brand value co-creation process. The value of a brand which means the benefits for a value network instead of the monetary brand value is co-created through the interactions between stakeholders in a value network. In other words, stakeholders such as customers, communities, employees and other service providers are the sources to discover new brand meaning to create innovative ideas for the brand.

A brand from a traditional viewpoint already has its value proposition proposed by businesses through their brand strategy (Aaker, 1996). When the meaning and value of a brand are determined by stakeholders, is it possible for a business to co-create its brand with customers? In this study, service imagery is proposed to point out the current position of services offered by service providers and can be used to design service value propositions. In this sense, service imagery for services, service providers, and regions is created from the stakeholder's perspectives. The negotiation between service providers and customers in Mt. Pillow can be viewed as evidence to

design the service through their diversified imagery. The service journey generated for customers would consist of the service imageries of service providers and located regions. The customer perceived and expected service experiences for value creation would be deduced through this active service design process. Therefore, the design of a value network which interacts with customers can shift from functional design or resource integration to being customer driven and process oriented.

For the position of service imagery and brand image in the SDL evolution, Figure 8.1 and Table 8.1 demonstrate the relationship between brand and service imagery. In the figure, the x-dimension of ”Sustaining” and “Generative” indicates the purpose of brand or service imagery creation in the market, and the y-dimension of “Functional design” and “Actors for change” means the contents of brand image or service imagery focusing on either functional benefits and features or new positioning in their value network. From the study of Heding *et al*. (2006) and Merz *et al*. (2009), brand image in the economic and identity approach is an operand resource and acts as an identifier for products. Brand value in the economic, identity consumer-based and personality approach occurs via value-in-exchange. Therefore, brand images are only the results of marketer strategies and act as references for products in a value network.

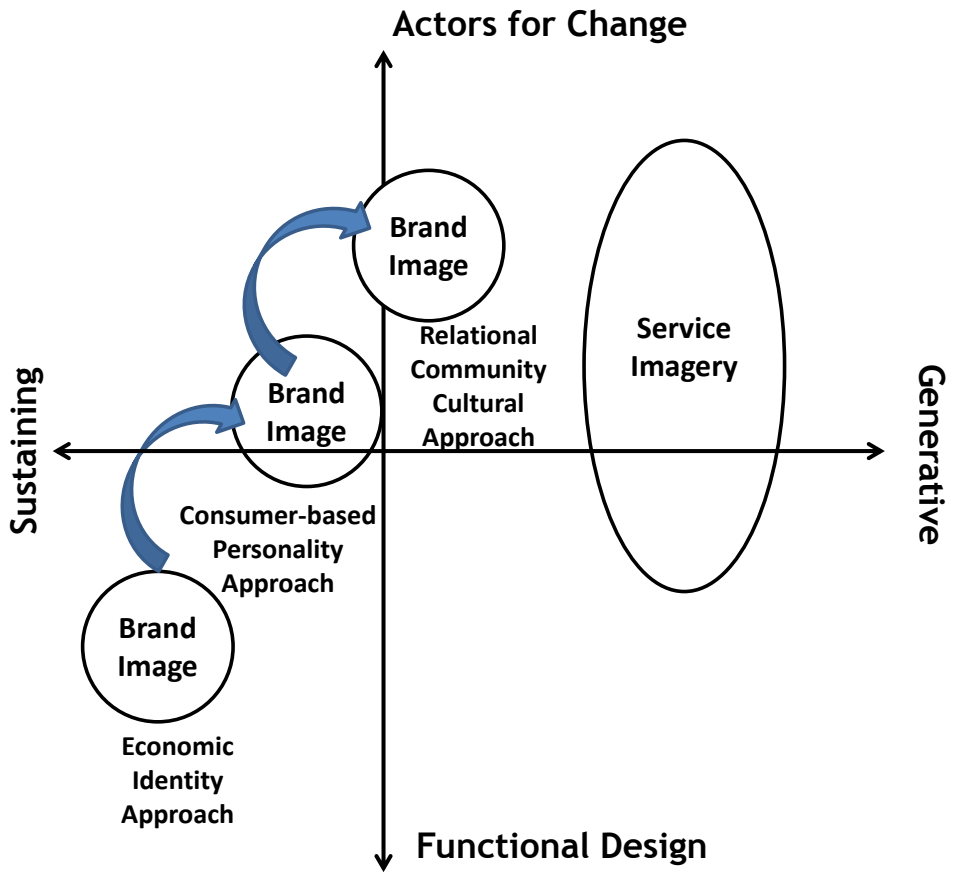

Figure 8.1 The Evolution of Brand Image and Service Imagery

From the consumer-based and personality approach, brands become both operand and operant resources due to the emphasis on the content and context of the brand. With the increasing competition in the markets, brands have evolved to have personality related to emotional meaning. How to promote and find benefits and value for the brand for customers are the key to competing with other brands. The associations of brand are not only in terms of function, but also the intangible and symbolic benefits. In this sense, brand images are shifting from only functional design to actors for change. However, brand value is still created via value-in-exchange. Although brands were known as operant resources to gain competitive advantages, customers were mostly viewed as operand resources rather than operant resources. In the consumer-based approach, a brand is formed from the cognitions of customers but the brand value is still determined by marketers.

Until the development of the relational, community, and cultural approach for brand management, brands were fully operant resources that were co-created with customers. Additionally, the meaning of the tangible and intangible properties of brand perceived and shared by customers would be expanded to the social and cultural level from the economic perspective. Due to the emphasis on the interactions between B2C and B2B, brand image exists not only to represent the result of the brand after service experiences, but also the process during service experiences. Therefore, brand image has an active role which is used by different stakeholders during communication in a value network. The position of brand image finally changes to generative and actors for change.

On the other hand, service imagery which is used for service design originates from SDL. Service imagery can exist in the service design and experience process. The identification of service imagery for services, businesses, and the region help configure both functional and customer-driven types of value network design. From interactions with customers during service design, service imagery for the designed service stands for the proposed benefits and value expected by customers and businesses under a specific context. Tangible and intangible needs and expectations of customers should be satisfied. The interactions crystallize service imagery and these service imageries accumulate in services, businesses and the region over time. Of course, the value of a service for specific service imagery results from value-in-use. The role of service imagery is not only for communication but also the elements, sources, and results in a value network design. Therefore, in Figure 8.1, the trends of brand image development are closer and closer to service imagery, which plays a generative and active role for stakeholders in a value network and seeks innovation opportunities from stakeholders.

In this research, two important applications for service imagery, the diffusion and generalization of service imagery, are also indicated. The tourism case in this study shows the feedback and reflections on images from tourists to the SMEs and tour region. For the diffusion part, when a business seeks partners to fulfill a service design challenge identified from customers, the cooperation may diffuse the image elements of service imagery for a business (Figure 8.2). This is because service imagery resulting from customer service experiences for the entire service journey may influence the entire service value network. In other words, a business cooperating with others may create a new service imagery experienced by customers and influence its original service imagery. Therefore, when a business is an active service provider in a value network, the synergy of the network may help businesses achieve or find new service imagery as a new position in a region. On the hand, a service provision or journey from business cooperation might be viewed as a whole from customers' viewpoint for the value propositions. When the value of B2B relationships is determined by B2C relationships, enablers in a value network should also receive some passive changes to their service imagery. The essences of service imagery and its diffusion therefore enable the potential innovation of operant resources of a business. A business can learn how to apply its operant resources in different way through the change in service imagery.

Table 8.1 The Evolution of Brand Image and Service Imagery

Category	Brand							Service Imagery
Approach	Economic	Identity	Consumer-based	Personality	Relational	Community	Cultural	CIVND
Logic	GDL	GDL	GDL	GDL to SDL	SDL	SDL	SDL	SDL
Value creation	Value-in-exchange	Value-in-exchange	Value-in-exchange	Value-in-exchange	Value-in-use	Value-in-use	Value-in-use	Value-in-use
Resource type	Brand as operand resource	Brand as operand resource	Brand as operand/t resource	Brand as operand/t resource	Brand as operant resource	Brand as operant resource	Brand as operant resource	Service Imagery as operant resource
Influences on a Value Network	Brand image as an evaluation result		Brand image as customer needs and emotions		Brand image as the driver for value co-creation			Service imagery as source and result of network design

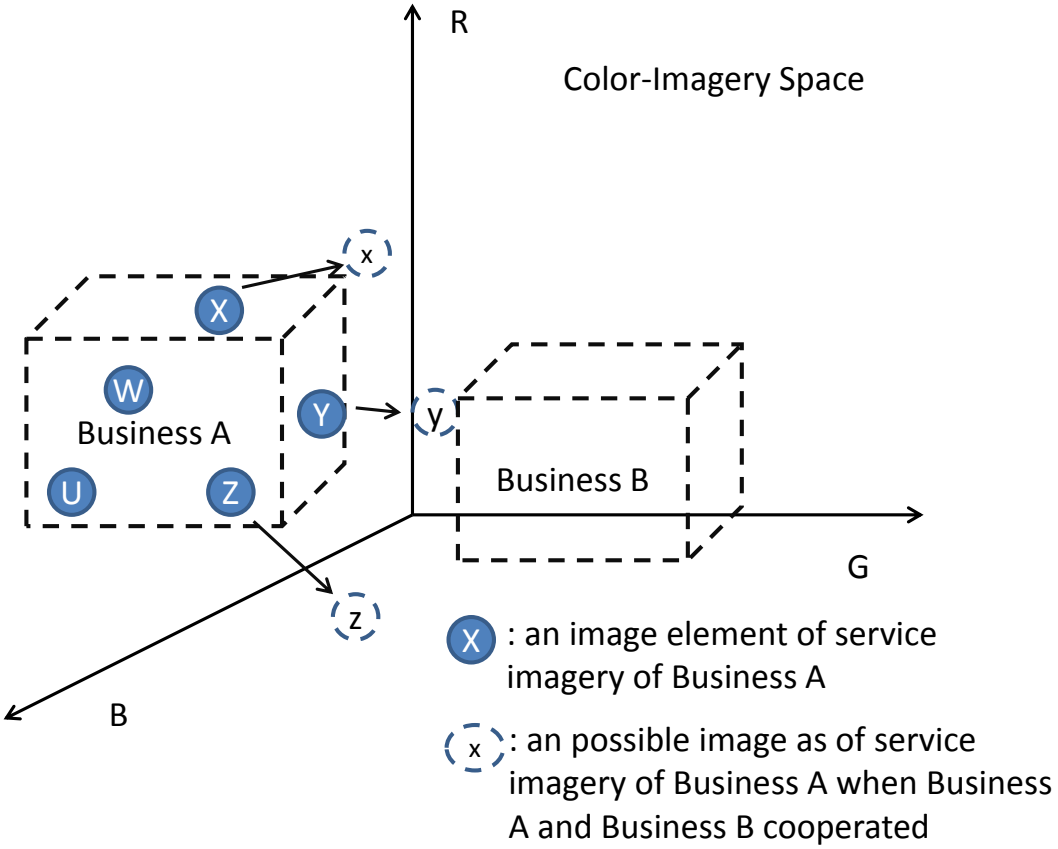

Figure 8.2 The Diffusion of Service Imagery

Compared with brand management in cooperation, co-branding occurs when a brand is leveraged to other products (Aaker, 1996). The synergy of co-branding is the extension of benefits, and the market segmentation of a single brand. For customer need fulfillment and niche market discovery, co-branding which integrates two brand associations may create new competitive advantages and distribute the risk of new product or service development. However, in addition to the organization fit and implementation problems occurring in co-branding, each brand in co-branding retains its principal part to fit the brand strategy. In other words, new brand image creation for the original brand may not have the goal of co-branding. A new brand instead of the cooperation of two brands may be better to receive customer service experiences and create new brand image for customers. Therefore, in a value network, the composition of two brand images in business cooperation aims to extend the existing

advantages, but the composition of two service images may help businesses to find new opportunities from their evolving server imagery.

For the generalization part of the service imagery application, in tourism, the destination image of a region can be viewed as the generalization of different images from economic, social and environment perspectives and different stakeholder's viewpoints (Figure 8.3). The service imagery of businesses would influence the entire image of a region. Therefore, service imagery can scale up from services to service providers and even to the region of service providers. The process of the scale up of service imagery can be viewed as a generalization. A tour region may be famous for the environment and culture. Businesses in this region may utilize the environmental and cultural resources for their service design. The development of businesses becomes an inseparable part of a region. Every unique service experience for service imagery creation from a customer can be accumulated and contribute to the destination image building. Therefore, not only in a tour region but also in a region with human interactions taking place, service imagery can also be used to represent the primary service features of a region from generalizing the service imagery from the interactions in its network.

In sum, service imagery in this research is viewed as the primary element for service feature representation. The meanings and contents of service imagery can be assigned from the business, social or cultural perspective. By integrating the diverse contents, we believe service imagery with an appropriate method of representation can contribute to the research on service design and value network study.

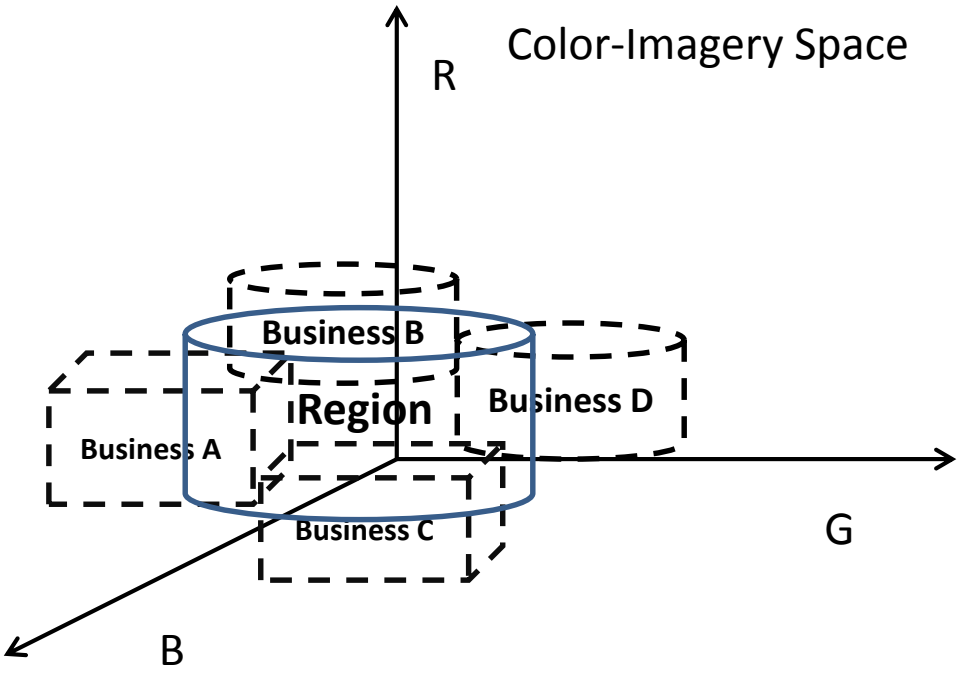

Figure 8.3 The Generalization of Service Imagery

8.1.2 The Application of CIVNDA in Service Industry

For the future development of CIVNDA, how to select and apply CIVNDA to different service industries is crucial. Since the study of value network design among SMEs is the main purpose of this research, the potential service industry which is suitable for using CIVNDA should chiefly consist of SMEs. Tourism is taken as the business environment to evaluate the proposed CIVNDA. In tourism, a tour region consists of SMEs providing different services. A tour service journey can be constructed and provided by tourism SMEs to meet various customers. The features of SMEs and preferences of customers could be derived from the analysis of interactions between SMEs and customers. When there are only a few businesses or customers, their features may be steadfast (*e.g*. the images of oligarchic enterprises) or unknown (*e.g*. the images of nameless small businesses). There should be a certain amount of stakeholders to create enough interactions to observe the dynamic changes

in stakeholders' features. Therefore, service industries with varieties of enablers for various service combinations emphasizing service design through customer interactions are believed to be suitable for CIVNDA applications.

In Taiwan, service industries are classified into 12 categories (Taiwan Coalition of Service Industries, 2012). Tourism is included in the Tourism and leisure sports services category. The other categories are Banking, Logistics, Communication and media, Medical health and care, Personnel training, Personnel services and property management, Culture and creativity, Design, Information, Research, Environmental protection, and Engineering consulting services. Among the 12 categories of service industries, for a single category consideration, the cores of the value network in Banking, Communication and media are mainly large enterprises. Logistics, Personnel training, Personnel services and property management, Research and Information services may be indispensable services for most industries, but they may be only auxiliary enablers rather than the primary enabler roles or service providers in a value network consisting of multiple service industries. Therefore, Research, Environmental protection, Medical health and care, and Engineering consulting services which involve special professional knowledge and special customer segments may have few chances to interact with common people.

Therefore, in addition to Tourism and leisure sports services, Design and the Culture and creativity service industry which are related to the general public and consist of SMEs may be possible for CIVNDA application. In CIVNDA, interactions between customers and service providers to co-create a value proposition are emphasized. The feedback from customer service experiences not only creates the brand images for specific service providers, but also holistic service imagery for a region consisting of service providers. Design and Cultural and creativity service

industry have the potential to apply CIVDA due to the similar features in comparison with tourism. SMEs play important roles and customers are the crucial operant resources in Design and Cultural and creativity service industry to design their services.

For instance, costume design services which can be considered as a Design service industry are a possible business domain for CIVNDA. The different parts of the costume such as shirts, skirts, pants, and dresses have various imageries with different combinations. Customers who want to buy a set of costumes may choose the clothes they prefer. Costume designers who interact with their customers may obtain information about customer needs and preferences. When a service platform similar to uVoyage exists, customers and designers can work together to customize the costume and the costume is then delivered by a specific manufacturer. A value network for costume design can be dynamically constructed to fulfill diversified needs. Emotions, feelings, style preferences, and other psychological things from service experiences can be the input for service imagery creation for the dynamic configured designer groups and manufacturers. Service imageries for all stakeholders in a costume design platform can be continuously updated with the interactions among stakeholders. The development of a costume design platform may be fitted to the model illustrated in Figure 7.9.

The CIVNDA can also be applied to a multiple service industries combination. That is, a value network is designed for a specific goal by identifying customer needs For example, traditionally, maternity dresses are designed and manufactured for pregnant women. The value network of maternity dress delivery simply involves material suppliers, dress designer, manufacturers, and customers. Although the birth rate of developed nations is becoming lower and lower, people in developed nations

pay more attention to their children. Therefore, during pregnancy, it is important for pregnant women to choose appropriate maternity dresses. The manufacturing process of maternity dresses is transforming from production-based to service-based, similar to the transformation of leisure agriculture services. Therefore, the value network of dress design services for maternity dresses would change and be driven by customers. The relationships between maternity dress designers, material suppliers, and maternity dress manufacturers have become more complex than before. Therefore, there is a real case (http://www.ymr.com.tw/) for a maternity dress manufacturer establishing a tourism factory. The network of this tourism factory involves the dress designer, material supplier marketing channels, and an online service platform to provide the cooperation goal for “Support for the new life”.

To achieve the cooperation goal, the manufacturer created not only a service platform to support the cooperation online, but also offered some special service experiences for tourists in its factory to experience the related knowledge of pregnancy. Therefore, the customer segmentation of this manufacturer can be expanded from pregnant women to the spouses of pregnant women and students. The interactions with these stakeholders resulted in some innovative ideas for new products or service development. Products such as shoes for pregnant women and dresses for breast-feeding are designed. In addition, students and men can experience the weight and inconvenience during pregnancy by using a simulated cloth. The value of the cooperation goal, “Support for the new life”, would be co-created through both physical and virtual interactions between stakeholders.

In sum, intuitively, a service industry mainly consists of SMEs having more diversity in service imagery creation. Since cooperation for innovative service provision is encouraged in CIVNDA, with more participants in a service region or a

platform, there would be greater chances of developing more innovative services with fewer participants. In short, in addition to the tourism industry, Design, and the Cultural and creativity service industry would be the appropriate industries for CIVNDA application. We still believe there may be other possible undiscovered application areas for CIVNDA.

8.1.3 Development of Information System in the Service Ecosystem for Value Creation in Service Dominant Logic

Information systems are often considered as enablers to deal with the increasing complexities in value networks (Chesbrough and Spohrer, 2006; Basole and Rouse, 2008; Lush *et al.*, 2008). The relationships of B2B and B2C in a service value network can be smoothly connected through the delivery of information systems that establish the multi-way communications between B2B and B2C involving value network members. Customers can retrieve from or send feedback to information systems to understand or identify the value proposition of services in businesses. Businesses can exchange and utilize information from value network members to enhance their service provision. In other words, information systems can benefit service systems through the processes of value creation and value delivery.

Based on the case study of the Mt. Pillow, the evolution of information system development adapting to the different needs of the evolutionary stages of regional SMEs roles can be identified. In the early stages, when customers were viewed as operand resources, the aim of an information system such as an electronic platform was used to build a channel for marketing and product sales. However, from the individual operation stage, feedback from customer service experiences is crucial for SMEs to build their service imagery and brand image. Customers may share their service experiences about these SMEs on Internet. Those sharing of service experience on Internet may influence the customer cognitions toward SMEs or

located regions. For SMEs, customers then become operant resources to provide clues to construct service imagery. Web 2.0 technology and social software such as blog platforms and web forums can help establish communication channels for stakeholders in value networks. In this sense, two challenges are existed for SMEs: (1) How do SMEs encourage and collect feedback of customer services on Internet? (2) What can SMEs do to find appropriate service imagery to improve their service value creation based on the feedback from customer service experiences?

These questions imply that two gaps exist for SMEs to connect from value proposition to customer perceived service value to economic activities, and from service experiences to recycled value in the service ecosystem for value creation in service dominant logic. For the first question, web 2.0 technology and social software for information system development could be the answer. For the example of the Mt. Pillow case study, the transition of the service platform from traditional electronic commerce platform to Facebook shows the evolution of the information system adoption. That is, information systems should connect the value creation and delivery processes from service value proposition to service experience feedback. For the second question, the advanced analysis of customer service experiences is then needed to find the clues of appropriate service imagery. Considering the limited resources and capabilities of SMEs, the cooperation and collaboration among SMEs to integrate recyclable resources can be discovered and developed into new service imagery. The development of information systems then should support the cooperation and collaboration among SMEs to communicate the feedback, analyze the interactions and facilitate the decision making given the inputs from social systems to economic systems.

Based on the insights attained from the Mt. Pillow case study, the requirements

of information systems would change with the evolutionary stages of regional SMEs roles. Table 8.2 summarizes the required and predicted needs of the information system development. In the first two stages, the service system was still in GDL. To increase customers as operand resources, electronic commerce platform may be helpful to create new channels to strengthen the B2C relationships. With the stage evolving to the individual operation stage, SMEs began to understand that the information of service experiences shared among customers (C2C network) is important to build their imagery in customers' mind. Social communication platform such as Facebook can be used to extend pure electronic commerce platforms. The interactions with customers in the ICT service platform would be increased though the integration with social network functions. In the community development stage, the communication is required in not only B2C but also B2B in order to integrate limited resources for the regional development. The role of information system is expected to facilitate the interactions between economic, social and environmental systems. In addition, information systems can help identify the potential value from recyclable operant resources from social systems. The cycle in the service ecosystem for value creation in service dominant logic then can accordingly be realized smoothly.

Table 8.2 Summary of Required Expectation of the Information System Development in Different Evolutionary Stages of Regional SMEs Roles

Stage	Production and marketing transformation & Individual operation stage	Integrative operation stage	Community development stage (predicted)
Logic	GDL	GDL to SDL	SDL
Information system requirement	A channel to connect businesses to customers	A channel to communicate with customers	A channel to communicate with customers A platform to cooperate and communicate with other businesses Integrate resources from partners
Examples of information system	Electronic-commerce service platform	Facebook	uVoyage

From the information system usage in different evolutionary stages, the different paradigms of information system development are identified based on the investigation of the Mt. Pillow case study. In addition, this research also develops the conceptual framework and service platform of uVoyage to demonstrate the possible form of the next generation information systems. The future study of uVoyage applications to different service industry are also believed to evidence the contribution of the mentioned next generation information systems.

8.2 Implications

Demirkan *et al*. (2011) proposed ten core concepts of service science. The principles and approaches to understand and foster value creation through the interactions between service systems are the focus of the ten concepts. Therefore, in these core concepts, ecology in service science concerns entities in service systems, interactions in value networks, and the outcomes with the value change.

In this research, the research questions on the evolution of the service system and evolutionary path for cluster SMEs in a service economy and the design of a value network for cluster SMEs with productivity, innovation, and growth improvement are important to the stakeholders in value networks and crucial for service science study. They would provide theoretical foundations to investigate and model the behaviors of the ecology of service systems, and interactions between stakeholders. Therefore, the conceptual framework of the service ecosystem for value creation in service dominant logic, and a four-stage model for cluster SMEs evolution and CIVNDA are proposed to contribute to the study of the core concepts in service science study. Moreover, service imagery, a new understanding of service value outcome representation, is conceptualized toward the new dominant logic. Stakeholders in a value network might use service imagery to identify innovation opportunities from the accumulation of service experiences.

The results from this research first suggest the operators of cluster SMEs should notice their current evolutionary stage to form an appropriate strategy for development. With the evolution of the SME role, the service values of SMEs created by diverse service experiences progressively integrate their service characteristics with customer needs, understanding, and participation, thus achieving high quality

value propositions. The network relationships of B2B and B2C become crucial as the stages evolve. Not only is service value determined by B2C relationships, but also the process of value proposition formation and B2B network connections are related to the interactions with customers. SME operators in a value network might benefit from deepened interactions with customers. SMEs should be aware of estimating their competitive advantages and understand the exact positions of the outcomes. That is, what value is provided and how the provided service's value changes should be noticed to understand the roles and positions in a value network. In addition, customers should be encouraged by SME operators to be involved in the service value co-creation process.

Additionally, customer interactions and service experiences would influence the entire value network instead of just the front-end service providers. The value-proposition-based interactions evolve from being provider-centric to being customer-driven. SME operators might need to know both their brand image and service imagery are continuously evaluated by different stakeholders via different forms of service experiences. In other words, when a SME may act as an enabler role in a value network which is not a primary service provider during the service encounter, customer service experiences would have a certain degree of influence on the enablers. In other words, all businesses in a region would have different degrees of interactions with, and influences on, one another.

From the customer's perception, the service imagery of a business region may be crucial to their decision. For example, a tour region with a bad reputation due to confusing pricing of their commodity would affect all businesses in the same region, even though most businesses are honest. Therefore, the evolution of SME clusters to the integrative operation stage stands for not only economic cooperation, but also

consensus at a social level. The meaning of service value also contains social meanings co-created by businesses and customers for a business region. Cluster SMEs might need to work together for regional development and seek balances in the economic, social, and environmental systems.

Finally, this research also suggests cluster SMEs might view the different needs of customers as design challenges and be aware of the measurement of the service value of network members to improve productivity and innovation capabilities. In traditional approaches, the goal of cooperation is to acquire resources and capabilities from other businesses. However, in SDL, the value of a business relies on the service experiences of customers. The service imagery co-created by business and customers might be an index in the search for business partners. SME operators could find their characteristics from customers and position themselves in the market by analyzing the interactions and service experiences through changes in service imagery. For each diversified customer need, a value network consisting of clustered SMEs could be dynamically configured using service imagery. The accumulation of customer service experiences would be a valuable asset for cluster SMEs to find innovation opportunities. Therefore, in the evolving dominant logic from goods to services, SME operators and their service designers should record the details of customer interactions and keep tracking their service imagery to understand the potential competitive advantages for the decision making in the value co-creation process.

Chapter 9 Conclusion Remarks

In this chapter, the conclusion of this research is addressed first to overview the entire study. Then, research contributions, limitations and future research directions are proposed for the future study on service science, service value network design and service innovation.

9.1 Conclusion

Vargo and Lusch (2004, 2008) proposed a new dominant logic to the consumer market to address changes in value creation and the evolution of market behavior. Research objects were the conceptualization of service ecosystem evolution within SDL, a value network design approach, and ICT-enabled service platform for service innovation in SME clusters. This research studies examined cluster SMEs in the evolution of a service system in a service economy. With the dominant logic shifting from GDL to SDL in the ecosystem, interactions between the economic, social, and environmental systems should evolve due to different value creation processes. How to conceptualize the relationships between the economic, social, and environmental systems with the value creation process is the key to identifying appropriate methods to achieve sustainable development in an industry.

Therefore, based on SDL, MBP, and image theory, this research synthesizes the conceptual framework of the service ecosystem for value creation in service dominant logic extended from the traditional MBP model to elucidate the value creation process in the economic, social, and environmental systems (Chapter 5, Figure 5.4).

Additionally, within SDL contexts, the evolution of cluster SMEs in tourism is analyzed to develop a novel method for service value presentation - service imagery (Chapter 7, Table 7.5). Service imagery identified from cooperation between SMEs in regional tourism is characterized as an operant resource for synthesizing outcomes of the service value proposition and distribution from service experiences in a value network in the cognitive and psychological domains. For service design, the conceptual framework of the service ecosystem for value creation in service dominant logic and service imagery provides a theoretical foundation supporting innovative value network creation and service innovation in service science.

To evaluate the conceptual framework of the service ecosystem for value creation in service dominant logic, the leisure agriculture service in the tourism industry is studied to elucidate the evolution of cluster SMEs evolution. Based on interview and focus-group data for Mt. Pillow (Chapter 4 and Chapter 7), cluster SMEs continue to evolve with the trend of the service economy from economic, social, and environmental perspectives. The cluster SMEs in Mt. Pillow are evolving from pure production to services for regional development. Based on collected qualitative data, a four-stage evolutionary path explains the process of evolution for cluster SMEs and the shift from GDL to SDL. In the third stage of cluster SMEs evolution, the integrative operation stage, views customers as operant resources. This transformation makes SMEs attempt to integrate their resources to meet their customers' needs. During the fourth stage, cluster SMEs are concerned about the balance among natural ecologies, the lives of residents, and regional development. These four stages can co-exist within a region. As stages evolve, considerations of cluster SMEs in the economic, social, and environmental aspects are connected to regional development (Chapter 7, Table 7.3).

On the basis of the conceptual framework of the service ecosystem for value creation in service dominant logic, this research also proposes a value network design approach, the CIVNDA (Chapter 5, Figure 5.5), from a service science perspective and a novel service platform, uVoyage (Chapter 6, Figure 6.3), for service industries. To facilitate the evolution of cluster SMEs, improving the value network design of SMEs in terms of productivity, innovation, and growth is one solution. The CIVNDA uses images as representations of service value and customer-driven cooperation. From the service science perspective, value can only be created by customers (Vargo *et al.*, 2009). Attractive services are important to business sustainability, understanding customer needs, and an appropriate value proposition. That is, customer-driven cooperation encourages SMEs to enhance their services. Customer-driven cooperation therefore has a positive effect on SME growth. The uVoyage service platform is implemented for cluster SMEs to capture the ideas of CIVNDA.

Currently, the leisure agriculture service in the tourism industry is the primary focus of the CIVNDA and uVoyage service platform. To evaluate the effects of the CIVNDA and uVoyage service platform on tourism SMEs from the design science perspective, three stages of interviews and focus groups (Chapter 7, Table 7.2) were conducted to determine how the value network design with productivity, innovation, and growth improvement and the uVoyage service platform can assist in the development of the tourism industry ecosystem. Evaluation results show that the two main designs in the uVoyage platform, an imagery-based search for customers and imagery-based cooperation for businesses, may facilitate service value design. Design artifacts from the CIVNDA and uVoyage service platform have important contributions to the development of service innovation in SME tourism clusters. A

regional developmental model for the service industry (Chapter 7,Figure 7.10) is proposed. Service industries consisting of SMEs, such as Design and Cultural and creative service industry, are believed to apply the proposed model. A service imagery-based ecosystem can be established for innovative service provisions based on this research.

9.2 Research Contributions

The contributions of this research to literature are the proposed the service ecosystem for value creation in service dominant logic, and imagery-based value network design approach for cluster SMEs. The service ecosystem for value creation in service dominant logic connects economic, social, and environmental systems for service value delivery, evaluation, and creation. The imagery-based value network analyzes service value characteristics of each business from customers' service experiences on the Internet. Then, the service value of cooperative services for the value network design can be estimated using service imagery. We believe that both tangible and intangible value modeling and the ICT-based service system for value network design in this study contribute to future service science study. In summary, this research contributes service science core concepts in terms of entities, interactions, and outcomes (Figure 9.1) (Demirkan *et al*., 2011).

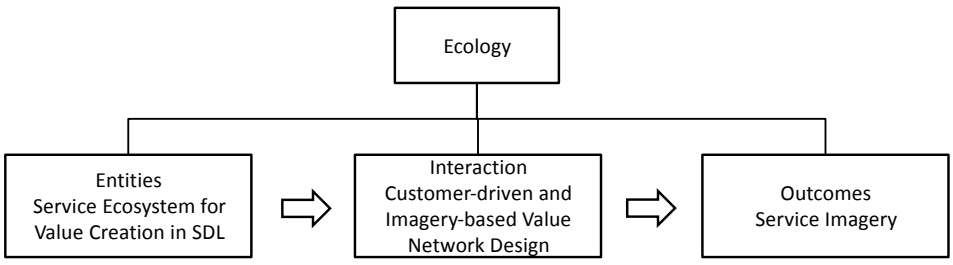

Figure 9.1 The Research Contributions in Service Science Core Concepts

- For the entity part of the service science research, a service ecosystem (Chapter 5,

Figure 5.4) illustrating the evolution of a service ecosystem is extended to the economic, social, and environmental systems to describe how value is created, the roles of the economic, social, and environment systems in service value creation processes, and why service value, recyclable resources, and waste are created by the service ecosystem. Additionally, the work proposes an evolutionary model of cluster SMEs. This model has four stages in the tourism industry during transformation from a production-based economy to a service-based economy. The changing relationships among the economic, social, and environmental systems while adopting SDL in regional development are identified.

- For the interaction part of the service science research, a customer-driven and imagery-based approach for value network design and configuration (Chapter 5, Figure 5.5 and Figure 5.7) enables resource integration among SMEs at the value level and predicts the benefits of SME cooperation. Customers are also involved in the value co-creation process in the entire value network by contributing preference images for service value evaluation. Once co-created value can be presented and evaluated, the evolution of SME clusters from GDL to SDL runs smoothly.

- For the outcome part of the service science research, the concepts of service imagery from the SDL perspective, which has meanings that differ from those of brand image is proposed. Differences in initiation, the attached vehicle, interaction with customers, influences and similarities on the generative features and new positioning in a value network of service imagery and brand image (Chapter8, Table 8.1 and Figure 8.2) contribute to the understanding of product design and service design evolution of under different dominant logics.

- Finally, implementation of the ICT-based service system, based on the imagery-based value network design approach (Chapter 6, Figure 6.3), produces valuable artifacts for the SSME discipline to examine the effects of ICT on the value co-creation process.

9.3 Research Limitations

The single case study of Mt. Pillow is used to answer the proposed research questions, to construct the conceptual model of CIVNDA, and evaluate the conceptual framework of the service ecosystem for value creation in service dominant logic. Additional evidence is needed to demonstrate model applicability to other service industries. Conversely, the uVoyage platform prototype is still in production and, thus, lacks real usage data about how customer interactions with SMEs influence the precision and accuracy of the representation of service imagery by a color image scale.

Briefly, these limitations preclude generalization of the proposed framework and models to the entire service industry. Particularly, research contexts and conditions are set in the cluster SMEs, such that a service industry consisting of MNEs may not fully fit CIVNDA. To further evaluate CIVNDA, in addition to qualitative research methodologies, quantitative research methodologies and other research methods may be helpful. Therefore, production of the uVoyage service platform is important to the acquisition of real data, such as those for interactions between SMEs and customers, changes in service imagery to adjust the parameters in color image scale. A service value network design using the uVoyage platform for customers and SMEs will provide valuable data for evaluation of CIVNDA and the discovery of related research questions in SME value network design.

9.4 Future Research Directions

For future research directions, studies of the evolutionary service economy system, imagery-based service design development, and service value measurement in a value network are valuable.

1. Study of the evolutionary service economy system

In this work, a conceptual framework of the service ecosystem for value creation in service dominant logic is proposed (Chapter 5). A case study in the tourism industry is used to collect field data for evaluating the propositions in this conceptual framework. Due to the different contexts and conditions in different service industries, the conceptual framework may be improved. An opportunity exists for constructing a theory that describes how service value creation and delivery in a value network through the economic, social, and environmental systems, based on the evolutionary service economy system could be proposed. The proposed theory may be the foundation of the sustainable service management study.

2. Imagery-based service design methodology

In the service economy, service experiences are keys to determining service value and the directions of innovative services. How to understand and represent service experiences is important to organizations during service design. In this research, the color image scale is utilized to represent service experiences from a customer's psychological perspective. Service imagery can then be identified for specific services or products by investigating and integrating customer service experiences. Therefore, during service design, if designers have service imagery for specific services and products, designers could design innovative services or products that meet customer needs. The application of imagery-based service design occurs on

the macro scale, such as value network design in this research, and on the micro scale, such as a single service or product design. In this research direction, extending imagery-based service design to different service industries and different services and products is an important direction for future research. Conversely, other ways to represent images of customer service experiences, such as affective computing, is another valuable research direction.

3. Measurement of service value in a value network

From the literature review (Chapter 2, Table 2.3), the measurement of value in a value network has already shifted from tangible operand resources to both operand and operant resources. To measure the value of operant and operand resources of a value network's members, this work uses service imagery from customer service experiences based on SDL and image theory. Extending service value measurement from an economic perspective to social and psychological perspectives would generate opportunities to bridge gaps between different stakeholders in a value network. Further, with the integration of service imagery and information technology, a service platform can be constructed to test service imagery for service value measurement and the effects of service design on customers. A dynamic and automatically updated service value measurement would be of assistance to the service industry when analyzing and responding to the different needs of stakeholders.

References

1. Aaker, D. A. and Joachimsthaler, E. (2002). *Brand Leadership*, Free Press Business, US.

2. Aaker, D. A. (1996). *Building Strong Brands*, Free Press Business, US.

3. Alexander, N. and Mckenna, A. (1998). "Rural Tourism in the Heart of England", *International Journal of Contemporary Hospitality Management*, Vol.10(5), pp. 203-207.

4. Allee, V. (2000)."Reconfiguring the Value Network'', *Journal of Business Strategy*, Vol.21(4), pp.36-39.

5. Allee, V. (2002). *The Future of Knowledge: Increasing Prosperity through Value Networks*, Butterworth-Heinemann, Boston.

6. Australian Tourism Ministers' Council (2009). "National Long-Term Tourism Strategy - Industry Priorities for the Australian Government", available at: http://www.ret.gov.au /tourism/Documents/tmc/DRET%20Tourism%20Strategy.pdf

7. Allee, V. (2008). "Value Network Analysis and Value Conversion of Tangible and Intangible Assets", *Journal of Intellectual Capital*, Vol.9(1), pp.5-24.

8. Araujo, L. M., and Bramwell, B. (2002). "Partnership and Regional Tourism in Brazil", *Annals of Tourism Research*, Vol.29(4), pp.1138-1164.

9. Basole, R.C, and Rouse, W.B. (2008). "Complexity of Service Value Networks: Conceptualization and Empirical Investigation", *IBM System Journal*, Vol.47(1), pp.53-70.

10. Baidal, J. I. (2004). "Tourism Planning in Spain Evolution and Perspectives", *Annals of Tourism Research*, Vol.31(2), pp. 313-333.

11. Batey, M. (2008), *Brand Meaning*, Routledge, US.

12. Beach, L. R. (1990). *Image Theory: Decision Making in Personal and Organizational Contexts*, Wiley & Sons, UK.

13. Blau, B. S., Conte, T. D., and Weinhardt, C. (2010). "Incentives in Service Value Networks – On Truthfulness, Sustainability, and Interoperability", ICIS 2010 Proceedings. Paper 8. available at: http://aisel.aisnet.org/icis2010_submissions/8

14. Brown, D., Dillard, J., and Marshall, R.S. (2002). “Triple Bottom Line: A business Metaphor for a Social Construct”, Document de Treball, no. 06/2, available at : http://webs2002.uab.es/dep-economia-empresa/documents/06-2.pdf

15. Buhalisa, D and Law, R (2008). “Progress in Information Technology and Tourism Management: 20 Years on and 10 Years after the Internet—The State of Etourism Research”, *Tourism Management*, Vol.29(4), pp.609-623.

16. Capriello, A. and Rotherham, I.D. (2008). “Farm Attractions, Networks, and Destination Development - a Case Study of Sussex, England”, *Tourism Review*, Vol.63(2), pp.59-71.

17. Casakin, H. (2007). “Metaphor in Design Problem Solving Implications for Creativity”, *International Journal of Design*, Vol.1(2),pp. 21-33.

18. Caswell, N. S., Nikolaou, C., Sairamesh, J., Bitsaki, M., Koutras, G.D., and Iacovidos, G. (2008). “Estimating Value in Service Systems: A Case Study of Repair Service System”, *IBM System Journal*, Vol.47(1), pp.87-100.

19. Chai, K-H., Zhang, J., and Tan, K-C. (2005). “A TRIZ-Based Method for New Service Design”, *Journal of Service Research*, Vol.8(1), pp.48-66.

20. Chesbrough, H. and Spohrer, J. (2006). “A Research Manifesto for Services Science”, *Communication of the ACM*, Vol.49(7), pp.34-40.

21. Cheng, K. F. (2002). “How the Development of the Cultural and Creative Industry Boosts Economic Prosperity“, *Economic Outlook Bimonthly*, Vol.83, pp. 52-55.

22. Cambra-Fierro, J., Florin, J., Perez, L., and Whitelock, J. (2011). “Inter-firm market orientation as antecedent of knowledge transfer, innovation and value creation in networks”, *Management Decision*, Vol.49(3), pp.444–467.

23. Cantarello, S., Nosella, A., Petroni, G., and Venturini, K. (2011). “External technology sourcing: Evidence from design-driven innovation”, *Management Decision*, Vol.49(6), pp.962–983.

24. Cohen, E. (1972). “Toward a Sociology of International Tourism,” *Social Research*, Vol.39(1), pp.164-182.

25. Cohen-Or, D., Sorkine, O., Gal, R., Leyvand, T., and Xu, Y. (2006). “Color harmonization”, ACM SIGGRAPH 2006 Papers: pp.624-630, ACM, Boston.

26. Connell, J, Page,S. J. , and Bentley, T. (2009).“Towards Sustainable Tourism

planning in New Zealand: Monitoring Local Government Planning under the Resource Management Act", *Tourism Management*, Vol.30(6), pp. 867–877.

27. Conte, T., Blau, B., and Knapper, R. (2010)." Networked Mechanism Design Incentive Engineering in Service Value Networks as Exemplified by the Co-Opetition Mechanism", *AMCIS 2010 Proceedings*. Paper 396. http://aisel.aisnet.org/amcis2010/396

28. Contini C., Scarpellini P., and Polidori R. (2009). "Agri-tourism and Rural Development - the Low-Valdelsa Case, Italy", *Tourism Review*, Vol.64(4), pp.27-36.

29. Control Yuan of R.O.C (2007). "Leisure Agriculture Development and Promotion Project Performance Report", *Control Yuan Communiqué,*, Vol. 2591, available at : http://www.cy.gov.tw/paper/096/mico/2591/2591_type21_01_p01.htm

30. Control Yuan of R.O.C. (2007). "The Project Report of Leisure Farm Promotion Performance and Development (1)", *Control Yuan Communiqué,* Vol.2591.

31. Corridoni, J., Del Bimbo, A., and Pala, P. (1999). "Image Retrieval by Color Semantics", *Multimedia Systems,* Vol.7(3), pp. 175-183.

32. Costanza, R., Norgaard, R.B., Goodland, R., Daly, H.E., and Cumberland, J. H. (1997). *An Introduction to Ecological Economics*. St. Lucie Press, Boca Raton.

33. Coylea,R. G and Alexander, M.D.W. (1997). "Two Approaches to Qualitative Modeling of a Nation's Drugs Trade", *System Dynamics Review*, Vol.13(3), pp.205-222.

34. Demirkan, H., Spohrer, James C. and Krishna, V. (2011). "Introduction of the Science of Service Systems", Book Chapter of *The Science of Service Systems*, Springer, New York.

35. Echtner, C. and Ritchie, B. (2003). "The Meaning and Measurement of Destination image", *Journal of Tourism Studies*, Vol.14(1), pp. 37-48.

36. Economides, N. (1996). "The Economic Networks", *International Journal of Industrial Organization*, Vol. 14(6), pp.673-699.

37. ENIT-Italian State Tourist Board (2008). "2008 Corporate Annual Report", available at: http://www.enit.it/2008careport.asp

38. European Commission (2005). The new SME definition - User guide and model

declaration, http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf

39. Fairman, H. S., Brill, M. H., and Hemmendinger, H. (1997). "How the CIE 1931 Color-matching Functions were Derived from Wright-guild Data," *Color Research & Application* , Vol.22(1), pp. 11-23.

40. Fleischer A., and Pizam A. (1997). "Rural Tourism in Israel", *Tourism Management*, Vol.18(6), pp.367-372.

41. Forrester, J. W. (1994). "System Dynamics, Systems Thinking, and Soft OR", *System Dynamics Review*, Vol.10(2-3), pp.245-256.

42. Gilmore, A, Carson, D., and Rocks, S. (2006). "Networking in SMEs: Evaluating its contribution to marketing activity", *International Business Review*. Vol.15(3), pp.278–293.

43. Gunn, C.A. (1994). *Tourism Planning: Basics, Concepts*, Cases, 3rd Editon. Taylor & Frances, US.

44. Gordon, I.R., and McCann, P. (2000). "Industrial Clusters: Complexes, Agglomeration and/or Social Networks?", *Urban Studies*, Vol.37(3), pp.513-532.

45. Han, H., Hsu, L. T., and Lee, J-S. (2009). "Empirical Investigation of the Roles Of Attitudes Toward Green Behaviors, Overall Image, Gender, and Age in Hotel Customers' Eco-Friendly Decision-Making Process", *International Journal of Hospitality Management*, Vol.28(4), pp.518-528.

46. Heding, H., Knudtzen, C.F. and Bjerre, M. (2006). *Brand Management – Research, Theory and Practice*, Routledge, US.

47. Hevner, A. R., March, S. T., Park, J., and Ram, S. (2004). "Design Science in Information Systems Research", *MIS Quarterly*, 28(1), pp.75-105.

48. Hill, R. C., and Levenhagen, M. (1995). "Metaphors and Mental Models: Sensemaking and Sensegiving in Innovative and Entrepreneurial Activities", *Journal of Management*, Vol.21(6), pp.1057-1074.

49. Hjalager, A.M. (2010). "A Review of Innovation Research in Tourism", *Tourism Management*, Vol.31(1), pp.1-12.

50. Holm, D. B., Eriksson, K. and Johanson, J. (1996). "Business Networks and Cooperation in International Business Relationships", *Journal of International Business Studies*, Vol.27(5), pp.1033-1053.

51. Hummelbrunner, R., and Miglbauer, E. (1994). “Tourism Promotion and Potential in Peripheral Areas: the Austrian Case”, *Journal of Sustainable Tourism*, Vol.2(1+2), pp.41–50.

52. Huybers, T. and Bennett, J. (2003). “Inter-Firm Cooperation at Nature-Based Tourism Destinations”, *Journal of Socio-Economics*, Vol.32(5), pp. 571-587.

53. Jackson, J. (2006). “Developing Regional Tourism in China: The Potential for Activating Business Clusters in a Socialist Market Economy”, *Tourism Management*, Vol.27(4), pp.695-706.

54. Jackon, O. M. and Wolinsky, A. (1996). “A Strategic Model of Social and Economic Networks”, *Journal of Economic Theory*, Vol.71(1), pp.44-74.

55. Jackson, J. and Murphy, P. (2006). “Clusters In Regional Tourism - an Australian Case”, *Annals of Tourism Research*, Vol.33(4), pp.1018-1035.

56. Jarillo, J. C. (1998). “On Strategic Networks”, *Strategic Management Journal*, Vol.9(1), pp.31-41.

57. Karlsson, C., Johansson, B., Stough, R.R. (2005). *Industrial Clusters and Inter-firm Networks*, Cheltenham, Edward Elgar Pub. UK.

58. Kates, R.W., Parris, T.M, and Leiserowitz, A.A. (2005). “What is Sustainable Development? Goals, Indicators, Values, and Practice”, *Environment: Science and Policy for Sustainable Development*, Vol.47(3) , pp.8-21.

59. Kaufmann, A, and To¨dtling, F. (2002). “How Effective is Innovation Support for SMEs? An Analysis of the Region of Upper Austria”, *Technovation*, Vol.22(3), pp.147-159.

60. Keller, K. L., (1993).” Conceptualizing, Measuring, and Managing Customer-Based Brand Equity”, *Journal of Marketing*, Vol.57(1), pp.1-22.

61. Kobayashi, S. (1981). “The Aim and Method of the Color Image Scale”, *Color Research & Application*, Vol.6(2), pp. 93-107.

62. Kobayashi, S. (1992). *Color Image Scale*, New York, Kodansha International, NY.

63. Kobayashi, S. (2001). *カラーイメージスケール 改訂版*, 講談社, JP.

64. Korea Tourism Organization (2009). Guide to Tourism Investment in Korea, available at: http://english.visitkorea.or.kr/enu/ebook/tour_investment_guide_2010/tourism/ EBook.htm

65. Kuah, A. T. H. (2002). “Cluster Theory and Practice: Advantages for the Small Business Locating in a Vibrant Cluster”, *Journal of Research in Marketing and Entrepreneurship*, Vol.4(3), pp.206-228.

66. Lai, F., Griffin, K., and Bahin, B. J. (2009). “How Quality, Value, Image, and Satisfaction Create Loyalty at a Chinese Telecom”, *Journal of Business Research*, Vol.62, pp.980-986.

67. Lakoff, G. (1992). “The Contemporary Theory of Metaphor”, Book Chapter of *Metaphor and Thought*, 2nd edition, Cambridge University Press, UK.

68. Lakoff, G. and Johnson, M. (1980). *Metaphors We Live By*, University of Chicago Press, US.

69. Lauwers, L. (2009). “Justifying The Incorporation of the Materials Balance Principle into Frontier-Based Eco-Efficiency Models”, *Ecological Economics*, Vol.68(6), pp.1605-1614.

70. Lazzarini, S.G., Chaddad, F.R., and Cook, M.L. (2001). “Integrating Supply Chain and Network Analyses: The Study of Netchains”, *Chain and Network Science*, Vol.1(1), pp.7-22.

71. Lederer, P.J. (1993). “A Competitive Network Design Problem with Pricing”, *Transportation Science*, Vol.27(1), pp.25-38.

72. Lee, A. S. (1989). “A Scientific Methodology for MIS Case Studies”, *MIS Quarterly*, Vol.13(1), pp. 33-50.

73. Lu, J. W. and Beamish, P. W. (2001). “The Internationalization and Performance of SMEs”, *Strategic Management Journal*, Vol.22(6-7), pp.565-586.

74. Lucchese, L., Mitra, S., and Mukherjee, J. (2001). “A New Algorithm based on Saturation and Desaturation in the xy Chromaticity Diagram for Enhancement and Re-rendition of Color Images,” 2001 International Conference On Image Processing, Vol.2, pp. 1077-1080.

75. Lusch, R. F., Vargo, S. L., Tanniru, M. (2009). “Service, Value Networks and Learning”, *Journal of the Academy of Marketing Science*, Vol. 38(1), pp.83-96.

76. Lusch, R. F., Vargo, S. L., Wessels, G. (2008). “Toward a Conceptual Foundation for Service Science: Contributions from Service-Dominant Logic”, *IBM System Journal*, Vol.47 (1), pp.5-14.

77. Ma, J.X., Buhalis. D., and Song, H. (2003). “ICTs and Internet Adoption in

China's Tourism Industry", *International Journal of Information Management*, Vol.23(6), pp.451-467.

78. Mackay, K. J. and Fesenmaier, D. R. (1997). "Pictorial Element of Destination in Image Formation", *Annals of Tourism Research*, Vol.24(3), pp. 537–565.

79. Madhavan, R., Koka, B., and Prescott, J. (1998). "Networks in transition: How Industry Events (Re)shape Interfirm Relationships", *Strategic Management Journal*, Vol. 19(5), pp. 439-459.

80. Merrifield, D.B. (2007). "Strategic Collaborations- Essence of Survival", *Research Technology Management*, Vol.50 (2), pp. 10-14.

81. Merz, M. A., He, Y., and Vargo S.L. (2009). "The Evolving Brand Logic: A Service-Dominant Logic Perspective", *Journal of the Academy of Marketing Science*, Vol.37(3), pp.328-344.

82. Michel, S., Brown, S. W., Gallan, A. S. (2007). "An Expanded and Strategic View of Discontinuous Innovations: Deploying a Service-Dominant Logic", *Journal of the Academy of Marketing Science*, Vol. 36(1), pp.54-66.

83. Morgan, G. (2006). *Images of Organization*, Sage Publications, US.

84. Mulder, P. and Van Den Bergh, J. (2001). "Evolutionary Economic Theories of Sustainable Development", *Growth and Change*, Vol.32(1), pp.110-134.

85. Munasinghe, M. (2002). "The Sustainomics Trans-disciplinary Meta-framework for Making Development More Sustainable: Applications to Energy Issues", *International Journal of Sustainable Development*, Vol.5(1/2), pp.125-182.

86. Navickas, V., and Malakauskaite, A. (2009). "The Possibilities for the Identification and Evaluation of Tourism Sector Competitiveness Factors", *Inzinerine Ekonomika-Engineering Economics*, Vol.1(1), pp.37-44.

87. Nelson, K. A., (2004). "Consumer Decision Making and Image Theory: Understanding Value-Laden Decisions", *Journal of Consumer Psychology*, Vol. 14(1&2), pp.28-40.

88. Nelson, R.R. (1995). "Recent Evolutionary Theorizing about Economic Change", *Journal of Economic Literature*, Vol.53(1), pp.48-90.

89. Nijdam, N. A. (2005). *Mapping Emotion to Color*, University of Twente, Netherlands.

90. Norgaard, R. B. (1984). “Co-evolutionary Development Potential”, *Land Economics*, Vol.60(2), pp.160-173.

91. Nguyen, N. and Leblanc, G. (2001). “Corporate Image and Corporate Reputation in Customers' Retention Decisions in Services“, *Journal of Retailing and Consumer Services*, Vol.8(4), pp.227-236.

92. Nilsson, P. A. (2002). “Staying on Farms: An Ideological Background”, *Annals of Tourism Research*, Vol.29(1), pp.7-24.

93. Nordin S. (2003). “Tourism Clustering and Innoetour– Paths to Economic Growth and Development”, European Tourism Research Institute, Mid-Sweden University, Sweden.

94. Novelli, M., Schmitz, B., and Spencer, T. (2006). “Networks, Clusters and Innovation in Tourism: A UK experience”, *Tourism Management*, Vol.27(6), pp.1141-1152.

95. OECD (2001), *Innovative Clusters*, OECD Publishing, rue André-Pascal, France.

96. OECD (2008a), *Enhancing the Role of SMEs in Global Value Chains*, OECD Publishing, rue André-Pascal, France.

97. OECD (2008b), *Tourism in OECD Countries 2008 - Trends and Polices*, OECD Publishing, rue André-Pascal, France.

98. OECD (2009), *The Impact of Culture on Tourism*, OECD Publishing, rue André-Pascal, France.

99. OECD (2010), *OECD Tourism Trends and Policies 2010*, OECD Publishing, rue André-Pascal, France.

100. Oppermann, M. (1996). “Rural tourism in Southern Germany”, Annals of *Tourism Research*, Vol.23(1), pp.86-102.

101. Ou, L., Luo, M. R., Woodcock, A., and Wright, A. (2004). “A Study of Colour Emotion and Colour Preference. Part I: Colour Emotions for Single Colours”, *Color Research & Application*, Vol.29(3), pp. 232-240.

102. Pansiri, J. (2008). “The Effects of Characteristics of Partners on Strategic Alliance Performance in the SME Dominated Travel Sector”, *Tourism Management*, Vol.29(1), pp.101-115.

103. Parasuraman, A., Berry, L. L., Zeithaml, V.A. (1988). “SERVQUAL: A

Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality", *Journal of Retailing*, Vol.64(1), pp.12-40.

104. Peppard, J. and Rylander, A. (2006). "From Value Chain to Value Network: Insights for Mobile Operators", *European Management Journal*, Vol. 24(2), pp. 128-141.

105. Pei, S., Zeng, Y., and Chang, C. (2004). "Virtual Restoration of Ancient Chinese Paintings Using Color Contrast Enhancement and Lacuna Texture Synthesis," *IEEE Transactions on Image Processing*, Vol.13(3), pp. 416-429.

106. Pitelis, C. and Pseiridis, A. (2007). "A Conceptual Framework for Firm Cooperation and Clusters, and Their Impact on Productivity", Book Chapter in *Regional Knowledge Economies: Markets, Clusters and Innovation*, Edward Elgar, UK.

107. Porter, M.E. (1998a). *On Competition*, Harvard Business School Press, Boston.

108. Porter, M.E. (1998b). "Clusters and the New Economics of Competition", *Harvard Business Review*, November-December, pp.77-90.

109. Rosenfeld, S.A. (2001), "Backing into Clusters: Retrofitting Public Policies", Integration Pressures: Lessons from Around the World, John F. Kennedy School Symposium, Harvard University, March 29-30.

110. Russo, P.A., and Segre, G (2009). "Destination models and property regimes: An exploration", *Annals of Tourism Research*, Vol.36(4), pp.587-606.

111. Prebensen, N. K. (2007). "Exploring Tourists' Images of a Distant Destination", *Tourism Management*, Vol. 28(3), pp.747-756.

112. Sandstrom, S., Edvardsson, B. , Kristensson, P. (2008). "Value in Use through Service Experience", *Managing Service Quality,* Vol.18(2), pp.112-126.

113. Sarker, S. and Lee, A. S. (2003). "Using a Case Study to Test the Role of Three Key Social Enablers in ERP Implementation", *Information & Management*, Vol.40(8), pp.813-829.

114. Shanks, G., and Parr, A. (2003). "Positivist, Single Case Study Research in Information Systems: a Critical Analysis", *Proceedings of the 11th European Conference on Information Systems*, Naples, Italy, 16-21 June.

115. Sharpley, R., and Vass, A. (2006). "Tourism, Farming and Diversification: An Attitudinal Study", *Tourism Management*, Vol.27(5), pp.1040-1052.

116. Spohrer, J., Maglio, J., Bailey, J. and Grubl, D. (2007). “Steps toward a Science of Service Systems”, *Computer*, Vol.40(1), pp.71-77.

117. Spohrer, J. and Maglio, J., (2008). “The Emergence of Service Science: Toward Systematic Service Innovations to Accelerate Co-Creation of Value”, *Production Operations Management*, Vol.17(3), pp.238-246.

118. Stabell, C and Fjekdstad, O. D. (1998). “Configuring Value for Competitive Advantage: on Chains, Shops and Networks”, *Strategic Management Journal*, Vol.19(5), 413-437.

119. State Secretariat for Economic Affairs SECO (2008). The Federal Government’s Regional Policy, State Secretariat for Economic Affairs SECO, Bern. available at: http://www.swiss-contribution.admin.ch/hungary/ressources/resource_en_183849.pdf

120. Sterman, J. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World*, Irwin/McGraw-Hill, US.

121. Solli, M., and Lenz, R. (2009). “Color Based Bags-of-Emotions”, Book Chapter in *Computer Analysis of Images and Patterns*, pp. 573-580.

122. Suk, H., and Irtel, H. (2010). “Emotional Response to Color Across Media”, *Color Research & Application*, Vol.35(1), pp. 64-77.

123. Taiwan Coalition of Service Industries, http://www.twcsi.org.tw/columnpage/service/definition.aspx, retrieval date: 2012.04.07.

124. Taiwan Leisure Farms Development Association (2004). The Comprehensive Survey Report of Leisure Farms. Available at : http://www.coa.gov.tw/view.php?catid=1361

125. Tian, C.H., Ray, B.K., Lee, J., Cao, R., and Ding, W. (2008).” BEAM: A Framework for Business Ecosystem Analysis and Modeling”, *IBM System Journal*, Vol.42(1), pp.101-114.

126. Todeva, E. and Knoke, D. (2006). “Strategic Alliances and Models of Collaboration”, *Management Decision*, Vol.43(1), pp.123-148.

127. Touray, K. and Jung, T. (2010). “Exploratory Study on Contributions of ICTs to Sustainable Tourism Development in Manchester”, Book Chapter in *Information and Communication Technologies in Tourism 2010*, pp. 493-505, Springer,

Vienna.

128. Tourism Bureau (2010a). Annual Survey Report of National Tourist in 2009, available at : http://admin.taiwan.net.tw/statistics/market.asp?relno=11

129. Tourism Bureau (2010b). Business Report on B&B in 2009, available at : http://admin.taiwan.net.tw/statistics/month_show_2.asp?selno=57&selyear=2009&selmonth=12&sikey=2

130. T.R. Ministry of Culture and Tourism (2007). Tourism Strategy of Turkey- 2023, T.R. Ministry of Culture and Tourism Publications, Ankara, Turkey, available at: http://www.kulturturizm.gov.tr/genel/text/eng/TST2023.pdf

131. Tuan, C. L. (2007). "A Review of the Leisure Farm Development in Taiwan and the Future Development Strategies", *Agricultural Policy and Agricultural Situation*, Vol. 177, pp.64-70.

132. Vargo, S. L., and Lusch, R. F. (2004). "Evolving to a New Dominant Logic for Marketing", *Journal of Marketing*, Vol.68(1), pp.1-17.

133. Vargo, S. L., and Lusch, R. F. (2008). "Service-dominant Logic Continuing the Evolution", *Journal of the Academy of Marketing Science*, Vol.36(1), pp.1-10.

134. Vargo, S.L., Maglio, P.P., and Akaka, A.M. (2009). "On Value and Value Co-creation: A Service Systems and Service Logic Perspective", *European Management Journal*, Vol.26(3), pp145-152.

135. Veale, T., and Hao, Y. (2007). "Comprehending and Generating Apt Metaphors: a Web-driven, Case-based Approach to Figurative Language", *Proceedings of the National Conference of Artificial Intelligence*, pp.1471-1476.

136. Wanhill, S. (2000). "Small and Medium Tourism Enterprises", *Annals of Tourism Research*, Vol.27(1), pp.132-147.

137. Williams, T. (2005). "Cooperation by Design: Structure and Cooperation in Interorganizational Networks", *Journal of Business Research*, Vol.58(2), pp.223-231.

138. Winter, T. (2007). "Rethinking Tourism in Asia", *Annals of Tourism Research*, Vol.34(1) , pp.27-44.

139. Wolstenholme, E., Monk, D., McKelvie, D., and Arnold, S. (2007). "Coping but Not Coping in Health and Social Care: Masking the Reality of Running Organizations Beyond Safe Design Capacity", *System dynamics Review*,

Vol.23(4), pp.371-389.

140. World Tourism Organization (WTO), http://unwto.org/, retrial date: 2010.11.13

141. World Commission on Environment and Development (1987). *Our Common Future*. Oxford University Press, UK.

142. Xin, J. H., Cheng, K., Chong, T., Tetsuya Sato, Taeko Nakamura, Kanij Kajiwara, and Hiroshi Hoshino (1998). "Quantifying Colour Emotion - What Has Been Achieved", *Research Journal of Textile and Apparel*, Vol.2(1), pp. 46-54.

143. Yang, C., and Chen. 2008. "Colored Visual Cryptography Scheme Based on Additive Color Mixing", *Pattern Recognition*, Vol.41(10), pp. 3114-3129.

144. Yang, C.Y. , Yuan, S.T. (2010). "Color Imagery for Destination Recommendation in Regional Tourism", 2010 Pacific Asia Conference on Information Systems. Taipei, Taiwan. 2010, pp.1274-1285.

145. Yeh, Y.C., Hsieh, P.H. and Yuan, S.T. (2010), "Metaphor-Based Alliance Partners Recommendation for Unique and Attractive Destination Image Building". *Proceedings of the 44th Hawaii International Conference on System Sciences – 2011*, pp.1-11.

146. Yin, R.K. (1994). *Case Study Research: Design and Methods 2nd edition*, Sage Publications, US.

147. Yu¨ ksel, A., and Akgu¨ l, O. (2007). "Postcards as affective image makers: An idle agent in destination marketing", *Tourism Management*, Vol.28(3), pp. 714-725

148. Zeng, S.X., Xie, X.M. and Tam, C.M. (2010). "Relationship between Cooperation Networks and Innovation Performance of SMEs", *Technovation*, Vol.30(3), pp.181-194.

149. Zelenka, J (2009). "Information and Communication Technology in Tourism – Influence, Dynamics and Trends", *E + M EKONOMIE A MANAGEMENT*, Vol.12(1), pp123-133.

Appendix Image Modeling, Mixing and Matching in uVoyage

In Appendix A, the related literatures and the color imagery scale for service imagery representation are detailed. It is also used in uVoyage for image modeling module, image mixing module, and image matching for destination service matching (Chapter 6, page 116). The complete work of these modules can reference Yang and Yuan (2010)[2] and Yang *et al.* (2012)[3].

A.1 Color Imagery Scale

According to the studies on the color psychology, color can be used to evoke human's emotional feelings (Xin *et al*., 1998; Kobayashi, 1981; Nijdam, 2005; Ou *et al.*, 2004; Suk and Irtel, 2010). Kobayashi (1981) stated that every color has its own meaning, which can be mapped onto one or more words. For example, "red is regarded as adventurous, sociable, and powerful (Xin *et al*., 1998)". These emotional feelings, impressions, or images are color emotions (Ou *et al*., 2004). Literatures contributed efforts to quantify the relationship between color and emotion for the advantages brought by the integration of color's physical property of the spectrum of light and its psychological nature. One advantage is that color selection can be more objective when each color is specified by the emotions conveyed. Another is that using numerical value or standard colorimetric systems such as RGB or CIE to represent color emotions facilitates the communication between different parties (e.g.

[2] Yang, C.Y. , Yuan, S.T. (2010). "Color Imagery for Destination Recommendation in Regional Tourism", 2010 Pacific Asia Conference on Information Systems. Taipei, Taiwan. 2010, pp.1274-1285.

[3] Yang, C.Y. Hsieh, P.H. and Yuan, S.T. (2012) Color Imagery Based Recommender System: A Case Study on for Regional Destination Tourism. Working Paper in Ambient e-Services Lab.

Web designers and programmers) (Xin *et al.*, 1998).

To achieve the goal of quantifying the color emotions, four sets of color-emotion factors are claimed to cross-culturally exist, including warm–cool, heavy–light, active–passive, and hard–soft (Ou *et al.*, 2004). These factors can be considered as color semantics or high-level properties which are color-induced sensations, whereas low-level properties are the syntactic characteristics such as hue, luminance and saturation (Corridoni *et al.*, 1999). In the content-based image retrieval field, researchers combined the syntactic level and the semantic level to devise formulas for transforming colors into emotions (Corridoni *et al.*, 1999; Solli and Lenz, 2009). However, the number results calculated by these formulas are convenient for machine computation but have a lack of human readability.

Color Image Scale (Kobayashi, 1981, 1992, 2001) which combined color science, color emotion and word semantics explicitly defined the meanings of 130 basic colors and over 1000 color combinations. Each color combination is assigned one or more image words (an adjective) through investigation and factor analysis. These colors are categorized with Hue and Tone System (Kobayashi, 1981, 1992, 2001), consisting of 40 hues and 12 tones (Value-Chroma) and based on the ISCC-NBS color naming method and the Munsell color System. Three psychological axes including warm-cool, soft-hard, and clear-greyish correspond to the hue, value, and chroma in the Munsell system (Kobayashi, 1981). The closer the distance between colors on the scale, the greater the similarity between their images. On the Single Color Image Scale, colors belonging to the same tone are arranged in order of hue, whose images vary but have common characteristics the tone conveys. Take vivid tone for example, it means vivid, bold, clear, full of life, and attract attention (Kobayashi, 1992).

For color mixture, center of gravity law for color mixture can be applied to

predict the color of a mixture of lights. the additive color mixing has been widely used such as painting restoration (Pei *et al.*, 2004), OLED display (Wu et al., 2006), and colored visual cryptography (Yang and Chen, 2008) for its natures of saturation and de-saturation concept, preventing the introduction of unnatural colors, and the capability of brightness manipulation (Lucchese *et al.*, 2001; Pei *et al.*, 2004). Color mixture can be achieved by using a xy chromaticity diagram where the color gamut is arranged on the circumference of a circle, and white color lies at the center. By assigning to each of color of components a weight proportional to the intensity of light, then the center of gravity of the resultant figure then represent the color of the mixture of lights (Broackes, 1992). The equations 1 illustrate the calculation of center of gravity law of color mixture (Lucchese *et al.*, 2001). C_2 (x_2, y_2, Y_2) is the result from the mixture of C_w (x_w,y_w,Y_w) and C_s (x_s, y_s, Y_s). C_2, C_w and C_s use CIE xyY color space representations which convert from RGB values to indicate their location in xy chromaticity diagram.

When C_i RGB form, i = 2, w, s,

C_i (X, Y, Z) is calculated from $\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} 0.49000 & 0.31000 & 0.20000 \\ 0.17697 & 0.81240 & 0.01063 \\ 0.00000 & 0.01000 & 0.99000 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$

C_i (x, y, Y) is calculated from $x = \frac{X}{X+Y+Z}$, $y = \frac{Y}{X+Y+Z}$

$x_2 = \frac{x_w \frac{Y_w}{y_w} + x_s \frac{Y_s}{y_s}}{\frac{Y_w}{y_w} + \frac{Y_s}{y_s}}$, $y_2 = \frac{Y_w + Y_s}{\frac{Y_w}{y_w} + \frac{Y_s}{y_s}}$, Y = Y which contains brightness information (1)

A.2 The Detail Design in Image Modeling Module

Image modeling module (IMM) is designed for modeling images as profiles for each stakeholder, including tourists, destinations, and SMEs in tourism application. It also works as the core for imagery representation in uVoygae. Every image model is composed of psychological characteristic attributes. The tourist image model reflects

a tourist's self-image representing his personality and preference derived from a machine-learning process. Image matrix constructor and word/color translator form IMM whose input is the data from tourists, SMEs, and destinations and output is the corresponding image matrices for each role.

Two approaches are used to construct image matrices for tourists, SMEs and destination. First, in tourist's image initialization, tourists are classified in three categories - Independent Mass Tourist, Explorer, and Drifter (Lepp and Gibson, 2003) according to their selection. Each category has its own default characteristics corresponding to specific images. Therefore, for different application, customers should be classified first in uVoyage. Then tourist's image models are continuous updated according to their behaviors recording in encounter database including entering search terms, buying products or services from a specific providers and interaction with a service provider.

The representation of images is composed of psychological words (i.e., a representation of image attributes). These words come from Color Image Scale (Kobayashi, 1992) and all of them are adjectives. With Color Image Scale, converting the feelings about products, services, and experiences into mathematical notations becomes easier, because on the Internet, they are usually accompanied with text information which can be analyzed with text mining techniques. Table A.1 presents part of image attributes taken to construct an image model within our system. In total, 122 image attributes are chosen from Color Image Scale, and they can be categorized into 14 groups (casual, chic, classic, clear, cool-casual, dandy, dynamic, elegant, formal, gorgeous, modern, natural, pretty, and romantic) according to their meanings. The original Color Image Scale has 130 colors and 180 emotional words. However, their positions on the scale are not exactly and directly mapped, and some of colors

are too close to be distinguished, so only 122 relations among them could be clearly identified and used in our research.

Table A.1 Exemplars of Image Attributes/Elements in Modified Color Image Scale

Image Attribute	Chinese	R	G	B	Munsell	Adjective Factor	Category
amusing	好玩的	184	28	16	R/S	evaluative	CASUAL
bright	多采多姿的	216	128	0	YR/S	sensitive	CASUAL
casual	休閒的	192	0	112	RP/V	dynamic	CASUAL
cheerful	開朗的	255	217	0	Y/V	emotional	CASUAL
dazzling	耀眼眩目的	208	0	32	R/V	evaluative	CASUAL
delicious	美妙的	186	69	131	RP/S	sensitive	CASUAL
enjoyable	享樂的	216	128	0	YR/S	emotional	CASUAL
friendly	友善的	239	143	184	RP/B	evaluative	CASUAL
chic	雅緻的	54	96	141	PB/S	evaluative	CHIC
modest	簡樸的	129	145	66	GY/Dl	evaluative	CHIC
noble and elegant	高貴典雅的	82	131	124	BG/Dl	evaluative	CHIC
quiet	清靜的	133	153	186	PB/L	scale	CHIC
simple, quiet and elegant	簡單、安靜和優雅的	171	157	109	Y/Gr	evaluative	CHIC
sober	穩重的	102	120	149	PB/Dl	scale	CHIC
stylish	新潮的	0	33	152	PB/V	evaluative	CHIC
classic	經典的	102	0	117	P/Dp	evaluative	CLASSIC
complex	複雜的	184	147	143	R/Gr	scale	CLASSIC
conservative	保守的	112	92	0	Y/Dk	evaluative	CLASSIC
elaborate	精緻的	104	0	31	R/Dk	evaluative	CLASSIC

Each image attribute is represented by a psychological word and has several properties: color notations, including Munsell and RGB value, and adjective factor (evaluative, sensitive, dynamic, emotional, scale (Kobayashi, 1981), which will be used in the image matching and mixing process. Because the raw data for building image models are gathered either by text mining from Internet or through open questions from tourists and SMEs, DISCO, a JAVA tool, which retrieves the semantic similarity between arbitrary words are used to retrieve the semantic similarity between external words and psychological words in Color Image Scale. In consequence, all the external text contents could be translated into words within the boundary of our modified Color Image Scale.

Since image elements can be represented either by words or by colors, every image model in the system has three matrices, which contains words (W), RGB

values set (C), and their intensity values (I, the value which equals the count of a particular psychological word divided by the total number of the psychological words in percentage terms) separately. After the image matrix in the word format is constructed and accompanied with intensity values, the word/color translator will map those words onto colors according to Color Image Scale (Kobayashi, 1992, 2001). In uVoyage, for simplicity the relation of word and color is many to one (it is many to many in the original color image scale), that is, every image attribute has its own meaning, and it can be presented either by multiple words or one single color.

A.3 The Detail Design in Image Mixing Module

Image Mixing Module (IMM) is responsible for updating images via interactions from encounter database. uVoyage supposes different role's image has different influences on others to a certain extent. Figure A.1 depicts this mutually influencing concept considered in uVoyage for tourism. Those numbers in the chart stand for the relative strength of the influences between the images of roles (bold lines are those above six). When interaction contacts occur, the images of the involving entities would slightly change in accord with the influences from the other's images. For example, a man with red image visit a place with yellow image, the man's image will turn to more orange, because this fact reveals the man's preference in an implicit way.

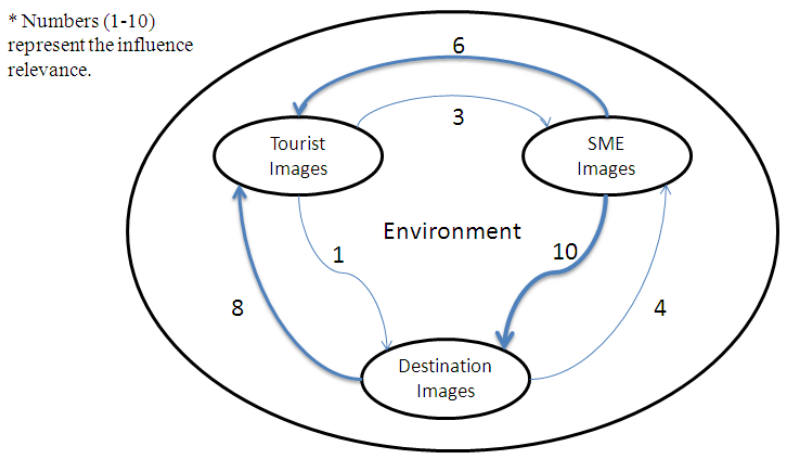

Figure A.1 Influences of the Interactions among Stakeholders' Roles

Destinations are believed to have more significant attraction to tourists than SMEs in regional tourism, or SMEs would devote to collaboration to thrive a destination. Tourists are less powerful on the influences than the other two because choices convey humans' preferences. Therefore, different weights for three roles in tourism are set in Figure 3. When the interactions occur, more than the sum of all the image attributes within each entity, uVoyage mixes their images to realize the influences on their image matrices. The alliances of SMEs and a union of destinations can be viewed as an interaction in which every member's influence is regarded as equal. Two levels of image mixing as below:

Level 1 – Most Precise:

Select image elements in each role's image model whose intensities are higher than a threshold (10% here). Combine the image elements from step 1 to form the alliance image. Each image element in the alliance will have a raw value which equals to the sum of the percentage values of the referred same word, e.g. in Figure 4, the raw value of the word 'traditional' in the alliance is equal to the sum of '36' in Pounded Tea and '24' in Bull Cart. The intensity values of an alliance image are the results of normalization to these raw values.

Level 2 –Most Comprehensive:

Assuming two roles interact with each other, their image models are IM1 and IM2. In the following steps, CBRS then find what image elements IM1 is attained as the results of its interaction with IM2.

Step 1. Categorize all images elements in IM1 and IM2 into five groups according to their adjective factors: Evaluative, Sensitive, Emotional, Dynamic, and Scale (Kobayashi, 1981).

Step 2. For both IM1 and IM2, use the additive color mixing method to find five centers of gravity according to the group types. This method requires the percentage of each image element (its amount / weight in the mass) as parameters for the percentage of luminance used in the additive color mixture method. Use a squash function to adjust their intensity values as the inputs (i.e. percentage = squash(element.intensity), the squash function we use is f(x) = x*2.5), because the intensities might be so small after the categorization in step 1 that the produced center of gravity would become a bias.

Step 3. CBRS now has five new color points of IM1 and IM2 respectively. Use the additive color mixing method again to find the center of gravity in each pair of these color points (each pair is in the same adjective category). This time, use the influence weight values corresponding to the IM1's and IM2's stakeholder roles (e.g. (1-0.6) and 0.6 if IM1 is a tourist's image model and IM2 is a SME's) as the required percentage parameters.

Step 4. Find image elements in Color Image Scale whose colors have shortest distances in RGB space with the five centers of gravity gained from step 3.

Step 5. The image elements we get from step 4 are the image mixing results IM1 will be given after interaction. That is, they are treated as additional ones

which will be added into IM1 as influenced by the other stakeholders. Since CBRS has intensity values, image elements which have less influences are like 'filtered' during the mixing process. In addition, image mixing increases the possibility with which we find image elements that differ from anyone within all participants' images.

Additive color mixing method are used (normally used to do the light mixture) to facilitate the mixture of images. Here the four steps of the additive color mixture method uVoyage adopted in the image mixing process: (Fairman *et al*., 1997; Lucchese *et al*., 2001; Pei *et al*., 2004)

Step 1. Choose i numbers of emotional words or colors as targets, and find their RGB values in the Color Image Scale (Kobayashi, 2001).

Step 2. Convert those RGB values into CIE xyY color space representations

Step 3. Use the Center of Gravity Law for Color Mixture to find the result (xr, yr) of color mixing (Lucchese *et al*., 2001; Pei *et al*., 2004).

Step 4. Look up the image word represented by the result of color mixing. If there are no words for the mixed color, use a fuzzy method to gain surrounding words (e.g., if there is a major color, the mixed image will be like "pretty casual" in which the "casual" is in the main image). Table A.2 illustrates the computing process of the image mixing by above steps.

Table A.2 The Example of Image Mixing Computing

				CIE Color Space			CIE xyY color space			After Mixing			Mixing Result
Munsell	R	G	B	X	Y	Z	x	y	Y	R	G	B	
R/S	184	28	16	102.04	55.4798	16.12	0.58765	0.31951					amusing
YR/S	216	128	0	145.52	142.213	1.28	0.50351	0.49206					bright
R/D1	168	104	96	133.76	115.241	96.08	0.38762	0.33395					glossy
YR/Dp				127.107	104.311	37.8267	0.47209	0.38742	104.311	189.333	86.6667	37.3333	aromatic

A.4 Detail Design in Image Matching

With the fundamental element, images, being comprehensively cultivated, image

matching processes them to find the good destination or SMEs matches to fulfill tourists' emotional needs. When a tourist inputs a query, the query would be used as a filter to build a candidate list from the database, followed by the list being sorted based on the tourist's image model for personalization. Queries are considered as a short-term image representing the tourist instant emotional needs translated from a query when planning a trip to update tourist's image model viewed as a long-term image. The SME image model represents the real-time mental vision or the impression of a SME from the population.

Therefore, the recommendation procedures are concluded in four steps. First, uVoyage attains tourist images and analyzes the tourist (the current user)'s instant inputs, which stands for his expected images. Second, uVoyage gets a selection pool and uses the short-term image model attained from previous step to filter candidate image models in the database. Image elements' intensity value in these candidate models must exceed a certain threshold. Third, uVoyage retrieves similarity value and selects top three colors having the most intensity value in the tourist image model and candidate image models. Then based on the color harmony theory (Cohen-Or et al., 2006), uVoyage calculates the similarity of each pair of them but when colors not in the same particular zone in a color model will gain zero score. Finally, personalized recommendation list are made and each candidate image model has a similarity score gained from step 3. uVoyage ranks this candidate list with these scores, and find out destinations or service providers who own these image models. Finally, uVoyage renders this name list with an appropriate format, and present it to the current user as a personalized recommendation.

Appendix B SME Alliance Service Formation in uVoyage

In appendix B, the design and algorithms of alliance partner recommendation for uVoyage SME alliance service formation module (Chapter 6, page 116) is detailed. The complete work can be found in Yeh *et al.* (2010)[4]. According to uVoyage conceptual framework computing metaphor and image building are eventually leading to SME alliance service formation. Computing metaphor refers to computationally calculating the measure of salience in comparing metaphors. Since metaphors are great vehicles to carry images and a great tool for innovative solution design, the unique and attractive image building then relies on the selection of appropriate metaphors. By designing a novel metaphor generation mechanism, metaphors can help alliance partner configurations and recommendations for a specific SME, which pursues particularly unique and attractive image building.

SME alliance service formation module architecture consists of four main modules – goal comprehension module, candidates generation module, niche assessment module and image classification module. The detailed architecture (Figure B.1) starts with analyzing the goal from the user side (i.e., a SME service provider). SME alliance service formation module according to the analyzed results will generate the possible partner candidate sets by the aid of metaphor generation process. Finally, SME alliance service formation module turns to evaluate the level of niche for each candidate set and give partner recommendations to users.

[4] Yeh Y.C., Hsieh P.H. and Yuan S.T. (2010), "Metaphor-Based Alliance Partners Recommendation for Unique and Attractive Destination Image Building". Proceedings of the 44th Hawaii International Conference on System Sciences – 2011, pp.1-11.

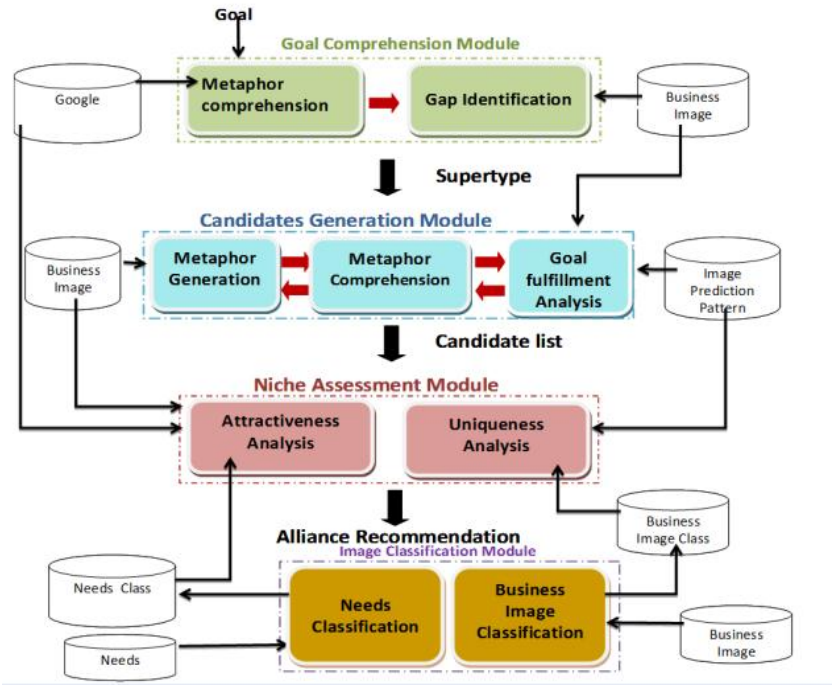

Figure B.1 Detailed Architecture for SME Alliance Service Formation Module

B.1 Goal Comprehension Module

Goal comprehension module is designed for comprehending the goal of a SME. The goal here is a high-level image that the SME craves to deliver to public. At the beginning, the user needs to offer a goal in the form of a metaphorical statement and then the metaphor comprehension component is evoked to analyze the statement and extract the latent properties of it. In turn, comparison analysis is conducted to figure out the gap between what the user wants to be and what it is now.

Once the gap is identified, it can then move to the next stage. In general, goal comprehension module is aimed to identify the image gap between now and future through metaphor comprehension and gap identification process. In order to comprehend metaphors, we adopt a web-driven, case-based approach developed by Veale and Hao (2007), which leverages the text of web as a plentiful knowledge source (i.e., collective intelligence) to identify what properties are most contextually

appropriate to apply to both sides of topic and vehicle. This approach employs Google search engine as a retrieval mechanism for finding properties of words using its APIs that allow the wildcard term * and any possible words. A metaphor statement will be decomposed into processable lexical units first and then the topic and vehicle of the metaphor will be recognized. Next, send the query in the pattern of "as * as vehicle" to Google. By filtering out the meaningless words (including undesired negative terms) through tools like WordNet, we can get a series of terms used for describing the vehicle. For example, if you send a query "as * as chocolate", you may get some terms after filtering, such as sweet, delicious, wonderful, etc. That implies chocolate can be sweet, delicious and wonderful. More specifically, those words can be the properties of chocolate. Through carrying out a set of similar processes, the salient properties of the specific vehicle that are applicable to the specific topic are discovered. Thus, the properties of a metaphor will be uncovered and the goal (images) is comprehended as well. For more details of metaphor comprehension process, see the algorithm in Figure B.2.

Thereafter, the module attempts to catch the missing part of existing images of the SME. The collected images are basically adjectives used for describing a destination or a SME. The image gap can be identified through comparing the existing images with the wanted images by the aid of semantic analysis, which evaluates how close the meanings of two words are. If any of the wanted images cannot be found in the existing images of SME or be found in the existing image with a small level of similarity, that image would be considered as one of the gap images. In other words, gap images are those which are not able to be fulfilled by existing images. The algorithm of gap identification is specified in Figure B.3. In sum, the identified gap images will entail what are the elements that should be complemented by others for

achieving the goal so that they can serve as the good starting point for partner candidate generation.

Metaphor Comprehension Component

Step1: Decompose the metaphorical statement into processable lexical unit
Step2: Identify topic and vehicle of the metaphor statement
Step3: Send query "as * as vehicle" to Google
Step4: Get a series of properties of vehicle
  Save the results of query as image vector
    FOR i TO the total number of image elements in image vector
      Send the query "as $Image_i$ as vehicle" to Google
      IF the number of returned results is higher than a specific threshold THEN
        Keep $Image_i$
      ELSE
        Remove $Image_i$
      END
    NEXT
Step5: Verify those properties whether they are applicable to Topic or not
    FOR i TO the total number of image elements in image vector
      Send the query "Topic is as $Image_i$ as vehicle" to Google
      IF the number of returned results higher than a specific threshold THEN
        Keep $Image_i$
      ELSE
        Remove $Image_i$
      END
    NEXT
Step6: Save the rest of image elements in the image vector as the salient properties vector

Figure B.2. Metaphor comprehension algorithm

Gap Identification Component
  Step1: Take the image vector of a specific SME
  Step2: Conduct the similarity analysis
    For each element of salient properties vector, examine its semantic similarity relative to the images of SME.
    Set MaxSimilarity = the highest level of similarity of specific salient property
    FOR i To total number of salient properties
      MaxSimilarity = 0
      FOR j To total number of images of SME
        TempSimilarity = Compute the semantic similarity index between $Salient_i$ and $ImgSME_i$
        IF MaxSimilarity < TempSimilarity THEN
          MaxSimilarity = TempSimilarity
        END
      NEXT
      IF Maxsimilarity > specific threshold THEN
        Tag $Salient_i$ with "fulfilled"
      ELSE
        Tag $Salient_i$ with "unfulfilled"
      END
    NEXT
  Step3: Save all of the properties tagged with "unfulfilled" as the Gap vector

Figure B.3 Gap identification algorithm

B.2 Candidates Generation Module

Candidates generation module aims to attain possible cooperating partners. Based on the gap identified in the last module, hereafter named “supertype”, this module uses it to generate a collection of new metaphors. These metaphors are then analyzed by the metaphor comprehension process to ensure every metaphor we generate makes sense and then each metaphor can also be projected to specific business types for possible cooperation accordingly. Once these candidates are identified, goal fulfillment analysis is executed to ensure that cooperating with those candidates can achieve the user’s goal, attaining a series of business types for potential cooperation.

Similar to what the metaphor comprehension process does, the metaphor generation process uses the “gap” as salient properties of metaphors and send the query “as gap as *” to Google. It will return a collection of vehicles that have the “gap” properties. This process involves the filtering work as well. For instance, if the gap properties include sweet and delicious, it will send two queries, “as sweet as *” and “as delicious as *”, to Google and then gathers collections of vehicles that can be depicted as sweet and delicious. The vehicles with those two properties are preferred. After collecting a series of vehicles, this module combines the topic and vehicles to form a complete set of metaphors and uses the metaphor comprehension process to examine the suitability of the metaphor configurations. Once this step is completed, the module then projects the vehicles to some real business types and investigates the level of fulfillment of the user’s goal.

For space limitation, we omit the presentation of the algorithm of the goal fulfillment component. The main steps of this component are two folds: (1) Project

vehicles to real business types by engaging the similarity analysis to compare the properties of vehicles attained by the first two components to the existing images of a set of pre-defined business types. Given the assumption of those properties and images being stored in the forms of collections of adjectives, this module then inspects the level of likeness between both sides. As the level of likeness of a particular pair exceeds a specific threshold, the projection relationship is hence established. (2) For each projected real business type, compute its level of goal fulfillment. Since the goal of the SME is to convey a specific image to public through the aid of cooperation, it's essential to have the anticipated effect of cooperation forecasted when different partner compositions are formed. To this end, the image prediction patterns are accordingly adopted. In addition, whether the goal can be achieved or not is done by computing how many gap images can be fulfilled through the cooperation with the projected business type. The result of this component will then be a set of business types for the SME to cooperate with to achieve the goal.

B.3 Niche Assessment Module and Image Classification Module

Niche assessment module is built for evaluating the market potential of each likely partner composition. Niche assessment here involves attractiveness analysis and uniqueness analysis. Attractiveness analysis is to measure the consumer desirability and uniqueness analysis is to examine the degree of differentiation (Yu¨ ksel and Akgu¨ l, 2007). The notion of attractiveness here refers to the extent of allurement and capacity that can satisfy the needs of customers. In order to assess attractiveness, the needs of customers are collected and stored in the database, especially emotional needs. This module then tries to match the predicted image based on the results of the

last module with the historical needs of customers. We assume that those needs data have been categorized into several needs classes to avoid the complex computation afterwards. The more needs can be satisfied, the higher level of attractiveness is measured. Besides, uniqueness here signifies the extent of image differences between a new partner composition and existing entities perceived by customers.

The dissimilarity analysis is conducted to understand the degree of divergence. For simplicity, this component divides the analysis into three cases: (1) The images of the new partner compositions and the existing ones of the business entity are completely the same. (2) The images of the new partner compositions and the existing ones of the business entity are partially the same. (3) The images of the new partner compositions and the existing one of the business entity are completely different. When the image of a partner composition is evaluated as attractive and unique, this partner composition would be considered to have a market potential. By appraising the niche of each possible partner composition, this module is able to identify the novel partnerships with high desirability and differentiation. To differentiate the three cases, a diversity intensity is associated with each case to indicate the level of uniqueness for the image of a partner composition.

For the purpose of reducing computation complexity in niche assessment module, image classification module is developed because the niche assessment module involves intensive computation and comparison processes. For example, when evaluating the level of uniqueness, it's possible to compare the image configuration of a new alliance to all of existing business entities. This process would take considerable time due to the magnitude of data entries. Hence, this module processes the required inputs (e.g., the needs of tourists and the images of businesses) for the niche assessment module in advance. In doing so, cluster analysis is adopted by

classifying both the needs of tourists and the images of businesses beforehand so as to make the computation process in the niche assessment module more efficiently and effectively.