INSTITUTO
UNIVERSITÁRIO
DE LISBOA

Approach to C2F2C (Customer to Factory to Customer) Strategy: A Case Study of the Fanqing Furniture Company

ZHONG Liang

Doctor of Management

Supervisors:
PhD Maria Santos, Assistant Professor,
ISCTE University Institute of Lisbon

PhD YIN Jin, Associate Professor,
University of Electronic Science and Technology of China

May, 2019

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

Approach to C2F2C (Customer to Factory to Customer) Strategy: A Case Study of the Fanqing Furniture Company

ZHONG Liang

Doctor of Management

Supervisors:
PhD Maria Santos, Assistant Professor,
ISCTE University Institute of Lisbon

PhD YIN Jin, Associate Professor,
University of Electronic Science and Technology of China

May, 2019

BUSINESS SCHOOL

Marketing, Operations and General Management Department

Approach to C2F2C (Customer to Factory to Customer) Strategy: A Case Study of the Fanqing Furniture Company

ZHONG Liang

Doctor of Management

Jury:

PhD Elizabeth Reis, Full Professor,
ISCTE University Institute of Lisbon
PhD Virginia Trigo, Professor Emeritus,
ISCTE University Institute of Lisbon
PhD Maria Santos, Assistant Professor,
ISCTE University Institute of Lisbon
PhD António Rui Moreira de Carvalho, Associate Professor,
Instituto Superior de Gestão,
PhD LU Ruoyu, Full Professor,
University of Electronic Science and Technology of China
PhD LI Qiang, Associate Professor
University of Electronic Science and Technology of China

May, 2019

This page is intentionally left blank.

Statement of honor

Submission of doctoral thesis

I the undersigned state on my honor that:

- The work submitted herewith is original and of my exclusive authorship and that I have indicated all the sources used.
- I give my permission for my work to be put through Safe Assign plagiarism detection tool.
- I am familiar with the ISCTE-IUL Student Disciplinary Regulations and the ISCTE-IUL Code of Academic Conduct.
- I am aware that plagiarism, self-plagiarism or copying constitutes an academic violation.

Full name Zhong Liang

Course Management

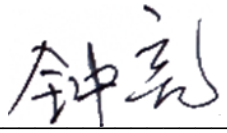
Student number 70813

Email address zlggh@iscte.pt

Personal email address 1412575923@qq.com

Telephone number +86-13982259339

ISCTE-IUL, 19/5/2019

Signed 

This page is intentionally left blank.

Abstract

Hotel furniture manufacturers, as key components of modern service industry, have become leading service companies concerning China's economic development. Consumer-driven business model and mass customization are becoming important direction of hotel furniture manufacturers' transformation and upgrade.

In a context of fragmented competition and individualized customers' demand, it is difficult to take advantage of the low cost and high efficiency of mass production, while meeting the customers' individualized needs. Internet led business increases the difficulty of balancing the offer of large production and customization, because companies face a high cost (Customer to Factory), while the customers' satisfaction is low (Factory to Customer). Finding a solution to this trade-off is not only a major challenge in the process of company model transformation, but also an important topic that has not yet been studied in depth.

Based on Fanqing Hotel Furniture Company's empirical case of solving the contradiction between individualized demand and mass production, this thesis studies the evolution of hotel furniture manufacturers' (HFM) innovation ecosystem and the value co-creation mode. The C2F2C (Customer to Factory to Customer) strategy of Fanqing was constructed based on both company innovation ecosystem theory and customer value co-creation theory. By implementing the C2F2C strategy, Fanqing has realized standardization, informatization and lean production, and also fulfilled customers' needs and improved their satisfaction. The C2F2C strategy also helps to reduce costs and achieve value co-creation between the company and customers. This thesis explores an effective way to improve technological innovation ability and international competitiveness of HFM in China.

Keywords: innovation ecosystem; value co-creation; hotel furniture manufacturers; C2F2C

JEL: L10; M10

This page is intentionally left blank.

Resumo

As empresas de móveis para hotéis constituem um sector importante no desenvolvimento da indústria de serviços modernos, liderando já a indústria no desenvolvimento económico da China. Seguir um modelo de negócio de personalização em larga escala e orientação para o consumidor aponta ser uma direção significativa a tomar para a transformação e inovação das empresas de serviços.

Face à concorrência individualizada e fragmentada na procura de clientes da indústria hoteleira, é difícil oferecer ao cliente uma personalização em larga escala, que permita atingir as vantagens de baixo custo e alta eficiência de produção em volume, atendendo simultaneamente à personalização das necessidades de cada cliente. Na comercialização pela internet é mais difícil equilibrar a oferta de uma produção em larga escala e personalizada, porque é elevado o custo em C2F, mas em contrapartida baixo o nível de satisfação do cliente em F2C.

Como suporte empírico, esta tese analisou o caso da empresa de Móveis para Hotéis Fanqing, que resolveu a contradição entre procura individualizada e produção de massa em grande escala, permitindo estudar a evolução para um ecossistema inovador e de criação conjunta de valor entre empresas de móveis e clientes nesta industria de mobiliário para hóteis (HFM). A estratégia da relação cliente para fabricante e deste para cliente (C2F2C) da Fanqing foi desenvolvida com base nas teorias da inovação do ecossistema e da criação de valor conjunta. Ao implementar a estratégia de C2F2C, a Fanqing operou tanto a standardização, a informatização e a produção lean, como a satisfação do cliente preenchendo as suas necessidades. A estratégia C2F2C permite reduzir custos e potencia a criação conjunta de valor entre fabricantes e clientes, explorando uma maneira eficaz de melhorar a capacidade de inovação tecnológica e a competitividade internacional das empresas de móveis para hotéis da China.

Palavras-chave: ecossistema inovador; criação conjunta de valor; empresa de móveis para hotéis; C2F2C

JEL: L10; M10

This page is intentionally left blank.

摘要

酒店家具企业是现代服务产业发展的关键组成部分，已成为我国经济发展的主导服务企业。消费者驱动的商业模式和大规模个性化定制正成为酒店家具企业转型升级的重要方向。

面对酒店产业消费者需求个性化、碎片化的竞争状况，如何实现既能发挥大规模生产的低成本与高效率优势，又能满足消费者个性化需求的大规模定制，解决现有互联网运行模式中“C2F 模式成本过高，F2C 模式客户满意度低”的问题。这不仅是企业模式转型过程中面临的重大挑战，也是理论研究尚未深入探讨的重要课题。

因此，本文采用案例分析法，结合繁清酒店家具公司在解决“个性化需求与大规模定制之间的矛盾”三年多的实践经验，研究了酒店家具企业创新生态系统的演化及其价值共创模式的发展。本文在总结和研究酒店家具公司创新生态系统的基础上，提出了三种不同的酒店家具公司价值共创运行模式；并从转型的视角分析了酒店家具制造公司各个业务流程节点，对公司价值共创的激起、实施和结果进行研究；基于公司创新生态系统理论与顾客价值共创理论，构建了繁清酒店家具公司 C2F2C 战略。繁清酒店家具公司通过有效实施 C2F2C 发展战略，实现了酒店家具公司的管理集约化、工艺标准化、生产过程信息化和精益化；在充分满足顾客需求、提高顾客满意度的同时，降低公司成本，实现公司和顾客之间价值共创；本文研究探索了我国酒店家具公司提高技术创新能力和国际竞争力的有效策略和途径。

关键词：创新生态系统；价值共创；酒店家具企业；C2F2C

JEL: L10; M10

This page is intentionally left blank.

Acknowledgements

It is of great significance to me to conduct research and study at ISCTE University Institute of Lisbon. The systematic learning program and favorable learning atmosphere enable me to gain a lot of knowledge and improve my theoretical research ability. It is also a great honor to express my sincere gratitude to Prof. Maria Santos and Prof. Yin Jin, who have been generously offering me help and inspired my study. Without their meticulous revision and illuminating instruction, I would not be able to face all the difficulties and pressure positively and my thesis would not have reached its present form.

My thanks also go to all professors who taught me, all classmates who studied with me and always encouraged me, and my friends and family who supported me to move forward whenever there were obstacles. Without them, I would not have been able to complete this program.

Last but not least, I am so grateful to all people who have been giving me help through all the stages of the thesis. Thank you for your suggestions and help.

This page is intentionally left blank.

致谢

在里斯本工商管理大学攻读管理学博士学位对于我而言非常重要。系统的学习，Maria 教授和殷瑾副教授的悉心指导，良好的学习氛围，让我像海绵吸水一样，获取了大量的知识，同时提升了自己的理论研究能力，而且更积极的态度面对困难和压力。因此，我感谢学院，感谢导师。

同时，我感谢所有授课的教授，一起认真学习互相鼓励的同学，以及支持我坚持学习的家人和朋友，让我顺利完成学业。

还有，我由衷地感谢论文从开题到完成过程中给予我帮助的所有人，谢谢您们的建议和帮助。

This page is intentionally left blank.

Contents

This page is intentionally left blank.

List of Tables

This page is intentionally left blank.

List of Figures

This page is intentionally left blank.

Chapter 1: Introduction

1.1 Research background and significance

1.1.1 Questions raised

Furniture is indispensable equipment and facility for people to engage in production practice, normal life and social activities. It finds wide application in residence, office, airport, hospital, hotel and other places. As a traditional labor-intensive industry, hotel furniture industry is not only an important part of China's livelihood project but also the key to the light industry to stimulate the national economy. Hotel furniture manufacturing company is an important part of the furniture industry. Its products are classified as post-real estate durable consumer goods. The company mainly provides production, design, transportation and installation services for units and individuals with home decoration needs.

With the characteristics of the internet era and the requirements of Made in China 2025 becoming more and more clear, the existing problems of hotel furniture enterprises in the past such as low production efficiency, low service capability, low concentration of furniture industry and low influence of independent brands are gradually exposed. Those problems make it impossible to meet the requirements of industrial upgrading under Made in China 2025, and adapt to the emerging consumption concept in the internet era. Nowadays, it seems that the supreme consumer is beginning to have more and more demands. They are not only satisfied with qualified off-the-shelf furniture products. They are not only satisfied with qualified, available furniture products. They pursue personalized design, ecological materials, rapid production, comfortable installation, attentive service and, at the same time, they hope to obtain the service of hotel furniture products at a lower cost in a shorter time. In a context of fragmented competition and consumers' demand, in order to obtain sustainable competitive advantage in the fierce market competition, hotel furniture production companies have to face the challenge and construct a new customer value co-creation model so as to meet the

customers' needs and improve customer satisfaction, while reducing cost of the companies and improving the efficiency of the companies.

Hotel furniture manufacturers try to carry out consumer-centered reform by drawing lessons from the valuable experience of the transformation and upgrading of other industries, and have created a C2F (customer to factory) model relying on changes of consumer demand. This model focuses on the introduction of custom furniture-based innovative activities that seek to meet all the consumer needs. The custom furniture with the idea of "what the consumer needs is what we produce" has become the standard of the new generation of consumers' fashionable life and the Blue Ocean (Kim & Mauborgne, 2005a, 2005b, 2014) of transformation and upgrading of traditional furniture manufacturers. However, in practice, the related strategic management measures cannot fully boost the profits of the companies. According to related data, in 2018, the average gross profit margin of China's custom furniture industry was between 30% and 50%, while the average net profit margin was only about 3% to 7%. Suofeiya, Home Like, OPPEIN and other domestic custom furniture giants have a net interest rate of only around 10%. And this figure is almost the highest level that the custom furniture industry can reach today. This phenomenon of high gross profit and low net profit is the pain point of custom furniture at present, reflecting the contradiction between the personalized and dispersed demand of the major hotels for their decoration style and the large-scale and mass production of hotel furniture production companies in the process of transformation and upgrading of the furniture industry. This contradiction has become the main obstacle for many furniture manufacturers to obtaining competitive advantage. Therefore, how to upgrade the future development strategy of the companies has become a major problem at present.

There is no hotel furniture company that could avoid this upgrading difficulty. As a major subdivision of commercial furniture, hotel furniture manufacturing companies mainly take the hotel as the target market to carry out their production and marketing activities. Compared with other furniture manufacturers, they relatively have the characteristics of scattered target customers, large order scale, sales channels, small target market scale, and greater influence by other industries such as hotel industry and tourism. These characteristics determine that the homogenization level of their products is lower than that of other furniture products, and the

market transactions with the target customers are more likely to be “one-to-one” mode, which highlights the contradiction between customization and low cost of hotel furniture manufacturers.

Consumer-driven business model and personal customization are becoming important direction for the transformation and upgrading of Chinese manufacturing companies. In the face of the competition situation of individualization and fragmentation of consumers’ demand in hotel industry, it is of vital importance to realize low cost and high efficiency advantages of mass production, meet the personalized needs of customers, and solve the existing network operational mode’s problem of "high cost of C2F model, and low customer satisfaction of F2C model". This is not only a major challenge to business model transformation of hotel furniture company, but also an important topic that has not been deeply discussed in academic field.

1.1.2 Practical context and significance

Under the trend of custom furniture, it is necessary to meet the personalized needs of consumers in hotel furniture manufacturers. With high labor cost, high financing cost, high tax burden and high institutional transaction cost, the need for low-cost operation of hotel furniture manufacturers is increasingly prominent.

With the rapid development of market economy and the gradual upgrading of industrial structure, the traditional furniture manufacturing industry has been unable to adapt to the new social environment. Only by realizing the transformation from traditional furniture to modern furniture and constructing the core competitiveness of the new era, can we remain invincible in the competition and adapt to the modern economy society and the sustainability of the furniture industry. The success of the transformation determines the future of the company. In traditional industry, the traditional real estate industry Wanda has transformed to the operating service industry, the traditional electrical retailer Su Ning to the online electrical retail industry, the traditional supermarket Yonghui to the online supermarket. The essence of all the transformations revolves around the user-centered feature of the current network. In the hotel furniture manufacturing industry, the length of production cycle, design style, installation service attitude can affect the satisfaction of users. Therefore, more and more companies are

considering to adjust the way of creating value, and that is from the company internal value creation to the value co-creation of the company and customers. So that customers could feel the sense of engagement and gain, and customer satisfaction is enhanced and core competitiveness is built.

This kind of experience-centered common value co-creation view, which is also called value co-creation, is evolved from the single value creation view centered on products or companies in the past. That is to say, in the process of providing products and services, a wide range of customer adaptive variables are created, and customers will then complete part of the work in the process of creating value for the company. The traditional value creation is completed within the company, value exchange in the external market, and the company determines the production of products and services. The needs of customers are inferred by the company itself. Now, value can be created jointly by the company and customers, more links are available to allow customers to participate in cooperation, sharing experience, and interactive integration. This has largely integrated the needs of consumers, enabling them to obtain satisfactory products and services, as well as unique personal experience, which is the key for companies to establish a new source of core competitiveness in the new era.

Personalized customization comes from the improvement of customers' living standards. With the development of industrial civilization, the level of social productivity has been greatly improved. People gradually get rid of the difficulty of lacking the means of production. At the same time, we step into a new stage—technology and information. Our living expense is getting to be higher, which requires a high standard of consumption. The bottleneck of mass customization growth is that personalized products have comparatively high cost. Personalized customization and mass production have always been an irreconcilable contradiction. Theoretically, the combination of mass customization and personalized customization can reach to a win-win situation of companies and customers. However, it is practically difficult to realize. As a leading hotel furniture company in China, Fanqing is also facing many of the above problems.

This thesis is a study of innovation ecosystem based on the theoretical perspective of value co-creation. It takes the development process of Fanqing Hotel Furniture Company as the

research object. The case study method is adopted to analyze the value co-creation model and the key influencing factors in the process of continuous evolution. The company's relevant experience in the past is explored and the customer and company win-win value co-creation model is extracted, so as to formulate the future development strategy of Fanqing hotel furniture company. The main problems that this thesis attempts to solve are: (1) the composition of the innovation ecosystem of hotel furniture manufacturers; (2) the operation mode and evolution of the value co-creation between hotel companies and customers in the process of the development of innovation ecosystem; (3) How can Fanqing Furniture Company solve the contradiction between customer personalized demand and company mass production and improve customer satisfaction; (4) How can the Company construct and implement the C2F2C development strategy based on value co-creation.

This thesis seeks not only to expand the boundary of innovation ecosystem, but also to enrich the knowledge of value co-creation model. It is also expected to provide guidance for hotel furniture manufacturers to achieve the transformation and development strategy of mass production under the personalized needs of customers, so it has profound practical significance.

1.1.3 Theoretical background and significance

From a theoretical perspective, the transformation of hotel furniture industry from "small-scale non-standardized custom production" to "mass standardized production" is the transition from the old furniture system to the new furniture system. It is an effective way to promote the maximization of value co-creation and enhance the competitiveness of the company to cooperate actively and closely with the related entities of the company.

Adner and Kapoor (2010b) referred to this kind of value chain of active cooperation and close collaboration among relevant subjects as "innovation ecosystem". The birth of this kind of system organization owes to the popularization and application of information technology in the world, promoting the industrial integration of customers, suppliers, intermediaries, dealers and other main bodies to realize the linear linkage of the supply chain. Moreover, with the extensive flow of scientific and technological resources, the system complexity, related matching and technological integration of industrial value co-creation activities are enhanced.

More and more enterprises take building a cross-industry cooperative innovation ecosystem as their common goal. This makes the competition among modern enterprises change from "enterprise competition" to "supply chain competition", and then upgrade to "innovation ecological competition", which reflects the gradual opening of enterprise boundaries and the formation of enterprise partnership. The process of cooperation and the construction of the system have also enhanced the necessity of this research in theoretical circle. Innovation ecosystem involves multiple related entities or industries. The key to its efficient operation lies not in the superiority of a single company, but in the joint efforts and co-creation among the relevant entities. In other words, the basis and implementation of value co-creation need the support of co-creation culture, the extension of communication channels, and the development of participation tools. These factors also lay the foundation for formal and informal cooperation between agents in innovation ecosystems.

The view that value co-creation is the main source of core competitiveness has been affirmed by many studies. Existing research should focus on the impact of customer participation on value co-creation. For example, Etgar (2008) pointed out that in customer participation, customers not only provide companies with knowledge related to their needs, but also participate in company innovation as co-producers, making it possible for customers to speak for themselves; Zwass (2010) focused on the customer value, such as environmental factors, relationship factors, project factors; Prahalad and Ramaswamy (2010) focused on the performance of value co-creation among companies, partners and customers, such as the speed of new products on the market, product market performance, product innovation and product customer satisfaction. However, as a part of traditional manufacturing industry, the research on how to realize value co-creation of furniture enterprises remains to be further explored. As is mentioned above, the contradiction between small scale customization and low-cost mass production faced by hotel furniture manufacturers is the problem existing in the process of jointly realizing value co-creation of customers and companies, or the problem lying in the realization of value co-creation in the new furniture innovation ecosystem.

Therefore, this thesis combines the theory of value co-creation with the innovation ecosystem model. It studies the evolution and development of the ecosystem where the hotel

furniture company is located and the mode of value co-creation between the company and the customer, and introduces years of practical experience of Fanqing hotel furniture company while analyzing problems that the hotel furniture company is facing at present. The development strategy of C2F2C of Fanqing is formulated to perfect the innovation ecosystem of Fanqing and realize the value co-creation between Fanqing and its customers. In theoretical aspect, the key is to realize efficient operation of the hotel furniture innovation ecosystem, and on this basis, extending a new value co-creation model, which has some theoretical reference value for the hotel furniture manufacturers to formulate the future development strategy. In addition, the theory is applied to solve the contradiction between personalized customization and low-cost mass production encountered in the transformation and upgrading of hotel furniture manufacturers, providing some experience for traditional hotel furniture manufacturers for their transformation and upgrading. It also offers some theoretical reference to all manufacturing companies involving with personalized customization.

1.2 Research content and innovation points

1.2.1 Research content and framework

The research design of this thesis is, “Putting forward the problem, analyzing and solving it”, which ensures the consistency of the full text and the preciseness of the structure.

(1) Raise questions. It is included in the first chapter “Introduction” and the second chapter “Theoretical Literature Review”. Firstly, this thesis expounds the realistic background and transformation status of the domestic furniture industry, and emphasizes the key problems that hinder the transformation of furniture manufacturing industry, that is, how to meet the personalized needs of customers and improve customer satisfaction. The particularity of hotel furniture in the furniture industry is analyzed to draw attention to the importance of the research on strategic outlook of hotel furniture industry and the significance of exploring measures promoting the transformation and development of hotel furniture manufacturers. Secondly, it gives a description of the theoretical background of the thesis, including the evolution of innovation ecosystem, the operation of innovation ecosystem and the implementation of value

co-creation. And it is of positive significance to study the evolution of innovation ecosystem in furniture industry and the operation of innovation ecosystem in furniture industry at present. Finally, the concept and theory of innovation ecosystem and value co-creation are explained in the research review, which provides a theoretical basis for the following analysis.

(2) Analyze problems. This part is included in the third chapter to the fifth chapter. In this part, this thesis uses the general research process to analyze the implementation of value co-creation in the innovation ecosystem of hotel furniture manufacturers in China. Firstly, it constructs the innovation ecosystem of hotel furniture manufacturers, clarifies the composition and internal relationship of the innovation ecosystem of hotel furniture manufacturers, and makes an in-depth analysis of the value co-creation strategy of the innovation ecosystem of hotel furniture manufacturers. The three modes of creating the current implementation value of hotel furniture manufacturers are obtained. Secondly, this thesis studies the key influencing factors of hotel furniture industry. Principal component analysis, cluster analysis and other methods are used to select and determine the factors that affect the value co-creation of hotel furniture manufacturers, and to find an important focus for the implementation of value co-creation. Finally, Sichuan Fanqing Furniture Company is taken as an example. This thesis analyzes the company's current innovation ecosystem environment, combs the changes of value co-creation strategy since its establishment, and summarizes the effectiveness of the company under the current value co-creation strategy. It not only verifies the correctness of the views put forward in the previous contents of this thesis, but also provides an analytical basis for next chapter to put forward specific countermeasures to solve the problem, and provides a wealth of experience for the conclusion of this thesis to be put into practice.

(3) Solve problems. This part comprises the sixth and seventh chapter. Based on the principle of concrete analysis of specific problems, this thesis takes Sichuan Fanqing Furniture Company as an example. It introduces Fanqing's mode of implementing value co-creation strategy in the latest innovation ecosystem operation and propose the development strategic direction of C2F2C.

Specifically, the research road map of this thesis is showed in Figure 1-1:

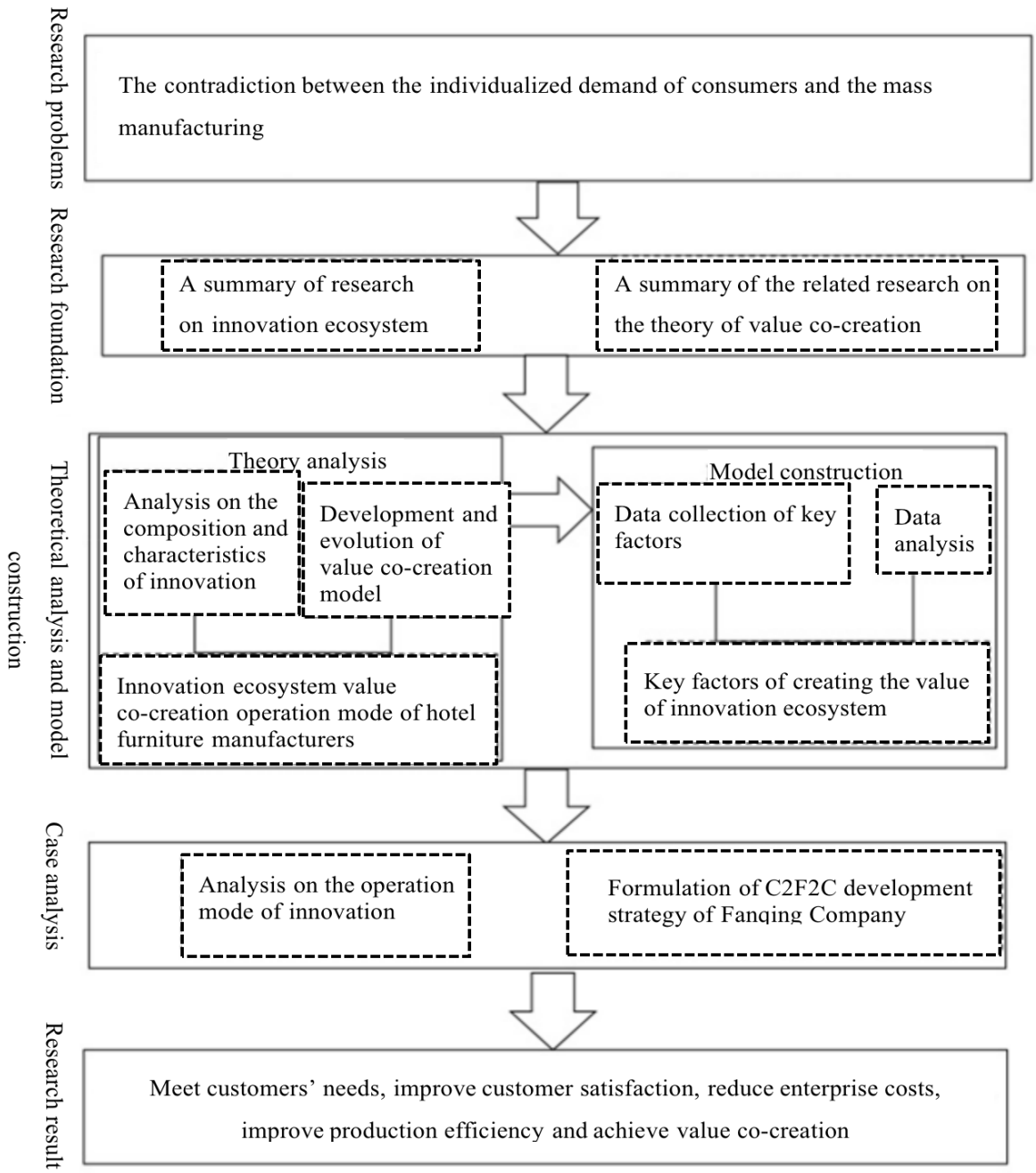


Figure 1-1 Research Technology Road Map of this Thesis

Focusing on the core problem faced by hotel furniture manufacturers, that is, how to realize mass customization, which can not only give full play to the advantages of low cost and high efficiency of mass production, but also meet the personalized needs of consumers. This thesis is based on the idea of innovative ecosystem and the theory of value co-creation. It constructs the innovative ecosystem model of hotel furniture manufacturers and the new model of value co-creation in the ecosystem. Taking Fanqing Hotel Company as an example, this thesis analyzes the composition of the innovation ecosystem of Fanqing Hotel Company and the

development of the mode of value co-creation, and constructs the C2F2C future development strategy of Fanqing based on the method of solving this core problem. It provides practical suggestions and theoretical values for the transformation of furniture manufacturing companies, and constructive references for Chinese companies to achieve transformation and upgrading. The main contents of this thesis are as follows:

The first part introduces the raise of question, as well as the significance and framework of the study. The second part reviews and collates the relevant theories to provide a theoretical framework and theoretical basis for the follow-up study. The third part analyzes the innovation ecosystem of hotel furniture manufacturers. In the fourth part, based on the literature and questionnaire survey, the key influencing factors of hotel furniture company innovation ecosystem are determined, and the key influencing factors of hotel furniture company innovation ecosystem are empirically analyzed by taking Fanqing Furniture Company as an example. The fifth part analyzes the development process and evolution process of value co-creation of Fanqing and the sixth part puts forward the key points of the construction of value co-creation mechanism in the innovation ecosystem of hotel furniture manufacturers based on the determination of the previous key influencing factors and constructs the C2F2C development strategy of Fanqing. The last part expounds the theoretical contribution and practical enlightenment of this study.

1.2.2 Research method

In order to construct an effective transformation strategy model from the perspective of hotel furniture manufacturers, on the basis of a large number of domestic and foreign literature, this thesis analyzes and collates the knowledge about value co-creation, innovation ecosystem. Starting from the development status of hotel furniture industry, industry characteristics and the practice of hotel furniture manufacturers, this thesis deduces the composition and evolution of the innovation ecosystem of hotel furniture manufacturers, the stimulation and construction of the ability of value co-creation by adopting statistical analysis, questionnaire and other research means. The main research methods of this thesis are as follows:

Literature analysis. Based on the innovation ecosystem and value co-creation, the relevant

domestic and foreign literature is summarized, which enlightens the design and concept construction of this thesis, and lays a theoretical foundation for the transformation of hotel furniture manufacturers.

Field interview. The core research method of this thesis is to use the Fanqing as a case to carry out the analysis and research. By analyzing and combing the state of the company before and after the transformation and the measures and strategies adopted during the transformation process, this thesis shows the process of the evolution of the innovation ecosystem and the construction of value co-creation ability of hotel furniture manufacturers.

Questionnaire survey. Taking the timeline as the context, a questionnaire survey is carried out, making investigation on the middle-level and high-level personnel of Fanqing and trying to obtain the relevant data to support this thesis.

Statistical analysis. In this thesis, the relevant data obtained from field visits and questionnaires are statistically analyzed by XX, and the distribution of data concepts is established.

1.2.3 Innovation points

The innovation of this thesis mainly includes the following three aspects:

Solution to the main research problem of how to balance the conflicts between customization demand and mass production faced by the hotel furniture manufacturers is found.

In the existing research, the operation of company innovation ecosystem has received more and more attention, but there is little research on the innovation ecosystem of furniture industry. Therefore, this thesis chooses to carry on a thorough analysis to the hotel furniture company in order to supplement the blank of the innovation ecosystem research. With the purpose of balancing the conflicts between customization demand and mass production faced by the hotel furniture manufacturers, this thesis draws lessons from Fanqing’s mature experience. The cost of products is reduced, the products delivery period is shorted and customers’ satisfaction is promoted by means of modular decomposition and information technology.

2. The theory and case of innovative ecosystem value co-creation operation mode are combined.

Through the field investigation and information retrieval, this thesis conducts case analysis of the innovation ecosystem value co-creation practice of hotel furniture manufacturers, and the relevant viewpoints and theories of the innovation ecosystem of hotel furniture industry put forward in this thesis are verified. It is a new attempt to combine the theoretical research of innovation ecosystem of hotel furniture manufacturers with case analysis.

By means of Fanqing Furniture Company practice experience, this thesis figures out the conflict solution between hotel furniture manufacturers' individualization and fragmentation needs and massive batch production, which signify that modular decomposition combined with information technology could not only achieve cost and delivery cycle reduction but also improve the customer satisfaction.

3. The forward-looking development strategy of C2F2C of hotel furniture manufacturers is constructed.

Based on the literature review and field research, the case about the hotel furniture manufacturers' innovation ecosystem and value co-creation evolution, has been presented comprehensively. Meanwhile, the value co-creation model under innovation ecosystem has been established and has been affirmed by practice as well. It is a new attempt that combining the theoretical research on the hotel furniture manufacturers innovation ecosystem with practical case study analysis.

At present, it is necessary for traditional manufacturing industry to transform to facilitate good development of modern companies, but there are many contradictions in the process of transformation. This thesis focuses on the prominent contradictions in the transformation of furniture manufacturers, and based on that, analyzes the latest innovative ecosystem environment of the current furniture industry. Taking the hotel furniture Fanqing as an example and value co-creation as the strategy, the C2F2C mode suitable for solving the contradiction of the transformation of the furniture industry at present is obtained.

This page is intentionally left blank.

Chapter 2: Theoretical Literature Review

This chapter focuses on the relevant theories of the key themes of this research, including the theoretical connotation and the current development situation of innovation ecosystem and value co-creation.

2.1 Overview of relevant research on innovation ecological models

The concept of innovation ecosystem is rooted in "ecosystem" (Gael et al., 2018). In 1947, British biologist Tansley (1947) put forward the concept of "ecosystem", which includes the whole complex of physical factors forming the environment. Tansley found that "ecosystem" is the basic unit of nature, with various sizes and types (Tansley, 1947). With the passage of time, the theory of ecosystem has been perfected. Now its research has been applied not only in biological field, but also to various subdivisions of human society, resulting in a large number of cross-cutting studies (Mack & Rogers, 1985; Rogers, 1995). In the 1970s, the concept of "ecosystem" was applied in the economic field. Scholars put forward "theory of company life cycle" by studying the organizational behavior of companies. Then some scholars propose the concepts of company ecosystem, industry ecosystem and national ecosystem, which further enrich the connotation of company organizational behavior management. Specifically, it is not only applied in strategic management, innovation management, but also in the level of company economic management.

Among the existing researches, there are a lot about "innovation ecosystem". Adner and Kapoor (2016) pointed out that the innovation ecosystem is a collaborative mechanism facing consumers in which companies play a leading role in solving problems through the organic combination of various inputs and innovative achievements. Li (2014) found that the innovation ecosystem is an open and complex dynamic evolution system, which refers to the ecosystem formed within a certain range through the environment interaction and the transmission of material, energy and information of innovation entities in the system. Zhao et al. (2015)

believed that the innovation ecosystem is a network formed by integrating resources, sharing resources and collaborating resources for building channels and platforms to achieve a win-win results among innovation entities.

At the beginning of this century, a large number of companies broke away from the traditional industrial perspective, and formed a close resource chain through technological cooperation and innovative evolution among companies. In order to study this kind of technical cooperation phenomenon, scholars introduced the ecosystem theory into the field of innovation, and put forward the concepts of organizational ecology, technological ecology, company ecology and industrial ecology, and have conducted in-depth study on basic examples and concepts.

2.1.1 Concept and connotation of innovation ecosystem

Figure 2-1 Three States of the Innovation Ecosystem

Since the 1960s, the innovation ecosystem has gone through three states as is shown in Figure 2-1.

(1) Technological innovation

Though the term “innovation” was first proposed by Schumpeter (1934), Schumpeter did not give a restricted definition to the term “innovation”. He explained it by enumerating specific innovative means in company production. New resources and production methods should be introduced, such as: new product development, method application, implementation of markets and supply channels, and novel forms of company organization. However, Schumpeter's concept of “innovation” is not confined to the “technical level”, but includes the “perfection of organizational system”, which is different from the endogenous growth theory of classical economics. The endogenous growth theory emphasizes the positive externality of innovation, that is, promoting technological innovation with direct investment in scientific research so as

to achieve economic growth. In the 1960s, Rostow (1959), an American economist, put forward the take-off six-stage theory of economic development. In his book The Diffusion of Innovation, he pointed out the four factors that affect the diffusion of innovation: the characteristics of innovation itself, the channels of communication, the time and the social system. He believed that the core of "innovation" lies in "technological innovation", and proposed five steps of innovation diffusion: cognition, persuasion, decision, implementation and confirmation.

(2) Innovation system

Innovation theory entered the stage of "national innovation system" in the 1980s. The theory of "national innovation system" has two distinct characteristics, one of which relies on "open innovation" theoretically and the other on the combination of industry and scientific research in practice (Pavitt, 1996, 1998). From 1985 to 1987, Lundvall and Freeman proposed the concepts of "innovation system" and "national innovation system" successively. Freeman (1987) studied the rise of Japan's economy and proposes that "national innovation system" is a network composed of market participants and governments. The interaction of each participant in the network leads to the generation, optimization and diffusion of new knowledge and realizes technological innovation. In addition, Freeman believes that in the system, the government plays an extremely important role in technological innovation in the market. The government offers public resources and services needed for "innovation" to meet the basic needs of "technological innovation", thus improving the competitiveness of the country in the international market and finally facilitating economic development.

Danish scholar Lundvall (1992) argued that the "national innovation system" depends on the efficiency of knowledge utilization, and the criteria for measuring the "national innovation system" are whether knowledge can be acquired, how to obtain the real positive impact in industry and how to create value. American economist Nelson (1993) studied the innovation policy system of 15 countries and regions, and came up with the theory of national innovation system. Nelson's research shows that different national policies have different priorities. In the United States, the government does not play a leading role, and technological innovation mainly depends on cooperation between companies and universities, scientific research institutions or other organizations. On the contrary, Japan's government acts like an organizer, directly

planning, coordinating and intervening in technological innovation (Fukuda & Watanabe, 2008). It has been confirmed that the complexity of the national innovation system is influenced by many factors such as systems, policies and existing technologies (Chung, 2002; Nasierowski & Arcelus, 2003). The main body of innovation is also diverse, in addition to companies, a large number of universities, institutions and even government-supported fund planning and implementation agencies are also participating in innovation. In the 1990s, new changes have taken place in innovation theory. The concept of "innovation ecology" has been brought into people's vision because of the "lost decade" in Japan and the rise of Silicon Valley in the United States (Nagaoka et al., 2009).

(3) Innovation ecosystem

In the 21st century, the innovation ecosystem has really formed a theoretical system and been deeply studied. "Innovation" is not the progress of scientific research in the traditional sense, but the concept of innovation formed by the interaction of industry, scientific research institutions, educational institutions and service institutions (The Organization for Economic Cooperation and Development [OECD], 1996). The Innovation America published in 2004 proposes that innovation is a non-linear, flexible project and a dynamic ecosystem that interacts, communicates, and cooperates among various entities within an economic society to promote innovation. There are three prerequisites for maintaining this ecosystem: high-quality talent echelon, long-term social investment with strong risk resistance, basic equipment necessary for carrying out innovative activities, and sound policies and systems. In June of the same year, the report Maintaining the National Innovative Ecosystem: Maintaining the Strength of American Science and Engineering Capability indicates that the reason that the United States could obtain the dominance of the world economy and long-term prosperity of the national economy is that it owns a perfect and developed innovative ecosystem. According to the report, the innovation ecosystem includes basic scientific research with long-term significance and value, top universities and first-class scientific research institutions (Chen & Kenney, 2007); related innovators and entrepreneurs are supposed to have enterprising spirit and creativity, and far-sighted basic technicians should dare to invest in risk industry that could transform to scientific research achievements.

The basic mode of innovation has evolved from “industry, university and research” to “government, company, university and user”. This new mode of innovation is called “user-oriented innovation”. Simanis and Hart (2009) gave this mode another name – “embedded innovation”, which takes the needs of consumers as the core, facilitates the product and service side in reverse, promotes producers to improve efficiency, produce new products and increase value. Hu, Huang and Du (2008) found that only when the benign and long-term innovation interaction occurs among the innovation subject, other subjects and the surrounding environment, can the innovation ecosystem be called truly established. Xiao (2006) also had a consistent view that innovation ecosystem is a process of maintaining beneficial and positive interaction among various subjects and promoting industrial evolution. Innovation ecosystem is no longer innovation on industrial production line. Organizations and industries in the innovation ecosystem cannot exist in isolation from the innovation environment. The organic combination of research and development (R&D), production and application has maintained the stability, balance and scientificity of the national innovation ecosystem (Estrin, 2008; Kashan & Mohannak, 2017).

2.1.2 Research status of innovation ecosystems

2.1.2.1 Research status of technological innovation

The term “technological innovation” is the product of the whole theory of “technological innovation”. From 1990 to 2000, scholars focused on linear innovation theory. Freeman (1987) put forward the theory of industrial innovation, and considers that market innovation, management innovation, process innovation, technology and skills innovation, as well as product innovation are the five core components of industrial innovation. Contemporary scholars from all over the world have deepened their research on “technological innovation” in a larger dimension. Furman, Porter, and Stern (2002) found that the competitive advantage of industrial innovation consists of opportunities and government behavior, company strategy, industrial structure, competitors, demand and factors. Andonova (2006) analyzed from the perspective of institutional environment and found that industrial technological innovation will be affected by research and development personnel, existing technology, political environment,

laws and regulations, administrative regulations, knowledge exchange, knowledge circulation and other aspects.

2.1.2.2 Research status of innovation system

With the deepening of the research field of technological innovation, its dynamics, self-organization and complexity have become increasingly prominent Scholars have introduced system theory to make a clearer and more comprehensive observation on technological innovation, and achieve better results. The main related research includes regional and industrial innovation system and company innovation system.

1. Regional and industrial innovation systems

From the medium perspective, there are two research modes and directions in academic circles, namely regional innovation (Doloreux, 2002; Li, 2009; Sternberg, 2010) and industrial innovation (Todtling & Kaufmann, 2001). However, compared with regional innovation, there are less industrial innovation research results. The system of industrial innovation, based on a higher market demand, depends on a peaceful political and economic environment. And with innovation as the power source, it seeks to realize the system pattern of industrial upgrading and evolution. Malerba (2002, 2003, 2005) proposed that institutions, actors and networks, knowledge and technology constitute the core of industrial innovation. Zhang et al. (2006) built a model to analyze the structure, function and operation principle of industrial innovation system, which includes four subsystems: innovation technology, innovation policy, innovation external environment and innovation evaluation. Zhang (2003) also used his model to study the empirical case of “China Optical Valley”. Li and Liu (2007) affirmed the significance of industrial innovation between company innovation system and national innovation system, analyzed the operation mechanism of industrial innovation system, and constructed relevant models. The model of industrial innovation system is built, mainly including external module of policy and institutional environment, market demand and boundary module, knowledge and technology module, participants and network module. Yu and Sun (2010) adopted EDA method to establish a model for evaluating the performance of industrial innovation system, and a relevant model for evaluating the stability of industrial innovation system from the perspective of evolutionary game theory. The results show that the cost-benefit ratio of innovation strategy

determines the final benefit of innovation strategy.

Annabelle and Michael (2014) pointed out that in the face of increasingly complex and difficult technological innovations, it is impossible for a single company to accomplish innovations, which can only be achieved through complementary collaboration of all innovation entities. The innovation ecosystem is a way to realize complementary collaboration. The overall innovation capability is a key factor affecting innovation performance. The contribution of individual companies to innovation is an indispensable part of the innovation ecosystem performance. Furthermore, the overall innovation capability of an innovation ecosystem is a key factor of individual companies' competitiveness (Courvisanos, 2003; Hwang & Mabogunje, 2013). The collaborative integration of the innovation ecosystem concordances the innovations results of the system members into specific solutions that meet market needs. In the innovation ecosystem, members are interdependent and develop simultaneously in technological innovation aspect, which helps small and medium-sized companies to improve technological viability. Through the technology innovation ecosystem, companies have increased the interaction between R&D personnel and technology. This not only creates opportunities and conditions for each company to enter each other's technology fields, but also adds value to the "knowledge and resource pool" of the innovation ecosystem (Geoffrey, Joyce, & James, 2018). In addition, foreign researchers apply the case study method, which uses Cisco (Li, 2009), Deutsche Telekom (Thom & Rohrbeck, 2009) and Airbus (Adner & Kapoor, 2010a) as examples to explain technological innovation ecosystem. The key factor of Cisco's value creation and competitive advantage is the innovation ecosystem platform establishment; Deutsche Telekom's core innovate ability is to open up traditional processes and implement external knowledge of innovation ecosystem; The interdependence between technology and organizational structure among Airbus's innovation ecosystem members has promoted technological innovation and realized value creation.

China's entry into the research field of the innovation ecosystem is relatively late, but there are also some fruits.

(1) Research on the concept of industrial technology innovation. Zhuang and Gong (2005) defined that industrial technological innovation, based on technological innovation and renewal,

is market-oriented, and the ultimate goal is to realize the competitive advantage of the industry. The core process of industrial innovation is the oscillation and diffusion in new technology companies and industries. Industrial innovation is the sum of dynamic processes that take technology as the point, go through the company to form a line and condense in the industry to form a plane. Zhuang and Gong (2005) believed that industrial innovation is the research, development, application and promotion of common divisor technology and pioneering technology in entrepreneurship and leapfrog technology. The sharing of common divisor technology, pioneering technology and leapfrog technology will exert great influence on single and multiple industries. It can be seen that these studies focused on the process of technology, as well as the innovation of common technology and pioneering technology.

(2) Research on the capability of industrial technological innovation. On the basis of the former research, Wu, Lv, and Tian (2014) further put forward several factors affecting innovation ability, such as resource investment, innovation management, research and development, manufacturing capacity.

(3) Research on the influencing factors and policies of industrial technology innovation. Gao (2004) focused on the phenomenon of technological innovation in the electronics industry through empirical analysis, mainly selecting the four indicators of the scale of the company: the openness of the industry, the change of the property rights system, and the degree of market concentration. The results show that the expansion of industrial scale, the increase of large companies in the industry and the increase of market import have the deepest impact on innovation. Market export and the average size of companies in the industry also have a certain impact on technological innovation. Wang and Jiang (2005) not only studied China's industrial technological innovation, but also put forward relevant solutions. Fan and Liu (2006) distinguished the scale of companies, quantitatively measure the factors that affect technological innovation, put forward the reasons that lead to the level of technological innovation in China's industries, and came up with the strategies of how to improve the technological innovation ability of industries with high technological density. Taking the pharmaceutical technology industry as an example, Wang (2000) put forward many factors, such as policies and regulations, market demand, innovation investment, technology and

equipment level, industrial structure, scientific and technological progress.

Therefore, it can be seen that the research mainly focuses on the definition of industrial technological innovation. The ability of innovation, factors, policies, suggestions and research results are scattered and not systematic, moreover, the research on the effect principle of influencing factors needs to be further studied.

2. Company innovation ecosystem

In the research of various innovation systems, it is easy to find that companies are always the main subject of innovation, so company innovation system must be put into the research of innovation system. Company innovation system is the sum of company internal relationship, relationship between companies, relationship between company and environment (Hemmert, 2004). These three interconnected relationships will affect every process of innovation behavior. However, the existing research lacks attention to the company internal relationship of company innovation system, and only focuses on the main body, external factors and operational principles.

(1) The subject of company innovation. Padmore, Schuetze, and Gibson (2004) argued that innovative behavior is essentially the adoption of new knowledge, and that the main body of new knowledge adoption can be the company itself, company supply chain, company competitors, consumers, government and other public sectors in the actual production and operation. Narula (2002) made a new division of the main body of company innovation. In addition to the original main body of companies involved in production, operation and consumption, there are universities, research institutes and various owners of individual intellectual property rights. But it should be noted that the innovator is always the company. The company itself has the greatest power to collect and apply all kinds of new knowledge and technology in the market. Therefore, the company is the core of the company innovation system.

(2) The innovation elements of company innovation system. Chinese scholar Gong and Nie (2002) pointed out that company innovation must be based on its own production products, preparation process, company team, company culture, company marketing means and company strategic objectives. Guo (2009) believed that company innovation comes from knowledge, system, organization, technology, management, and products, among which technology is the

most affected by external environmental factors. Sun and Lin (2011) put forward the theory of six elements, which can be divided into two types, stable elements and active elements. The former refers to the organizational structure, personnel level and strategy of companies, while the latter is market technology updating and market demand structure. However, only by dealing with the two types of elements and the relationship between elements at the same time can companies achieve innovation and ultimately achieve excellent performance in the innovation process.

(3) Dynamic mechanism of company innovation system. Padmore and Gibson (1998) pointed out that the innovation activities of companies have two characteristics: spontaneity and openness, and the evolution of the whole company innovation system must be based on coordinating the interaction among the internal systems. Wu (2006) defined the interaction and role of each system as the relationship of competition and cooperation, and Wu (2006) found that there are five internal and four external reasons for the motive force of company innovation system, among which the internal reasons are the value orientation of companies, the interest orientation of companies, the organizational culture of companies and the capability level of R&D departments of companies; while the external reasons are the supply-demand relationship of the whole society, the guidance of the public sector, the influence of capital market and social technology development level.

2.1.2.3 Research status of technological innovation ecosystem

Technological innovation ecosystem is a new concept in ecosystem theory nowadays. At present, there are few studies on this concept in the world. According to related literature, the regional technological innovation ecosystem and company technological innovation ecosystem in the research of technological innovation system are relatively concentrated in the ecological theory research as is shown in Figure 2-2.

(1) Application status of ecological theory and methods in the field of economic management

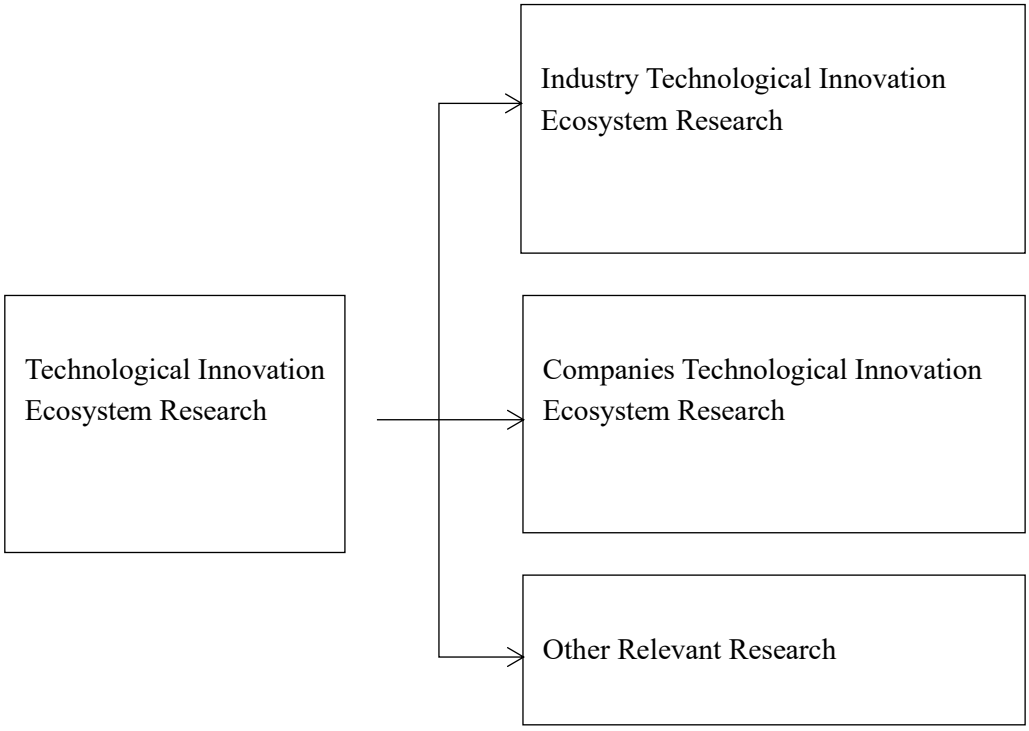


Figure 2-2 Technological Innovation Ecosystem in the Ecological Theory Research Concept

At the beginning of the 19th century, German researchers carried out relevant studies on ecology, which mainly studied the relationship and difference between animals and chemical and environmental sciences. As a result, ecology is developed and originated, and is defined by scholars as a discipline to study the interrelationship between biology and environment. In the first half of the 20th century, after the concept of ecosystem was put forward by Tansley (1947), people began to pay attention to ecological problems, and the concept of ecosystem was widely applied in various fields. In the second half of the 20th century, the field of economic management began to blend in the theory of ecology, which led to new research directions such as Organizational Ecosystems (Iansiti & Leviez, 2004), Business Ecosystems, Industrial Ecosystems (West & Iansiti, 2004) and Knowledge Ecosystemsx. (Wolfe, 2003; Papaioannou, Wield, & Chataway, 2009)

By the end of the 20th century, in order to solve the problem of technological innovation, researchers started to apply ecological theory to the field of technological innovation. Researcher Levine (1999) is one of them. In order to study the relationship among innovative products, he applied the population ecology model which can determine the future trend of existing products to the research of product ecology. Cleff and Rennings (2000) put forward

the notices of dual externalities (increasing the cost of external environment and knowledge spillover of technological innovation of companies; re-proposed the scope of innovation from the perspective of eco-economics.

(2) Research on industry technological innovation ecosystem

In 2004, Technological Innovation Ecosystem was proposed. In the same year, Innovate America: Thriving in a World of Challenge and Change was published by the U.S. Competition Commission. It mentions that from the 20th century to the early 21st century, the nature of innovation and the relationship between innovators have changed completely from the old antagonism relationship. Now this relationship has begun to develop in the direction of symbiosis and complementarity. In order to maintain its long-standing competitive advantage, the United States urgently needs to find new ways and ideas. Therefore, the report (Council on Competitiveness, 2004) proposed that "the innovation ecosystem of the 21st century needs to be established jointly by governments, educators, workers and companies."

At the beginning of the 21st century, China has made significant breakthroughs in the field of industry innovation ecosystem research. Huang (2003a) comprehensively analyzed the elements of ecosystem and industry technological innovation system, and put forward the feasibility and scientific application of ecological theory and methods to study industry technological innovation system. His research is the first and most cited research on how to use ecological methods to study industry technological innovation ecosystem. It has also become an important argument for the application of ecological theory in economic management. Huang (2003b) is also the first person to put forward the concept of industry technological innovation ecosystem. He conducted in-depth research on the hierarchy, dynamics, complexity, dissipation, integrity, dynamics, regulation and stability of industry technological innovation ecosystem, and analyzed the regulation mechanisms of industry technological innovation ecosystem, such as static equilibrium mechanism, diversity regulation mechanism and stability regulation mechanism. He has further analyzed the influence of restricting factors (ecological environment, policy, technology, market and institutional factors) on the industrial technological innovation ecosystem, and has found the constraints of technological innovation subjects and the solutions.

On the basis of ecological theory, the concept of innovative community was put forward (Huang, 2000, 2004, 2008; Huang & Zhang, 2006; Huang, Zhang, & Wang, 2007; Miao & Huang, 2007, 2008), and these scholars pointed out its differences among industrial community, scientific community, company community, cluster innovation and innovation cluster. After studying the quantitative and qualitative characteristics of innovative community, they found that it is of academic value to judge the technological innovation status of a region and provide ideas to discover and solve problems. The evolutionary relationships between different technological innovation populations in the telecommunications equipment manufacturing industry were also studied. In addition, an ecosystem health assessment method of industry technological innovation, which was based on ecosystem health theory and its evaluation criteria and index weights, was brought up, and the health assessment of Suzhou Science and Technology Park was taken as an experimental case to study.

In other related studies on industry technological innovation ecosystem, Luo and Zhang (2008) conducted ecology research on innovation dynamic mechanism of Olympic science and technology cluster. After the concept of Olympic science and technology cluster is put forward, the ecology theory and method are also included in the innovation research of Olympic science and technology cluster, which provides the research basis for the construction of the follow-up framework and structural characteristics. On this basis, Luo and Guo (2009) discussed its role in industry innovation system, put forward targeted policies and suggestions, as well as the robust principal component analysis method for comprehensive evaluation and analysis of industry technological innovation performance. After the establishment of the suitability evaluation index system of industry technological innovation ecosystem, the selected niche evaluation model was used to calculate the suitability of regional technological innovation ecosystem. According to the reality of regional technological innovation research in China, combined with regional development theory, technological innovation theory and eco-economics theory, Liu and Yi (2005, 2006) proposed the concept of industry technological innovation eco-economic system (RTIES), discussed the composition of RTIES, analyzed the real reasons for the inaccuracy of RTIES, and put forward some suggestions to improve the accuracy of RTIES. Zhou and Chen (2008) adopted index system to carry out empirical analysis

of local areas in China, and the results show that the region that is best suited to develop technological innovation ecosystem is the eastern part of China, followed by the central region, and the western region.

(3) Company technological innovation ecosystem

At present, the research on company technological innovation ecosystem is still in the initial stage of development in the world, and the related academic achievements are very scarce. Adner (2006) believed that company innovation can continue to create valuable products with customer experience as the core through a series of complementary cooperation instead of being achieved by a single company, so the key factors affecting company earnings begin to shift to the overall innovation ability. He also found that innovation ecosystem is a synergistic integration mechanism involving risk assessment, resource allocation and product cycle. After putting forward the innovation strategy of innovation ecosystem, he came up with the potential risks that innovation ecosystem may face in future practice, including integration risk, dependence risk and initiative risk.

Technological innovation ecosystem of high-tech companies is the main research field in China. Zhang (2008a, 2008b) focused on the structure and scope of innovation ecosystem of high-tech companies, and defined the connotation of innovation ecosystem of high-tech companies. In a complete innovation ecosystem, the success of a company often depends on whether it has the ability to cooperate with other collaborative R&D and technical standards, and whether it is able to avoid risks beyond traditional R&D project management. After a detailed study of the mechanism of risk generation in innovation ecosystems, Zhang and Zheng (2009) established a risk identification index system and a risk identification model, and classified the risks of the system (investment risk of specific assets, structural risk, dependence risk, resource loss risk, information asymmetry risk, income distribution risk), and finally built a risk evaluation index system for innovation ecosystem of high-tech companies. After combining the characteristics and risk sources of innovation ecosystem, it will comprehensively manage the innovation ecosystem of high-tech companies in terms of platform pricing mechanism, negotiation coordination mechanism and decision-making mechanism. After studying the causes of the high-tech company innovation ecosystem, Cao, Peng, and He (2008)

found that there is no clear boundary restriction within the whole system, showing the characteristics of change and ambiguity. By changing the organizational structure or boundary of the system, companies can integrate innovative resources, rationally distribute the interests of companies, and promote the ability of cooperation among organizations. They can strengthen links through honesty and credit, strengthen their core competitiveness through sharing channels, technology, knowledge and information, and achieve the purpose of adapting to the changing environment. In addition, Zhang (2009) found that the innovation ecosystem of high-tech companies could be operated by coordinating interest coordination mechanism, technology standards promotion mechanism, open innovation mechanism and company niche decision-making mechanism.

Among other research results on the company technology innovation ecosystem, Luan (2015) came up with the formation, structure and characteristics of the innovation ecosystem of high-tech multinational companies. After exploring the influencing factors of transnational innovation network development and analyzing the mechanism of strategic partner selection risk, network governance risk and innovation ecosystem risk, a series of potential problems of transnational innovation network risk control are found, which can help guiding our high-tech companies to quickly integrate into transnational innovation network and rapidly improve international core competitiveness. With the help of ecological theory, Adner (2006) deeply analyzed the definition of company innovation ecosystem, the life cycle and ecological characteristics of technological innovation, and the ecological environment and dynamic evolution process of the system. The integrity of the structure and function of company technological innovation system has become increasingly important to the sustainable development of companies. Chen and Kenney (2007) suggested that companies should consider how to find the future development direction from a multi-dimensional perspective and create a technological innovation eco-environment suitable for their own development. The development status of mobile phone technological innovation system is analyzed with examples, which highlights the importance of technological innovation eco-environment.

(4) Other relevant research status

The company technology innovation ecosystem and the industry technology innovation

ecosystem are currently the frontier research directions of the technology innovation ecosystem (Tidd & Bessant, 2018). In addition, there are also researches on industrial cluster innovation ecosystem, knowledge innovation ecosystem, national innovation ecosystem (Lee & Park, 2006), and science and technology innovation ecosystem.

1) Industrial cluster innovation ecosystem

After the concept of cluster innovation is put forward, scholars use the basic principles of behavioral ecology from the perspective of cluster innovation to obtain an industrial cluster analysis framework for technological innovation (Liu, 2004; Liu & Luo, 2004). After analyzing the clustering behavior of innovative units and the general process model in the cluster, Liu et al. (2001) established a game model about the basic conditions of aggregate behavior and the aggregation behavior of innovative units.

After comparing the differences between the natural ecosystem and the high-tech industrial cluster innovation ecosystem, the structure of the high-tech industrial cluster innovation ecosystem is discovered. Through the study of North's path dependence theory, Guo (2009) established the path dependence model to gradually verify the industrial ecosystem, and used Beijing, Dalian, Shanghai, Tianjin and other cities as samples to conduct case analysis. Finally, it can be concluded that the earlier the industrial ecological innovation occurs, the faster the industrial ecological development can get rid of the dependence on the original monotonous production mode, and quickly enter the benign circle of economic and environmental cooperation development in the next step. Looking through the research literature of various countries in the world, we know that the research of innovation ecosystem is a brand-new field in the stage of development at present, but a large number of researchers have begun to study company technological innovation ecosystem and regional technological innovation ecosystem step by step, and the research of industrial technological innovation ecosystem only has a small number.

2) Knowledge innovation ecosystem

Based on the macro-study of knowledge economy and the combination of ecological theory and innovation theory, He and Zeng (2008) established the theoretical model of knowledge innovation ecosystem-DICE model from four ecological aspects: knowledge

competition, knowledge interaction, knowledge evolution and knowledge distribution, and constructed the operation mechanism of knowledge innovation ecosystem. By transforming ecological facets into direct productivity, the knowledge innovation ecosystem was established, and knowledge innovation ecosystem was defined. Li and Zhan (2010) adopted knowledge fermentation model to study the role of innovative ecosystem, and found that the practical meaning of innovative ecosystem is to get a complete matrix through the integration of knowledge. They established an innovative ecosystem management matrix through knowledge management. The management of innovative ecosystem should seek the completeness of innovative knowledge from both internal and external aspects, so as to avoid breaking the complete innovation chain.

3) The research on the ecosystem of technology innovation based on ecological theory is at an emerging stage of development. At present, the research on the technology innovation ecosystem focuses on the high-tech company innovation ecosystem and the regional technology innovation ecosystem. Few academic researches on the industrial technology innovation ecosystem can be found.

In summary, through the multi-dimensional research on industrial innovation system, technological innovation, ecosystem and other issues, researchers have achieved many excellent results, but there are still shortcomings in the existing research content and methods, which need to be improved urgently.

(1) At present, the research on industrial technology innovation has gradually matured, and has achieved different degrees of development in industrial technology innovation policies, capabilities, connotations and evaluations. At present, it mainly explores the establishment of technological innovation capability evaluation index system. However, the research on the various impact factors of industrial technology innovation, especially the operation principle of each internal impact factor, is not systematic and comprehensive.

(2) In the research of innovation system from the four levels of regional innovation system (Asheim, Coenen, & Henning 2003; Asheim & Coenen, 2005; Li, 2009), national innovation system, company innovation system and industrial innovation system (Intarakumnerd, 2011; Viotti, 2012), the more comprehensive and in-depth research is about the influence factors,

performance and structure of national innovation system and regional innovation system (Heidenreich, 2005; Buesa et al., 2006). The research on the formation, meaning and structure of industrial innovation system, as well as the motive mechanism, innovative elements and innovative subjects of company innovation system need to be constantly expanded. At present, most of the research are about national innovation system and regional innovation system (Mitra, 2005; Mercan & Goktas, 2011). There is less research about innovation system from the perspective of industry and company. Many other researches focus on static analysis of system evaluation, composition, construction, characteristics and functions. There are few studies on the dynamic analysis of system operation, evolution and formation.

(3) The research on the ecosystem of technology innovation based on ecological theory is at an emerging stage of development. At present, the research on the technology innovation ecosystem focuses on the high-tech company innovation ecosystem and the regional technology innovation ecosystem. There are just a few academic researches on the industrial technology innovation ecosystem.

2.2 Relevant research on value co-creation

2.2.1 Concept and connotation of value co-creation

Value co-creation is a form of value creation (Payne, Storbacka, & Frow, 2008). According to the evolution of value creation summarized by Wu and Chen (2012), value creation has undergone three stages: value creation by producers alone, value creation by consumers alone and value creation by producers and consumers together. In the stage of value creation by the producer alone, the producer obeys the product-led logic, and the provided services or products is the carrier of value. Realizing the exchange of products and services is the main concern of the company, so the consumer only represents the demand (Vargo & Lusch, 2004). In the stage of individual value creation by consumers, the concept status of use value is promoted, and the creation of use value is controlled and dominated by consumers under the customer-led logic. This is a process in which consumers recreate the value of their products or services in the process of consumption according to their own value propositions (Heinonen et

al., 2010). In the stage of value creation, based on the interaction and cooperation between consumers and producers in the process of production, services and design, producers' value creation system evolves into an open system. Producers attach importance to consumers' opinions and expressions and add consumers as an important resource to the value creation process by setting up some "consumer data interface", so that both sides can accomplish value creation together. From this we can see that no matter what stage the concept of value creation is in, the main subjects involved are companies and consumers (Piller, 2006). It can be said that value creation is a concept about the relationship between producers and consumers (Grönroos, 2008a, 2009), and the problem to be solved in this research is also between producer costs and consumer needs.

Although nowadays the frequency of utilization of the word "value co-creation" is exponentially growing in literature, it is still difficult to be defined accurately according to latest literature (Ramaswamy & Ozcan, 2018). The concept of value co-creation was first proposed by Becker (1965) on the basis of the theory of consumer production. That is, the needs of consumers cannot be satisfied by any products provided by manufacturers, but only by consumers' own "production". Consumer "production" here refers to the efforts of consumers using their own time, knowledge and ability to meet their own needs on the basis of products and services provided by producers. Prahalad and Ramaswamy (2010) highlighted the role of consumer experience in value co-creation products based on consumer logic, believing that it is the core content of value co-creation between producers and consumers, and that interaction is the basic way to realize value co-creation. The theory of value co-creation was put forward based on service-oriented logic, according to this theory, service is the fundamental basis of all economic exchanges and consumers are the co-creators of value (Lusch & Vargo, 2006; Madhavaram & Hunt, 2008). Ramaswamy and Ozcan (2018) introduced the concept of value created by interaction to reveal the new connotation of value co-creation, which means the implementation of interaction creation across interactive system environments (provided by interactive platforms) including proxy conventions and organizational structures. At present, the latter two co-creation value theories are different in terms of theoretical perspective, value perspective, value foundation, value realization, company role, and focus of attention (Vargo

& Lusch, 2004; Lusch & Vargo, 2011). Based on related literature, details are demonstrated in Table 2-1.

Table 2-1 Value Creation and Consumer Logic under Producer Logic

	Producer logic	Consumer logic
Theoretical perspective	From the narrow perspective of economic development and evolution.	From the perspective of broad-based company management strategy, consider interaction and cooperation in products, services, and design.
Value point of view	Creating value only comes from the consumer's use and consumption process.	Co-creation value is related to experience and can be generated at any stage of value formation.
Value basis	Use value or context value.	Create a joint experience.
Company role	Propose value proposition, provide services, and co-create value.	Provide experience and interactive contexts, and promote consumer participation in value creation.
Company focus	Propose a value proposition to support consumers in achieving value co-creation.	Focus on the quality of interaction with consumers, consumer experience scenarios and experience network innovation.
Value realization	Value realization of value co-creation systems including production values, consumers and partners.	Focus on value realization for all parties of value co-creation.

This research argues that value co-creation is a value creation strategy for consumers, the relevant subjects in the company innovation ecosystem. This is based on the essence of all innovation and transformation around the characteristics of the current user-centered internet era. In furniture manufacturing industry, the production cycle, design style and installation service attitude can affect the satisfaction of users. Therefore, more and more companies are considering adjusting the way of value creation, changing from internal value creation to joint value creation by companies and customers, in order to harvest the sense of customer participation and acquisition, and enhancing customer satisfaction and building core competitiveness. Traditional value creation is characterized by value creation within the

company, value exchange in the external market, production of products and services decided by the company, and customers need to be inferred by the company independently. Nowadays, value can be created jointly by companies and customers. In more links, customers can participate in cooperation, share experience and interact with companies. Therefore, this research defines value co-creation as the process of creating and mining a large range of customer-adapted variables in the process of providing products and services, and the process of completing part of the work of value creation by customers.

2.2.2 Research status of value co-creation

Since the concept of value co-creation is closely related to companies and customers, the characteristics of value co-creation mainly focus on customer roles, customer contributions and customer management.

(1) Diversification of customer roles.

First, consumers are considered to be co-producers. At first, customers participate in a limited service industry. Scholars hold a view that that every resource integrator who cooperates with a company is a social and economic actor and could produce value together. Etgar (2008) developed a conceptual framework of a five-stage model for customers involved in cooperative production, and discussed where consumers in the chain of production activities can enter into and participate in production at different stages, so as to help companies better focus on the interests of different consumers.

Second, using customers as co-distributors, Porter (1985) identified customer positioning, indicating that the process of increase is based on increasing linearity. Some scholars believed that customers participate in the distribution of services, and customize according to their needs. Internet and self-service as a cost-cutting factor are creating tremendous impact. the development of e-commerce and the channel of secure payment are redefining the position of customers in cooperative distributors.

Third, customers are co-promoters. Zwass (2010) believed that the emergence of social media enables customers to share experiences, build stronger relationships and prevent negative word-of-mouth effects. Therefore, if the customer turns himself into the leading role of the

brand, the long-term co-creation value can be generated by their participation in the company's social activities and brand promotion plans (Romer, 1999).

Fourth, customers are co-manufacturers. Zwass (2010) believed that it is still due to the rise of the internet that digital goods can generate unlimited consumption power. User-created content, their ideas, blogs and family videos indirectly give meaning to others, and that sharing is widely accepted among the public.

Fifth, the consumption process of co-production provides customers with an opportunity to create meaning, experience and value for themselves and others. Etgar (2008) pointed out that consumption essentially contains profound social, cultural and psychological significance. The pre-consumption stage involves mutual recognition between customers and companies. In consumption, customers continue to consume and bring new customers to create value. After consumption, the customer experience can also create value together.

Sixth, customers are experience creators. Bolton and Saxena-Iyer (2009) believed that it is getting to be more and more difficult to achieve customer satisfaction, so it is needed to enhance the experience interaction to create value while emphasizing market products. Vargo and Lusch (2004) found that customers and companies exchange value on the basis of mutual understanding, and the exchange process creates value. It is not a good product that creates value, but a service or experience brought by the product.

Seventh, customers are innovators. Innovation can enable companies to obtain a new market or new service opportunities, leading to development, production and sales tasks. Successful innovation lies in understanding customers' needs. Thomke and Hippel (2002) believed that although customer innovation can be used to develop new products, it cannot capture customers' desires and needs, so we need to deeply understand customers' needs and further translate these needs into feasible innovative solutions.

Eighth, customers are co-advisers. The emergence of ideas is the first step in innovation. Social media helps companies build stronger relationships with customers. Meanwhile, strong cooperation and exchange of ideas between companies and customers can help encourage other customers to participate. Hippel (2001) believed that many companies run a variety of competitions, which are based on reasonable ideas and design. In those competitions customers

are invited to come up with innovative ideas.

Ninth, customers are co-evaluators. Füller, Katja, and Faullant (2011) believed that customers enjoy the honor of company representatives in the process of joint participation in evaluation, so companies should pay attention to maintaining existing customers and transforming customers into propagandists of brand image ambassadors.

Tenth, customers are co-designers. Füller, Katja, and Faullant (2011) believed that the first step is to integrate the customer's product knowledge to achieve the actual product part. As a cooperative designer, customers should make a coordinated response in different environments. Collaborative designers need to interact with companies. At the same time, companies need to find different ways to maintain the common design process of customers. Collaborative design is mainly about customization of products or customer service. Collaborative design products are more adaptable to the market than standard products, and it owns higher customer satisfaction.

Eleventh, customers are co-testers. Customers participate in the testing of the companies' upcoming product launch Feedback to products can help companies further enhance the characteristics and attributes provided by the market and increase the probability of product success. Therefore, when a company launches a product, it should find the precise target customers who have demand.

(2) Importance of customer resources.

The research on customer resource contribution mainly focuses on exploring the motivation and reasons behind the contribution. First, resources are defined as tangible or intangible companies that can provide services or products of a certain market value. Vargo and Lusch (2004) put forward two kinds of resource operand resources and operational resources. Commodity creates value by exchanging operand resources, while the combination of knowledge, skills and capabilities create value by using operational resources. Further research by Rosenbaum and Massiah (2007) showed that customers can create value together with other peers, during which they will feel two kinds of support, social emotional support and instrumental support, and the reasons for that lies in the reciprocity and voluntary participation of customers. Arnould (2008) further classified operational resources into social, economic and

cultural resources, and operand resources into resources composed of material objects and physical space. Spohrer and Maglio (2008) put forward the resources of power, property, physical entity and social construction. Therefore, people, technology, organization and sharing of information constitute the key contribution to the process of value co-creation. Based on operands and operational resources, resources at company and customer levels are classified as financial, physical, legal, human capital, organizational culture, information and related resources. Paredes, Barrutia, and Echebarria (2014) believed that the operational resource hierarchy begins with basic resources, moves to compound resources, and finally becomes interrelated operational resources. According to related literature, the resource classification at the company and customer levels are shown in Table 2-2.

(3) Complexity of customer management

The final conclusion can be understood as that the role of customers determines the contribution of customers in value co-creation, and the degree of the contribution depends on the environment created by customers and companies together and the expected value created in the process of co-creation. Therefore, Agrawal and Rahman (2015) believed that increasing customer participation and linking to create value process can bring about tremendous changes for companies. They suggested similar customers, organizational level, participation process and participation results contribute more to value.

Since customers will never exist alone, for customers of the similar type, we should pursue to enable them to create more resources, and study how to magnify customers' individual contribution generated during interaction among customers. To improve the organizational level, the new roles and contributions of customers to create value together are tend to have a lasting impact on organizational culture and learning.

Table 2-2 Resource Classification at Company and Customer Levels

	Financial resources	Physical resources	Legal resources	Human capital resources	Organizational cultural Resources	Information resources	Related social resources
Consumer's Holding	Money, materials,	Energy, emotion,	Intellectual property	Tacit knowledge,	Skills, knowledge,	Feedback, blogs,	Family, consumer,

Resources	goals, physical space	strength	rights, customer protection rights	status quo, cultural resources	personal values beliefs	comments, sharing	community business relationships
Business Holding Resources	Cash, assets and data in financial markets	Greening, equipment, machinery and technology	Trademark, copyright, license	Employee skills, ideas, abilities and knowledge	Capacity, management, policy and culture	Market intelligence	Relationship with consumers and suppliers

Therefore, it is feasible to implement high-quality management methods for customers to create value together, including deciding the role of customers, who is the decision maker, how to distribute the responsibilities and rights of customers, how to deal with the contradictions between customers and employees, and how to motivate the learning process of customer participation. When it goes to the participation process and results, efficient cooperation process should be based on the consistent support of customers and companies. For both customers and companies, it is necessary to establish appropriate indicators and evaluate the effectiveness of co-creation at appropriate time. Organizations need to find effective ways to integrate resources and constantly improve them. Customers are more involved in their company roles and activities, and create value together to promote positive outcomes.

Literature research on value co-creation is mainly divided into two parts: value co-creation in production and value co-creation in consumption.

Value creation in the field of consumption consists of three parts: value creation from the purchaser alone, value creation from the interaction between the purchaser and the company, and value creation from the interaction among the purchasers. Purchasers create value separately by treating companies and consumers as two independent individuals (Grönroos, 2008b). Consumers create value separately based on the products and services provided by companies. The main content of value creation is the interaction between purchasers and companies. From this point of view, the goal of companies is no longer simply to create value for customers, but to encourage customers to create value based on products and services provided by companies. Other researchers have noticed that the interaction between buyers is also an important aspect of customers' satisfaction and loyalty to a company (Langeard et al.,

1981), which is particularly prominent in the user community of brand creation. In the brand community, consumers form a circle to share resources and experience, and work together to enhance the value of the brand.

The application of value creation in the field of production mainly focus on stressing the importance of customer participation. Customers participate in the production process as co-producers, which is reflected in the research results of manufacturing and service industries. Among them, value creation in manufacturing industry is mainly reflected by customer participation in product development. Many scholars have studied the reasons, degree, links and results of customer participation. In the aspect of empirical analysis, Venkat and Francis (2010) elaborated in detail the stimulation of company value co-creation and the emergence of value co-creation culture by means of case analysis, emphasizing that value co-creation needs the support of co-creation culture, the extension of communication channels and the development of participation tools. Aarikka-Stenroos and Jaakkola (2012) interviewed 120 suppliers and consumers, analyzed their roles, resources and behaviors in the process of value co-creation, and found that value co-creation is a dynamic process of diagnosing consumer needs, designing production plans, organizing and coordinating resources, and coping with value conflicts. Lambert and Enz (2012) concluded that value co-creation includes three stages: value proposition, value realization and value determination through case analysis. In theoretical research, Fang (2008) found that the benefits of customer participation in new product development include the improvement of information sharing, collaboration ability and tangible specific investment through empirical research. The success of new product development depends on the company’s deep understanding of customers' needs. Customers’ participation in new product development activities will not only reduce the cost of company development and improve the efficiency of company development, but also develop product prototypes that meet customers' needs and produce products that satisfy customers. The success of new product development depends on the companies’ deep understanding of customers' needs. Grönroos (2008b) proposed that, under the new manufacturing background, manufacturers should change into service providers to create value through interaction with customers. And it is necessary to study the conceptual model of the degree of customer

participation in co-creation under the new product development environment, and discuss the influencing factors, process barriers and co-creation results of value co-creation from the perspectives of customers and companies.

Recent research on co-creation focuses on: customer voice (Zhang, Jahromi, & Kizildag, 2018), customer expectation (Zhang et al., 2017), cost-function model of co-production, (Seppo, Haapasalo, & Tolonen, 2018) supply chain problems and value chain management (Lyons & Brennan, 2019), cross-functional process (Melton & Hartline, 2015), validity of marketing strategy and operational efficiency (Vallaster & Sylvia, 2018), and other aspects, which provide considerable insights into the specific implementation of the value co-creation process. From the perspective of companies, this thesis focuses on the production field of value co-creation, and combs value co-creation as a solution to the problem.

However, our review of the literature shows that there is a lack of relevant theoretical work in providing a framework to help organizations manage the co-creation process except for "DART" models of Prahalad (2004). Besides, apart from Etgar's (2008) discussion of the production cost in the process of value co-creation, there are relatively few suggestions on how to improve the method of value co-creation and reduce the cost of production. While the existing literature gives examples of companies adopting co-creation and has some useful insights into the problems that need to be addressed, there are relatively few directions on how to proceed.

This research holds that value co-creation is a process of two aspects and a final result of mutual actions. In this process, companies, consumers, process suppliers and others jointly participate in the production and operation process, to achieve their own maximum interests and the common goal of the same activities. Different fields and research directions have different understanding toward it. As researchers solve the problem from different perspectives, different factors affecting value creation are formed.

2.3 Summary

This chapter reviews the literature on innovation ecosystem and value co-creation. Firstly,

the concept of innovation ecosystem and the conclusion of innovation ecosystem research are reviewed. And then it studies the related literature of value co-creation, drawing a conclusion that the characteristics of value co-creation are mainly concentrated on customer role, customer contribution and management, which lay a foundation on the deeply exploration of the company's C2F2C.

Chapter 3: The Composition and Relationship of Innovation Ecosystem in Hotel Furniture Manufacturers

3.1 The innovation ecosystem definition and characteristics of hotel furniture manufacturers

In the 21st century, the relations among innovators have significantly changed. People's understanding toward innovation has gradually formed a complete chain and a process, in which the new technology research and development (R&D) promote new industries and new products, and it is no longer limited to new ideas and methods. In the research report of Innovative America: Thriving in a World in Challenges and Changes, US Council on Competitiveness creatively proposes the concept of "Innovation Ecosystem" which is evolved from an innovation system and is an organism composed of the innovation environment, the innovative community and the interaction within the innovative community (Holbrook & Wolfe, 2002; Henisz, 2010). As information technology has greatly reduced coordination costs, innovation ecosystem has become a core element of the company strategy in various industries.

Combined with the concept, complexity and dependence of the innovation ecosystem, this research proposes the following definition of the innovation ecosystem of hotel furniture manufacturers: the innovation ecosystem of hotel furniture manufacturers consists of subsystems such as environment, technology, organization and policy and is a new symbiotic, complex and open ecosystem with the dynamic equilibrium evolution. It regards the bank credit institutions, talent agencies, venture capital institutions, technology consulting institutions, science and technology insurance institutions, financial management institutions and other social organizations as the links, and is supported by the big data internet technologies. It constitutes a multi-dimensional service system around market demands. Through the coordinated deployment complementary advantages, risk sharing, revenue sharing and other activities of various stakeholders, it carries out the organic combination and strategic matching

of innovative resource elements. Through the internal innovation material cycle, energy flow, information exchange, knowledge transfer and other methods, the innovation ecosystem of hotel furniture manufacturers effectively enhances the innovation level and competitive vitality of companies.

The innovation ecosystem is generally the result of innovation activities after years of internal and external evolution developments of companies through common coordination of different organizations, different management and different environments. This is similar to innovation ecosystem of hotel furniture manufacturers, which relies on the value flow of various activity entities within the system, the distribution of resources and the exchange of production value of operation activities. Therefore, in the future development of innovation-cored hotel furniture manufacturing companies, the analysis of the innovation ecosystem of hotel furniture manufacturers has a very important impact on the research of hotel furniture manufacturers' value creation process and future development strategy. Adner (2006) argues that during the practical operation process, the innovation ecosystem should be related to one's own industry and matched with the innovation strategy. Combined with the characteristics of hotel furniture manufacturers and the correlation between innovation ecosystems and ecology, and based on the previous literature review, this thesis summarizes the following characteristics of the innovation ecosystem of the hotel furniture manufacturers:

(1) Diversity of system composition. The innovation ecosystem of hotel furniture manufacturers involves many topics, including innovative internal and external environmental systems, innovative value flow activities, innovative environments and other related sets. Innovative core entities comprise hotel furniture manufacturing companies, external cooperative companies, universities, suppliers and innovative cultural systems and related policy environments of these entities. Innovation ecosystem is also consisted of technological innovation system, strategic decision-making system, and coordination assistance system, which are put together as a whole to cover the entire value flow according to certain logical rules. Therefore, the complexity and diversity of innovation ecosystem of hotel furniture manufacturers can reduce the impact of external environmental changes on the industry, and offer great help to the evolution and development of value co-creation.

(2) Ambiguity of system boundaries. The innovation ecosystem of hotel furniture manufacturers has different supply chains which integrate upstream and downstream of the company, forming a multi-dimensional network structure characterized by certain openness and changing connection levels. There are activities of value exchange between two connected nodes in the network, and the network boundaries are relatively vague. All of the alternative cooperative companies and cooperative supply chain companies more or less have certain fuzzification relationships which change according to the needs of value exchange. Meanwhile, there may be a small innovation ecosystem within each entity, and these small innovation ecosystems combine together and form different innovation ecosystems. Therefore, the boundary of the innovation ecosystem of hotel furniture manufacturers is vague and can exist in multiple systems.

(3) Instability of the system operation. Since this innovation ecosystem has complex and changeable characteristics, the changes of the pivotal parts within the system may bring about drastic changes in the entire system and even generate certain risks. Therefore, it is particularly important to learn about the exterior environment well enough. This instability is mainly reflected in the following aspects. In terms of management, some entities in the innovation ecosystem are uncontrollable, and the cooperative relationship is not stable. Therefore, there is a loose management relationship among such entities and there are certain management risks. The instability of integration brings certain uncertainty to the application and production cycle of products in the entire supply chain with the constant change of external resources, and the innovative ecological environment will also bring certain instability to the entire ecosystem and affect the production operations of the entire ecosystem.

(4) Sustainability of the ecological feature. The innovation ecosystem of hotel furniture manufacturers is the same as the natural ecosystem, which will develop according to external conditions and internal resource operations. Especially for the changes of different policy, economies, markets and social cultures, the internal ecosystems will have an automatic evolutionary development. Its essential core lies in value creation, maintaining a dynamic balance through internal and external competition and cooperation. Therefore, it is necessary to optimize the allocation of resources of companies and establish a sound guarantee mechanism

to formulate a stable development strategy and promote the continuous and in-depth development of the innovation ecosystem of hotel furniture manufacturers.

3.2 The innovation ecosystem composition of hotel furniture manufacturers

The innovation ecosystem integrates the character of dynamics, habitat and self-organization (Barron, 2001; Chang & Shih, 2004). Among them, the innovation environment is an organic combination of policy, economy, society, culture, institution, policy and market elements, while companies and service organizations constitute the innovative community. And innovative environment elements create a good atmosphere for mutual promotion and common development for the innovative community and then boost the innovation entities to break through bottlenecks in public R&D platforms, technology property transactions, scientific and technological achievement transformations, logistics platforms, incubators, investment and financing, legal services, and industrial supports. The entities inside the innovative community complements each other through competition and cooperation to optimize the allocation of resources, achieve the complementary advantages of functions, create a broad development space for mutualistic symbiosis of innovation communities and form a dynamic and ecological network of interconnection.

Innovation ecosystem mainly consists of two parts: innovative ecological community and innovative ecological environment (Chung, 2002; Chen & Kenney, 2007; Massis et al., 2017). Innovative ecological community includes strategic decision-making innovation population, coordinating and supporting innovation population and technology R&D innovation population. These innovative ecological communities are in a certain innovative ecological environment which include market product ecological environment, supplier ecological environment, customer resource ecological environment, information technology ecological environment, strategic support ecological environment, policy incentive ecological environment, and industrial culture ecological environment. On the one hand, innovative ecological communities improve innovative ecological environment, on the other hand, innovative ecological environment provides information and energy feedback for innovative ecological communities, thus forming a complete innovation ecosystem.

The external ecological environment includes the network value extension of the customer information resources. From the demand data of customers to the production data of the company and the information of suppliers, ecological chain of the whole industry is formed, from which different business models can be mined for innovation and transformation. Secondly, the combination of internal and external manufacturing technology has formed diverse production modes, such as the modular decomposition value co-creation model, which maximizes the enterprise resources use. Finally, the internal and external data of these ecosystems are integrated to form a mode of resource integration and sharing. Based on related literature, the model framework of the innovation ecosystem is constructed, and it is shown in Figure 3-1.

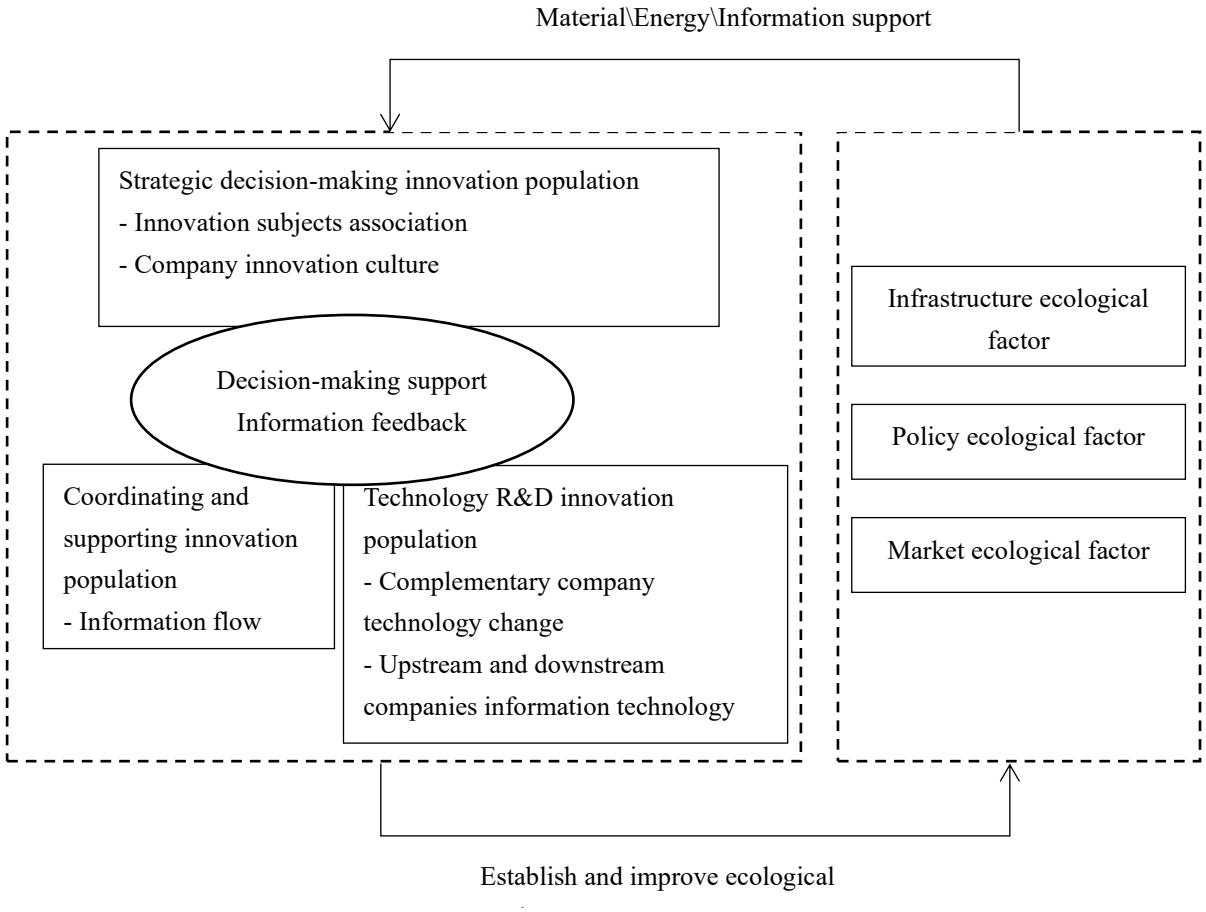


Figure 3-1 The Model Framework of the Innovation Ecosystem

Similar to natural ecological system, the innovation ecosystem in the hotel furniture is composed of innovative community and the ecological environment, including the internal

environment and external environment It contains five elements, namely hardware conditions, software conditions, industrial systems, talents and external environments. According to the role played by innovative communities within the system, this thesis divides the innovation population into three categories: innovation population for strategic decision-making, innovation population for technology research and development and innovation population for coordination and assistance.

The innovative ecological environment is a collection which is composed of resource environment, economic environment, market environment, policy environment and natural ecological environment. The resource environment consists of resources such as science and technology, information, education, and talents. The economic environment is inseparable from economic activities such as trade, investment, service, and production. The market environment depends on the demand of hotel furniture manufacturers, market structure layout, and industrial development status. The policy environment comprises basic laws and regulations, specific regulations, and industry standards. And the natural ecological environment involves factors such as greening, environmental protection, low carbon, climate, and humidity. As a support system for material energy information of innovation ecosystem, there are three ecological factors: infrastructure ecological factors, policy ecological factors, and market ecological factors.

3.2.1 Innovation ecological community of hotel furniture manufacturers

(1) Innovation population for strategic decision-making. The innovation population for strategic decision-making guides the development trend of innovation activities through the top-level design, and stabilizes the navigation direction for the innovation activities of the innovation entities. Government and users are two major components of the innovation population for strategic decision-making. On the one hand, as the subject of macro-control hotel furniture company development, governments formulate a sustainable development strategy based on supply-side structural reform and the direction of scientific and technological development, providing a good environment for innovation and development for innovation ecosystem of hotel furniture manufacturers. And through a series of policy means, other

innovation subjects are managed in a combination of binding and stimulating manner, so that the innovation activities within the system continue to operate. On the other hand, as consumers of the products of the hotel furniture company, the users can give more authentic feedback, so that the company can better understand the personalized needs of consumers, and improve their products in turn, so as to produce innovative products with strong practicability, high value and superior sense of use. Many previous related researches concerns about the mentioned governments and users. This thesis seeks to learn the impact of the resources that the company can acquire on the company's innovation decisions and considers the impact of the company's culture on the company's innovation. It also analyzes whether the company standardizes the system under certain circumstances, and whether the company accepts a variety of opinions and encourage open thinking. Innovative culture reflects the innovative character and values of an enterprise to a certain extent, and it shows the values of the innovation entities. Only by fundamentally recognizing that the driving factor of enterprise development has changed from enterprise factors to innovation and market demands and recognizing that the innovation is the soul of company culture, can it be possible to transform the innovation into a powerful implementation plan, further respect talents, reward creation, advocate inventions, form a correct value orientation in hotel furniture manufacturers, break through the bottleneck of development and draw on the development nutrients.

(2) Innovation population for technology research and development. Scientific technology is the core strength. As the core innovation group of the innovation ecosystem of the hotel furniture company, the innovation population for technology research and development is organically composed of hotel furniture manufacturers, colleges and universities, scientific research institutes, supply companies and complementary companies, and achieve the transformation of scientific and technological achievements through the technical research, development and application. The hotel furniture company is the core of the innovative subject and the implementer of the industrialization of scientific and technological achievements. Under the fierce market competition, the companies should fully tap the market demand, devote into the research and development of science and technology, and provide sufficient capital flow and material flow for the innovation ecosystem to realize the innovative profits in the

whole process. Universities and research institutes are mainly engaged in the basic work of disseminating new knowledge, improving basic theories, and cultivating high-quality professional talents for the development of the innovation ecosystem. Therefore, universities and research institutes are the innovation carriers of talents, knowledge and technology. Of course, the company's own patent layout is also an important part of the company's innovation ecosystem. Netizens have been socialized in the modern society, and they are the touchstones of the innovation ecosystem. They actively participate in innovative activities and continuously provide valuable suggestions. Under their effective supervision, innovative activities are continuously implemented and operated in a standardized direction.

(3) Innovation population for coordination and assistance. The innovation population for coordination and assistance consists of financial institution, venture capital institution, innovation and entrepreneurship institution, and intermediary organization. They play the role of financial support, risk taking, creation of opportunities and consulting services, and provide strong support for the coordinated development of the innovative subject. Innovation requires a capital pool, and financial institutions composed of bank financial institutions in bank and non-bank financial institutions provide a good environment for the fund of innovative activities. In innovation activities, opportunities and risks always coexist, and risk institutions participate in the company's innovation, which not only increases the possibility of the company to obtain profits, but also helps the company to share part of the risk, thereby reducing the risk cost of innovation subjects, which helps the company to formulate development strategies and do a good job in risk prevention and control. Innovative entrepreneurial institutions provide companies with opportunities and platforms for innovation and entrepreneurship, which will help stimulate the vitality of innovation and creation. Meanwhile, in order to effectively avoid information asymmetry and provide a platform for equal dialogue between supply and demand sides, intermediary organizations play the role of a fusion player in the innovation ecosystem of hotel furniture company, providing a bridge for communication between suppliers and demanders, and also offering specialized consultation service and information service to innovative subject. Through multi-channel and all-round cooperation and exchange, hotel furniture manufacturers, universities, scientific research institutions, and social netizens and

other innovative subjects effectively promote the innovation of the business model, optimization and upgrading of industrial structure, and synergy and win-win of value co-production. However, during the traditional hotel furniture industry development stage, there are few venture capital institutions and intermediary organizations involved, which proves that they are not the key point of this thesis. This thesis mainly focuses on the impact of information flow on innovation.

3.2.2 Innovative ecological environment of hotel furniture manufacturers

The innovative ecological environment is an external factor that affects the operation of the innovation ecosystem of hotel furniture manufacturers. The innovation infrastructure, policy incentives, market environment and other ecological factors jointly constitute an innovative ecological environment.

(1) Ecological factor of innovative infrastructure in innovative environment. Innovative infrastructure construction has a supporting and leading role in the innovation activities of hotel furniture manufacturers, which cannot be provided by the innovation entity itself. It is a kind of social capital and the basis of the innovation space. The improvement of the infrastructure will help to unite the innovation entity, stimulate innovative thinking, drive innovation activities, and bring convenience to innovation and creation. Innovative infrastructure mainly includes research and development infrastructure, education infrastructure, information infrastructure and market infrastructure which must be integrated with institutional innovation and be convergent with company management innovation goals, so as to help to gather professionals and reduce the cost of innovation, improve the conversion rate of scientific and technological knowledge in information exchange and practical research, and create great commercial value.

(2) Ecological factors of policy incentives in innovation environment. Policy incentives are the inevitable requirements and realistic paths for gathering high-quality innovation resources and accelerating the construction of innovative companies. Externally, policy incentives refer to laws, regulations and policies formulated by the government, while internally, they refer to the company's rules and regulations and management regulations, which influence each other Through formulating the development policies, investment and financing policies,

and technology consulting policies of hotel furniture manufacturers, the government has set the bottom line, provided the basis and direction for their development and innovation. A series of preferential policies also provide a relaxed political environment for enterprise development. The rules and regulations of the companies are conducive to the standardized management, which can clarify the development goals of the companies, make the economic responsibility concrete, and also play a role in restraining and supervising the employees of companies. Meanwhile, they can also be regarded the basis for creation and innovation rewards of employees so that the entrepreneurial group is motivated and the innovative and entrepreneurial atmosphere is maintained.

(3) Ecological factors of market in innovative environment. The innovative market environment has an important impact on the enterprise development. It not only includes the traditional political environment, economic environment, technical environment, but also includes the service environment and competitive environment. The development of new types of operation and new products must be tested in the market environment. When the market environment is poor, the innovation ecosystem of hotel furniture manufacturers will operate less energetically. By constantly optimizing the business environment, improving the service environment, and making the competition fair and standardized, companies can increase investment, focus on research and development creation and improvement, and tap their own development potentials. Accordingly, the market environment will be vigorous with the innovation of the companies, and the innovation level will continue to increase. Therefore, the innovation market is not only the starting point for the innovation activities of the innovation ecosystem of hotel furniture manufacturers, but also the objective of its innovation creation.

3.3 Key factors of hotel furniture company innovation ecosystem

3.3.1 Key factors collection of hotel furniture manufacturers' innovation ecosystem

(1) Key influence factors collection on innovation ecosystem of hotel furniture manufacturers

There are few studies on the co-creation of innovation ecosystem value in hotel furniture

industry, but there are many studies on the influencing factors and mechanism of innovation ecological value co-creation, some of which are based on the time of innovation ecosystem, some based on the perspective of the entire enterprise life cycle to analyze the factors that affect the value of co-creation, and others based on the characteristics of the hotel furniture industry. Nevertheless, there will be different initial sets of influencing factors from different perspectives. This thesis adopts the field survey questionnaire and argumentation method. With hotel furniture manufacturers as study object on the aspect of the network interaction, module segmentation and resource integration, 200 questionnaires are sent to do interview and investigation.

The first is the influence factors of network interaction on value creation.

From the empirical investigation, it is found that customers will participate in value creation from the aspects of customer organization socialization, interactive fairness, unique needs, and perceived risk. In actual network interaction, network interaction environment, network interaction topic, their own factors and other factors together constitute the key components of the network interaction activity. From the perspective of network interaction, the influence of resource characteristics, cooperative relationship and cooperative attitude of socialized e-commerce are studied. It also studies how customers react to the place, object, manner, and characteristics of the interaction.

The second is the influencing factors of module refinement on value creation.

In the hotel furniture innovation ecosystem, the core enterprise is the most important component, and the internal and external influence is mainly aimed at the core enterprise. The investigation shows that, in the core companies, there is a positive influence between knowledge clarity and innovation modularization, as well as the relationship between innovation policy and organizational learning. At the level of core enterprise business process module, the main influencing factors are the level of technical knowledge, policy environment, strategic importance and enterprise maturity. Exploring business process innovation, business model innovation, the independent knowledge attribute of innovation subject and openness are the key elements of value co-creation. In addition, according to the literature, the main findings are as follows:

One is the authority and industrial agglomeration of government, organizational intelligence, information technology and core subjects; the other is organizational learning ability, customer demand and coordination ability.

The third is the influencing factors of resource integration on value creation.

In the research of resource integration, the survey object mainly focuses on the the influencing factors of information resource integration and business technology resource integration. In the aspect of business resource integration, it mainly includes product construction, resource acquisition ability, integration ability, and user demand. The integration of information resources mainly analyzes the impact of information resources on value creation from the changes of customer role, business model and business links.

(2) Key influence factors analysis on innovation ecosystem of hotel furniture manufacturers

1) Principles for selecting key indicators

The index selection of influencing factors must include all aspects of the innovation ecosystem of hotel furniture manufacturers, so the key influencing factors of value co-creation should be evaluated from multiple dimensions and levels. If all aspects cannot be taken into account, it is also necessary to ensure that the selected indicators are representative and can contain important aspects that affect the co-creation of value, so as to ensure the comprehensiveness and accuracy of the analysis results. The fundamental purpose of screening the key influencing factors of value creation is to solve the practical problems in the process of innovation ecosystem of hotel furniture manufacturers. Because of different strategic decision-making innovation population and technology R&D innovation population, their links are different. Therefore, in order to select important influencing factors from many complex influencing factors, the feasibility of the indicators must be fully taken into account. The index selection of influencing factors must be fair, just and open, and cannot be determined according to one’s own preferences. It is of vital importance to ensure that the indicators of influencing factors are representative, real and credible, which can reflect the actual operation of the innovation ecosystem in hotel furniture manufacturers. The principle of clarity means that the choice of value co-creation impact factor indicators should be understandable, clearly defined,

and can be reviewed over and over again. Therefore, it is necessary to avoid the cross-confusion, ambiguity and the influencing factors that easily lead to misunderstanding among the indicators.

According to the selection principles of the influencing factors, including comprehensiveness, feasibility, objectivity and clarity, the indicators in this thesis are clustered and analyzed based on the analysis of the questionnaire.

3.3.2 Screening of key influencing factors for innovation ecosystems

3.3.2.1 Mathematical model construction of key influencing factors

(1) Principal Component Analysis

Principal component analysis (PCA) is a mathematical method for dimensionality reduction. Its basic concept is to try to recombine the original number of indicators with certain correlation X1 X2, … , XP (for example, there are p indicators) into a small number of unrelated composite indexes, Fm, to replace the original indicators and then to extract the synthetic index, so that it can reflect the information represented by the original variable Xp as much as possible, and ensure that the new indexes remain independent (information does not overlap).

Let F1 represent the principal component index formed by the first linear combination of the original variable, that is $F_1=a_{11}X_1+a_{21}X_2+...+a_{p1}X_p$, from the mathematical knowledge, it can be seen that the amount of information extracted by each principal component can be measured by its variance, and the greater its variance Var (F1) is, the more information F1 contains. It is often hoped that the first principal component F1 contains the largest amount of information, so the F1 selected in all linear combinations should be X1, X2, ..., XP and it has the greatest variance among all the linear combinations, so F1 is called the first principal component. If the first principal component is not sufficient to represent the information of the original p indexes, the second principal component index F2 should be selected. And in order to effectively reflect the original information, the existing information of F1 does not need to appear in F2, that is, F2 and F1 should remain independent and unrelated. That's to say, in mathematical language, their covariance Cov (F1, F2) = 0, and F2, which is not related to F1, has the greatest variance among all linear combination of X1, X2, …, XP. F2 is called the second principal component, and F1, F2, …, Fm are respectively the first, second, …, the m principal component of the original variable index X1, X2, …, XP.

$$\begin{cases} \mathbf{F_1 = a_{11}X_1 + a_{12}X_2 + \ldots + a_{1p}X_p} \\ \mathbf{F_2 = a_{21}X_1 + a_{22}X_2 + \ldots + a_{2p}X_p} \\ \cdots\cdots \\ \mathbf{F_m = a_{m1}X_1 + a_{m2}X_2 + \ldots + a_{mp}X_p} \end{cases} \quad (3.1)$$

According to the above analysis, it could be concluded that:

1) Fi and Fj are irrelevant, which means Cov (Fi, Fj) = 0, and Var (Fi)=ai'Σai, where Σ is the covariance matrix of X.

2) F1 has the largest variancis among all linear combinations of X1, X2, ..., XP (coefficients satisfy the above requirements), that is, Fm, which is not related to F1, F2, ..., Fm-1, has the largest variance among all linear combinations of X1, X2, …, XP.

F1, F2, …, Fm (m ≤ p) are new constructed variable indexes, that is, the first, the second, ..., the m principal component of the primary variable index.

The specific steps of the principal component analysis are as follows:

1) Calculate the covariance matrix

Calculate the covariance matrix of the sample data: Σ = (sij) p′p, where

$$\boldsymbol{s_{ij} = \frac{1}{n-1}\sum_{k=1}^{n}(x_{ki} - \bar{x}_i)(x_{kj} - \bar{x}_j)} \quad \mathbf{i,\ j\ =\ 1,\ 2,\ \ldots,\ p} \quad (3.2)$$

2) Calculate the eigenvalues of Σ and the corresponding orthogonalized unit eigenvectors

The first m large eigenvalues of l1³l2³… lm > 0 is the variance corresponding to the first m main components, the corresponding unit feature vector is the coefficient of the main component Fi with respect to the original variable, and the main component Fi of the original variable is:

$$\mathbf{Fi} = a_i{}' \mathbf{X} \quad (3.3)$$

The variance (information) contribution rate of the principal component is used to reflect the magnitude of the amount of information, α_i **:**

$$\boldsymbol{\alpha_i = \lambda_i / \sum_{i=1}^{m} \lambda_i} \quad (3.4)$$

3) Selection of principal components

In the end, several principal components should be selected, that is, the determination of m in F1, F2, ..., Fm is confirmed by the cumulative contribution rate of variance (information)

G (m).

$$\boldsymbol{G(m) = \sum_{i=1}^{m} \lambda_i \,/\, \sum_{k=1}^{p} \lambda_k} \tag{3.5}$$

When the cumulative contribution rate is greater than 85%, it is considered to be sufficient to reflect the information of the original variable, and the corresponding m is the extracted m main component.

4) Calculation of principal component loads

The principal component load reflects the degree of correlation between the principal component Fi and the original variable Xj, and the load lij(i = 1, 2, …, m; j = 1, 2, …, p) of the original variable Xj (j = 1, 2, …, p) in all principal components of Fi (i = 1, 2, …, m)：

$$\boldsymbol{l(Z_i, X_j) = \sqrt{\lambda_i} a_{ij} (i = 1, 2, \cdots, m;\ j = 1, 2, \cdots, p)} \tag{3.6}$$

In the result of principal component analysis (PCA) in SPSS software, the "component matrix" reflects the principal component load matrix.

5) Calculation of principal component scores

Calculate the score of the sample on m principal components:

$$\boldsymbol{F_i = a_{1i} X_1 + a_{2i} X_2 + \ldots + a_{pi} X_p} \quad \mathbf{i = 1,\ 2,\ \ldots,}\ \mathrm{m} \tag{3.7}$$

In practical application, the dimensions of the index are often different, so the influence of dimensions should be eliminated before the calculation of principal component. There are many ways to eliminate the dimensions of the data. The common method is to standardize the raw data, that is, to transform the data as follows:

$$\boldsymbol{x_{ij}^{*} = \frac{x_{ij} - \bar{x}_j}{s_j} \qquad i = 1, 2, \ldots, n;\ j = 1, 2, \ldots, p} \tag{3.8}$$

in which：

$$\boldsymbol{\bar{x}_j = \frac{1}{n} \sum_{i=1}^{n} x_{ij},\ \ s_j^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_{ij} - \bar{x}_j)^2} \tag{3.9}$$

According to the mathematical formula, on the one hand, after any random variable is standardized, its covariance and its correlation coefficient are the same, that is, the standardized variable covariance matrix is its correlation coefficient matrix. On the other hand, according to the formula of covariance, it can be deduced that the standardized covariance is the correlation coefficient of the original variable, that is, the covariance matrix of the standardized variable is

the correlation coefficient matrix of the original variable. That is to say, the correlation coefficient matrix of variables does not change before and after the standardization.

(2) Cluster Analysis

Cluster analysis is also called group analysis, point group analysis or cluster analysis. It studies the number of multi-element object classification problem and classifies the research object of multivariate analysis technology according to the characteristics of the research object. It divides the samples or variables into a class with similar properties according to the degree of affinity, so that the individuals in the same class have a high degree of homogeneity, and the individuals between different classes have a high degree of heterogeneity.

The basic principle of cluster analysis is to quantitatively determine the affinity between samples according to some similarity or difference index. Mathematical methods are adopted according to the attributes of the samples themselves and the cluster samples with certain degree of affinity.

There are usually two methods to describe the degree of intimacy: one is to see the p-dimensional vector from the sample or variable, and the sample point is regarded as a point in the P-dimensional space, and the distance between the points is defined; The other is to use the similarity coefficient between samples to describe the degree of affinity. With the distance and similarity coefficient, the samples can be quantitatively grouped. According to the classification function, the least difference can form a group, and the groups can be further classified according to the classification function until all the samples are grouped into the same class.

Clustering analysis is divided into Q-type and R-type according to the different classification objects. Q-type clustering is to classify samples, and R-type clustering is to classify variables.

The basic idea of cluster analysis is to divide the samples or variables of location categories into several categories according to the corresponding definitions. The classification process is a gradual reduction of categories. At each clustering level, the principle of “small intra-class differences and large inter-class differences” must be met until they are grouped into one category. The index to evaluate the clustering effect is generally variance, and the cluster variance composed of small distance samples is small.

The common clustering methods are systematic clustering, dynamic clustering (stepwise clustering), ordered sample clustering, graph theory clustering and fuzzy clustering.

1) Fuzzy matrix

According to the generalized angle cosine between the sample variables, the similarity of the two variables is calibrated, and then the fuzzy matrix is established according to the calibrated value, $D = \left(r_{ij}\right)_{nxn}$

$$\boldsymbol{r_{ij} = \sum_{k-1}^{m} x_{ik}\, x_{jk} / \sqrt{\sum_{k-1}^{m} x_{ik}^{2}} \sqrt{\sum_{k-1}^{m} x_{jk}^{2}}} \tag{3.10}$$

2) Sample clustering

According to the fuzzy relation, the matrix variables greater than 0.8 are selected, and the clustering is screened according to the principle that the rows of matrix variables are consistent. If b4, 5=0.9, it indicates that the fourth sample and the fifth sample belong to the same category, and all variables greater than 0.8 can be found recursively. The larger the variable selection is, the finer the classification is.

3) Cluster analysis test

The original influencing factor index and the selected key influencing factor index are clustered to the sample. The clustering process is basically the same, which indicates that the screening of key influencing factors is reliable, otherwise the boundary value needs to be redefined, re-screened and verified.

3.3.2.2 Mathematical model construction of key influencing factors

In order to confirm key influencing factors of the hotel furniture company's innovation ecosystem, this thesis conducts a survey of hotel furniture manufacturers on the aspect of the network interaction perspective, module subdivision and resource integration through field research questionnaires and argumentation methods. Before selecting the samples, it classifies and analyzes the hotel furniture manufacturers in china according to the distance, service scope, service type, popularity, availability of information data. Based on the principle of random sampling, samples are taken from different categories, and 10 hotel furniture manufacturers are finally selected as the sample companies for the survey, among which, there are hotel furniture production and manufacturing companies, hotel furniture design and planning companies, hotel furniture distribution service companies. The questionnaires are distributed to senior mangers

and department directors of the companies. A variety of departments are involved, such as production, design, finance, human resource, sale, engineering, installation and after-sale. The list of sample companies surveyed is shown in Table 3-1 below.

Table 3-1 List of Sample Companies

Number	Company Name
1	Shenzhen Golden Phoenix Futniture Group Co., Ltd.
2	Fujian Senyuan Furniture Co., Ltd.
3	Foshan Richang Furniture Co., Ltd.
4	Shanghai Taiyi Furniture Co., Ltd.
5	Sichuan Golden Baidu Furniture Co., Ltd.
6	Sichuan Fanqing Furniture Co., Ltd.
7	Chengdu Fanqing Furniture Co., Ltd.
8	Chengdu Fanhuang Furniture Co., Ltd.
9	Chengdu Qianshu Furniture Co., Ltd.
10	Chengdu Hualong Furniture Co., Ltd.

The reliability and validity guarantee strategies of this thesis are based on the existing case study methods. The evaluation criteria of case study quality are divided into four dimensions: construction validity, intrinsic validity, external validity and reliability so as to test and control the study (see Table 3-2).

Table 3-2 Strategy Table to Ensure Reliability and Validity

Test	**Strategy**	**Use Phase**	**Specific Practice**
Construct validity	Multiple data sources	Data collection	In-depth interviews, on-site observations, archival files, web search and other multi-channel data sources to ensure the integrity and consistency of views
	Form a chain of evidence	Data collection	Original data-sentence recognition-extraction of concepts-preliminary construction of the theory
	Verification	Data collection	The preliminary theoretical model is submitted to the senior level of the company for examination and verification to ensure the correctness of the understanding of the company transformation process by the researchers and the company personnel

Internal validity	Pattern match	Data analysis	The theoretical framework of value creation and the Research on the transition path of Fanqing Furniture Company
	Establish interpretation	Data analysis	The corresponding interpretation and description shall be carried out according to the logical framework
	Before and after analysis	Data analysis	Studying and explaining the different descriptions of the same kind of things according to the same interviewees in different periods
External validity	Theoretical guidance	Research design	The frame of theoretical analysis of this thesis is established through literature collation and analysis
Reliability	Create a database	Data collection	Establishment of information database according to content, access channel and acquisition time
	Repeated implementation	Data analysis	Different researchers analyze the data respectively, compare the results of the analysis, and form a unified opinion after discussion and research
	Presentation of multiple evidence	Data analysis	Evidence from multiple sources presented in the case analysis

(1) Validity

In this thesis, the above data were processed with the help of mathematical analysis software SPSS 22.0. Firstly, the validity of the data is tested, and the reliability is 0.920. The KMO value is 0.827, which is greater than 0.8, proving that the collected data is valid.

Table 3-3 Total Variance Table

Component	Initial Eigenvalue			Extract loading square sum			Rotation loading square sum		
	Total	Variance %	Cumulate %	Total	Variance %	Cumulate %	Total	Variance %	Cumulate %
1	8.613	35.888	35.888	8.613	35.888	35.888	4.103	17.096	17.096
2	3.253	13.555	49.444	3.253	13.555	49.444	3.861	16.088	33.184
3	1.869	7.789	57.233	1.869	7.789	57.233	3.245	13.519	46.703
4	1.159	4.829	62.062	1.159	4.829	62.062	3.135	13.061	59.765
5	1.110	4.627	66.689	1.110	4.627	66.689	1.662	6.924	66.689
6	0.883	3.678	70.367						
7	.862	3.593	73.960						
8	.798	3.326	77.286						

Component	Initial Eigenvalue			Extract loading square sum			Rotation loading square sum		
	Total	Variance %	Cumulate %	Total	Variance %	Cumulate %	Total	Variance %	Cumulate %
9	.751	3.130	80.416						
10	.702	2.924	83.340						
11	.608	2.533	85.873						
12	.484	2.016	87.890						
13	.472	1.966	89.855						
14	.378	1.573	91.428						
15	.361	1.505	92.934						
16	.343	1.427	94.361						
17	.259	1.079	95.440						
18	.201	.838	96.278						
19	.198	.825	97.102						
20	.179	.744	97.847						
21	.168	.700	98.547						
22	.144	.600	99.147						
23	.129	.537	99.684						
24	.076	.316	100.000						

Extraction method: Principal Component Analysis

(2) Extracting principal component

In the analysis of SPSS, the number of principal components will be generated by the variables in the study, which could reduce the dimension.

In this research, the questionnaire is analyzed by factor analysis, and the eigenvalues greater than 1 are selected. In general, if the eigenvalue of a principal component is less than 1, the principal component is considered to be less interpreted than the single variable and should be eliminated. According to the results of SPSS, five principal components are selected, and their cumulative variance contribution rate reaches 66.69%. The 24 questions in the questionnaire are analyzed, and the eigenvalues of the sample are calculated. In addition, the

unit features correspond to the eigenvalues are calculated as well. The vector is arranged from the largest to the smallest, and the main component whose cumulative feature value is greater than 1 is selected. As is shown in Table 3-3, the first five eigenvalues are greater than 1 and the cumulative variance contribution rate is 66.69%. Besides, the interpretation ratio of each principal component extracted to the data variation is greater than 4%, so the first five factors are selected to build an innovative ecosystem.

According to the principal component calculated by SPSS (see Table 3-4), after the rotated component matrix extracted, the explanation of each principle component is shown in Table 3-4.

As the table has shown, the first common factor can be measured by the question 1 to 6 in the questionnaire, which can be defined as “innovative subject contact”. The second common factor can be measured by the questions 7, 8, 11, 15, 16 in the questionnaire defined as “upstream and downstream companies’ information technology revolution”. The third common factor can be measured by the questions 9, 10, 14, 23 in the questionnaire defined as “complementary companies’ technological change”. The fourth common factor can be measured by the questions 12, 13, 18, 19, 20 in the questionnaire, which can be defined as “companies’ innovation culture”. The fifth common factor can be measured by the questions 21, 22 in the questionnaire defined as “information flow”. According to Table 3-4, there are several small problems in each measurement dimension, which are also paid a lot of attention in the furniture industry innovation ecosystem.

Table 3-4 The Rotated Component Matrix

	Component				
	1	2	3	4	5
3. The company works closely with research institutions	.779	-.031	.158	.226	.189
2. Government builds platform for company innovation	.763	-.150	.376	.199	-.190
6. Universities have research results that are beneficial to the company	.732	.220	.030	.063	.343
1. The government has corresponding policies to support company innovation	.718	-.043	.415	.186	-.271
5. The company works closely with universities	.714	.275	.081	-.012	.169
4. Research institutions have research results that are beneficial to the company	.707	.083	.166	.121	.156

8. Supplier's technological change promotes company innovation	.214	.766	.216	.058	.181
11. The development of information technology industry promotes company innovation	-.038	.729	-.046	.264	.254
15. Company facilities promote innovation	-.059	.717	.109	.343	-.215
16. Company’s systems (such as ERP, MIS systems) promote innovation	-.014	.668	.501	.190	.072
7. Suppliers have major technological changes	.361	.667	.111	.137	.278
17. The company pays attention to the talent introduction	.157	.592	.021	.446	-.144
24. Customers are willing to give feedback of the experience and individual needs to the company	.011	.501	.336	.199	.072
9. Complementary companies have major technological changes	.110	.102	.837	-.058	.074
10. Technological change of complementary companies promotes company innovation	.249	.120	.777	-.061	.062
23. There are channels for customers to exchange information	.363	.135	.649	.170	.357
14. The company conducts patent layout in the industry	.295	.256	.643	.290	-.016
13. The company has a well culture of innovation	.026	.336	-.073	.732	-.073
12. The company accepts a variety of opinions and encourages open thinking	.003	.415	-.070	.636	.220
20. Standardization of company system promotes innovation	.241	.094	.284	.635	.243
19. Company system has been standardized	.248	.145	.332	.612	.218
18. The company trains employees on new knowledge and skills	.252	.315	-.017	.579	.161
22. Supplier and company communication is effective	.249	.189	.276	.317	.655
21. Fast and accurate information transmission among various departments of the company	.330	.142	.125	.481	.584

It can be seen that the first common factor involves six problems, including three main bodies—government, company, and research institution. The relationship between these three is shown in Figure 3-2.

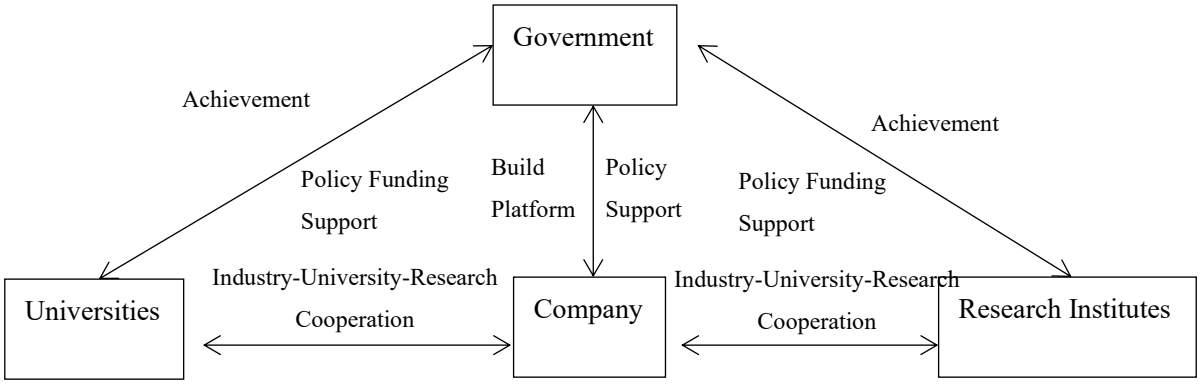


Figure 3-2 Innovation Main Part Intrinsic Logical Connection

The second and third common factors are mainly related to the information technology with the furniture company as the main body, but one is the technological change that connects the upstream and downstream, and the other is the technological change and patent layout of the complementary companies. In the question 16 of this case, there is a relatively high degree of interpretation in both the second and third common factors. This situation can also be explained by the existence of furniture company as the main body in both factors. Therefore, there is a certain degree of overlap in the impact of related technologies, which is reasonable. At the same time, the second and third common factors constitute the general pattern of technological change in the industry ecosystem. The fourth common factor is the description of the innovation culture of the innovative company. In this factor, it indicates that the company has a sound atmosphere of innovation, which can be explained in detail in the aspect of training employees, encouraging open thinking and standardizing. In the innovation ecosystem, the first and fourth common factors belong to the strategic decision-making population. The internal logic of the first common factor has been explained before. In fact, the fourth common factor is a perfection of its logic, because the reason that a company conducts industry-university-research study lies in its internal innovation culture. The last common factor is the validity of information flow. This common factor is explained by two main aspects: suppliers' communication and departments' communication. The questions 23 and 24 don't conform to the expectation that they own the highest degree of interpretation to the fifth common factor. This is probably due to the fact that in question 23, the channels for customers to communicate is mainly reflected in "channels" and is mainly based on online channels, so that information technology promotes more effective communication between the two. Actually, from the perspective of the innovation ecosystem, what the coordination of the innovation ecological community contains is information flow. Although customers and companies exchange information, they do not play a role in coordination, and instead, they do not act as a facilitator,

but provide feedback to promote innovation. In summary, all aspects involved in the process of building a company's innovation ecosystem are included in this thesis.

3.4 Relationship between elements of the innovation ecosystem in hotel furniture manufacturers

The hotel furniture company's innovation ecosystem consists of two parts: the innovative community and the innovation environment. In the innovative community, it contains three system that respectively play their roles in the whole system. The first one is strategic decision-making population, which can guide and motivate strategic innovation activities and drive force the industry development. The second one is technology R&D innovation population which engages in the innovation, development and application of innovative knowledge and promotes the industrialization of technology and products. It finds the demand resources in the above activities to exchange feedback, therefore, it affects decision-making. Meanwhile, it is also a consumer of innovative resources and a producer of innovative results, which is the main driving force for innovation and development. The last one is coordinating and supporting population which works as a hub of communication. Innovation activities of innovative subjects are coordinated through the flow of information, largely driving industrial integration and development. The innovation ecology mainly provides a good environment to support and guarantee the progress of the innovation activities. Moreover, it accepts the influence of innovative populations by constantly adjusting its structure, quantity and scale. Various types of innovative populations form the innovative community of hotel furniture manufacturers' innovation ecosystem. The innovative populations have the characteristics of adaptability, interactivity, coordination and complexity, which will have an important impact on the structural and functional characteristics of the community in the hotel furniture manufacturers' innovation ecosystem. From the perspective of ecology, the industrial innovation ecosystem is an open organic system. The various innovative populations in the system are interconnected, and will exchange material, energy and information with innovation factors unremittingly, so as to promote the industrial innovation activities continuously and stably. The relationship between them can be divided into the following two levels:

The first level is the relationship between the entire innovative community and the innovation ecosystem. In the operation process of the innovation ecosystem, the innovative ecological environment provides the necessary information, energy and material supply for the innovative community, which guarantees and supports the sustainable development of each innovative population. Additionally, it can carry out innovation and development within the respective innovation communities according to different innovative environmental conditions. Finally, it gives feedback about the innovation and development innovation results to the innovation environment to produce new knowledge, new technologies and new products and form a new industrial state, changing the ecological environment of innovation and forming a closed loop.

The second level is the development relationship among the innovation populations. Firstly, the strategic decision-making population is responsible for the overall development direction of the population and the formulation of relevant strategies. It also guides the development and operation of the other populations. At the same time, based on the feedback from the two populations, the strategic decision-making population needs to continuously upgrade itself, which can create a relaxed innovation environment for strategic industrial development. Secondly, the technology R&D population will integrate various innovation resources under the support of strategic decision-making population and the coordinating and supporting population, meanwhile, it conducts research and application of new knowledge and technologies to develop their own population strength. It also provides relevant technical services and gives feedback on the innovation resource needed for coordinating and assisting population, establishing the basis for mutual cooperation between the demand and supply sides. Finally, the coordinating and supporting population controls the operation of the whole

community and offers a well internal operation environment for the strategic decision-making population, which promotes the development of the entire innovation ecosystem and stimulates the vitality of the entire innovation ecosystem by specified strategic decision results. A closed loop is then formed. The three major populations rely on the ecological environment to interconnect in the process of innovation, which jointly promote the development of innovation ecosystem innovation. This thesis sorts out the relationship among the component factors of the innovation ecosystem shown in Figure 3-3.

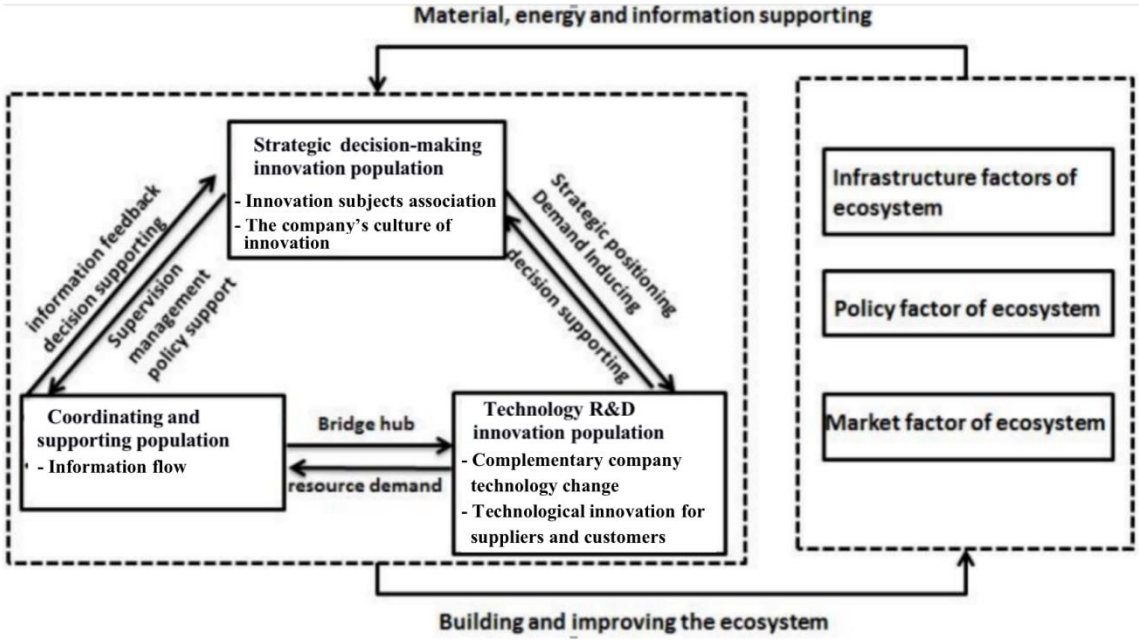


Figure 3-3 The Component Factors Relationship of the Innovation Ecosystem

3.5 Summary

This chapter focuses on the innovation ecosystem of furniture manufacturers and studies its components and factors. Through the questionnaire, the key factors of the furniture company innovation ecosystem are analyzed. Furthermore, the mathematical model is constructed and the key factors are selected. In order to ensure the data validity, these key factors are verified. Meanwhile, it has studied the relationship of three innovations populations as well as their connection with ecological environment.

Chapter 4: Value Co-creation Model Based on Innovation Ecosystem in Hotel Furniture Manufacturers

On the basis of the previous theoretical model, this thesis constructs the value co-creation mode as is shown in Figure 4-1.

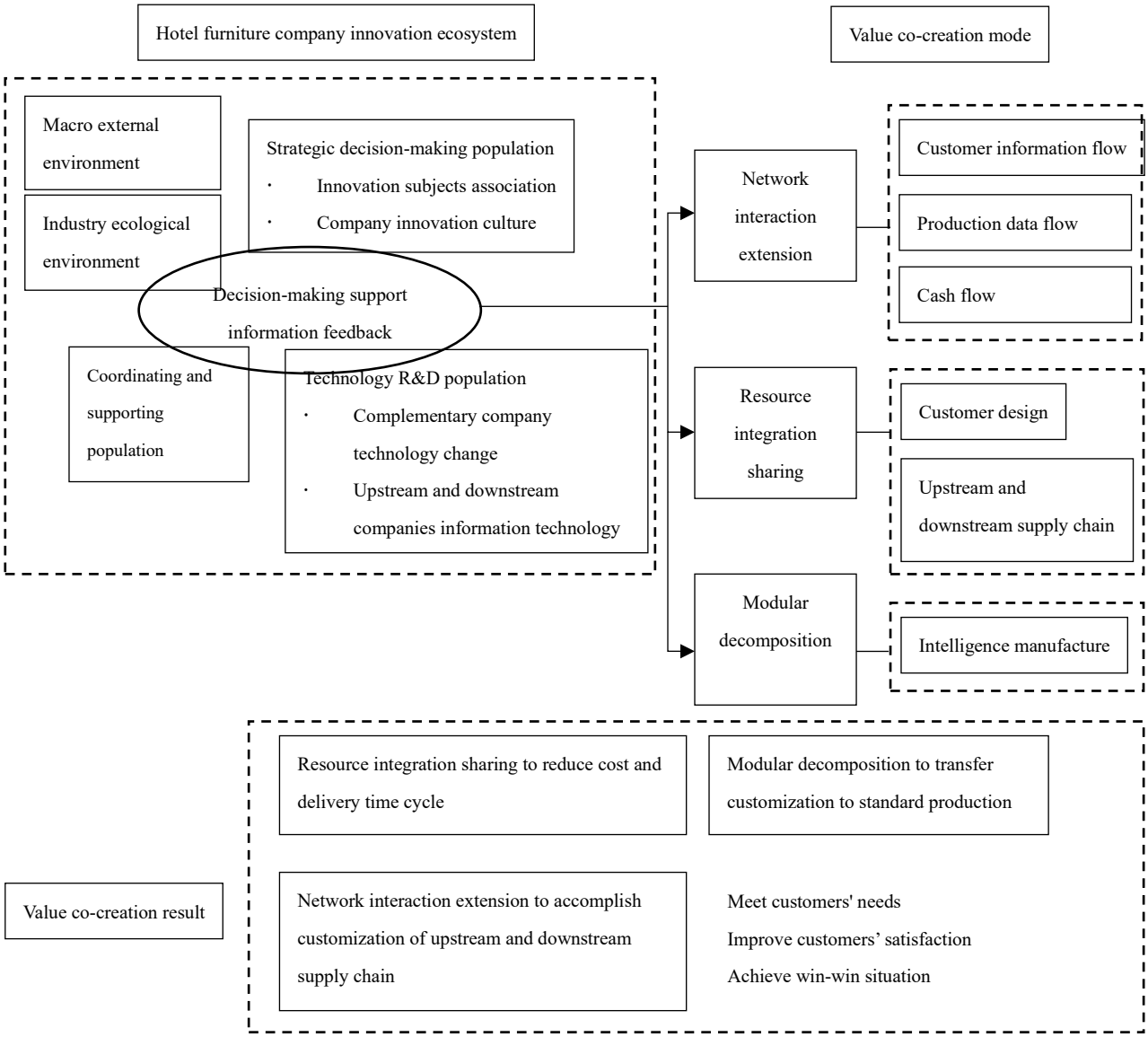


Figure 4-1 Value Co-creation Mode in Hotel Furniture Manufacturers

Firstly, the previous analysis has presented that the innovation ecosystem in Hotel furniture manufacturers is combined by innovation ecological environment and innovation

ecological community. The innovative ecological community focusing on hotel furniture manufacturers includes three main bodies: the strategic decision-making population, the coordinating and supporting population and technology research and development population. The process of discovering and exploring value creation is from C (customer) to F (factory) to C (customer), focusing on the supply chain and customers of hotel furniture manufacturers. Hotel furniture manufacturers provide F with products given to C, and products are then customized based on customers' personalized needs. Intelligent manufacturing is maintained through customers' participation in design, suppliers' providing of materials and hotel furniture manufacturers' production of goods that meets customers' needs. The companies also provide installation and after-sale service, and therefore the product end up with returning to customers. This process of business flow includes both capital flow and information flow. Capital flow converts the corresponding value of products into capital of the companies. Information flow includes information from customers' participation in design, raw material information provided by suppliers, production information data needed by intelligent manufacturing, and most important information, customer demand.

In this process, the three most important value co-creation operation modes are: network interaction extension mode, resource integration and sharing mode, and modular decomposition mode. And the operation of these three modes will not be separated by the support of innovative community. The connotation of ecosystem value co-creation operation mode of hotel furniture industry is analyzed in this thesis from three levels. And the driving factors of innovation ecosystem are also studied and included in the study of the innovation ecosystem of industrial technology (cluster), meanwhile, the strategic decision-making population is upgraded to offer a permissive environment for the ecosystem to explore the operation mechanism of value co-creation.

Through the network interaction extension, the overall management of the whole value flow network in hotel furniture enterprises is realized, and the individualized management of supply chain between upstream and downstream enterprises is realized. During that process, the key points of value creation are explored, and the common profits of the whole supply chain are realized, such as maximizing the value of suppliers, minimizing customer costs, shortening

the delivery cycle and maximizing the profits of enterprises. For enterprises, the most important thing is the operation mode of resource integration, which integrates all kinds of resources together to achieve the maximum use of all kinds of resources and maintain the maximization of various values. The biggest difficulty in this process is to solve the contradiction between personalized customization and mass production. Faced with the customers' individualized demand of large batches, small units and large scale, the core of transforming this demand into standardized mass production lies in the mode of modular decomposition. The large-scale production is realized by transforming the individualized demand of customers into standardized mass production and by subdividing the needs of customers and establishing relevant modular mode.

The network interaction extension mode is a breakthrough in traditional business model, expanding the diversified business model, greatly enhancing the participation enthusiasm and initiative of suppliers and demanders. The demanders express their real demands on the platform and actively receive related information. The supplier displays the products according to the demand of the other side and forms an interactive docking between supply and demand, which enables the demander to have a deep understanding of the products, so that they can obtain the desired products, save costs and improve efficiency. Modular decomposition, whose essence is a management concept, draws lessons from management theory and software engineering theory. Starting from customers' needs, it seeks to achieve a coordinated, accurate, efficient and sustainable development of innovation ecosystem by adopting means of informationization, refining objects, functions and tasks of management, clarifying functions and responsibilities, and optimizing management process. Resource integration and sharing mode is the key basic mode. The main subjects of this model seek to realize resource integration, innovate in resource sharing, and add value in innovation, so as to improve resource utilization, promote successful transformation and realize value co-creation.

According to the three different modes of value co-creation, this thesis analyzes the development and evolution of value co-creation in hotel furniture enterprises under these three modes, and establishes a questionnaire to collect relevant data on the influencing factors of the three modes. Then it builds an empirical analysis model to analyze the benefits of different

influencing factors and their proportion to the whole under these three operating modes, so as to establish the core influencing factors. On this basis, this thesis takes Fanqing as the research object, analyses the evolution process of Fanqing's innovation ecosystem and value co-creation operation mode, and constructs the future value co-creation model of Fanqing around the key factors and value co-creation mode, and finally puts forward the development strategy of Fanqing on this basis.

On the basis of the theoretical model, this part studies the network interaction, modular decomposition and resource integration of value co-creation with key companies in hotel furniture industry in Chengdu as the research subjects. A set of initial factors affecting value co-creation in the industry is constructed, and the key factors of value co-creation are studied with the means of principle component analysis and fuzzy clustering.

4.1 Value co-creation operation mode – network interaction extension

According to the analysis of the value co-creation mode and operation mode established earlier, this chapter deeply analyzes the connotation of the value co-creation operation mode of the innovation ecosystem of hotel furniture industry from three aspects: network interaction extension, detailed modular decomposition and resource integration and sharing. The driving factors of innovation ecosystem is analyzed and classified into industrial technology (cluster) innovation ecosystem research to explore the value co-creation operation mechanism.

With the wide application of big data and cloud computing technology in the commercial field, the competition of hotel furniture manufacturing industry no longer depends on the traditional marketing strategy and channel system, and its value creation model is replaced by the interconnected value network model. Cross-regional innovative service companies gather together on the new hotel furniture e-commerce platform, adhering to the principle of optimal distribution of interests, the aggregation of similar companies, mutual trust and mutually beneficial, form a new mode of value network. With hotel furniture industry regional hub as the node, relying on the company's service network, customer demand as the guidance, value added effect will be generated in the innovation ecosystem.

The network interaction extension mode is a breakthrough of the traditional business model, which expands the diversified business model and greatly promotes the initiative

participation of the demand side and the supply side. The demand side can express the real needs on the platform and actively receive the information resources. The supplier can display the corresponding products according to the needs of the other side, forming an interactive docking between supply and demand. The demand side can then have a deep understanding of the products, so as to obtain the desired products, save costs and improve efficiency. In the hotel furniture innovation ecosystem, the network interaction between companies is mainly manifested in three levels: customers' information flow, production data flow and capital flow. There are interactions between hotel furniture core companies and upstream and downstream companies, hotel furniture core companies and cooperative companies, and hotel furniture core companies and third-party service companies, from which corresponding information is obtained.

Firstly, the interaction between the core companies of hotel furniture and cooperative customer companies is mainly manifested in the strategic level. The cooperative customer company will inform the hotel furniture core company of its required technical standards and requirements. After carrying out experiential service, hotel furniture manufacturers should adjust the product positioning and service groups according to the experience feedback. Furthermore, the organizational structure and the direction of business expansion are studied and adjusted so as to realize the dynamic monitoring and adjustment of each link of the innovation ecosystem of the company. At the same time, through the in-depth communication between the customers and companies, the customer participation runs through the process of product design, production, sales, service and other links from beginning to end, and finally the value creation is realized among the hotel furniture manufacturers and the cooperative customers. Secondly, communication between the hotel furniture core companies and upstream and downstream companies are mainly manifested in the resource level. The original technical barriers between companies formed on the basis of technical protection hindered the development of innovation.The model of network interaction and extended value co-creation advocates industry-university-research cooperation among companies to jointly establish industry standards, jointly build and share innovation resources, and jointly maintain the value network environment. The realization of these functions requires the support of innovation ecosystem, which could serve as foundation to make the sharing of innovation resources among companies a reality. For example, furniture manufacturers such as the Master & Zest and Suofeiya have realized the dynamic balance between customer demand and company supply through the value internet, which has not only enhanced their own competitiveness, but also

facilitated the development of the market environment. Thirdly, the interaction between hotel furniture core companies and third-party service companies is mainly manifested in operational level. The hotel furniture core companies seek for the service demand from the third-party service companies, which offer them capital, human resources, information consultation and other services to coordinate the relationship between the stakeholders of all parties. A value-added situation is then achieved in hotel furniture core companies, maintaining a smooth operation of the industry innovation ecosystem.

In the innovation ecosystem of hotel furniture industry, network interaction enables the better flow of information within the industry. Hotels, hotel furniture material suppliers and real estate developers begin to cooperate across regions, spaces and borders. It integrates the innovative methods and resources of all stakeholders, promotes the flow of innovative resources, and realizes the co-creation of value. This network interaction has its own operating rules, which comprises two principles that need to be followed by the main bodies. The first is the principle of autonomy, and the stakeholders of all parties need to give full play to their subjective initiative, so as to provide diversified choices for the demand side of innovative resources, broaden the space for communication, and enhance innovation activity. The second is the win-win principle. In order to achieve mutual benefit, reach consensus, improve innovation and promote efficiency, all stakeholders must complement each other, maintain a better match of needs, carry out in-depth cooperation and effective communication.

In the upsurge of the internet, furniture manufacturers began to abandon the original cost competition and channel competition, and began to explore a variety of innovative marketing and service methods (See Table 4-1).

From the above table, it can be seen that the transformation of the furniture industry often takes the network interaction as the starting point, and develops towards the e-commerce platform, cooperative production , informationization. In the transformation of the above cases, it is not difficult to find that network interaction plays an important role in the “aggregation” effect of the network mode. At the hotel furniture industry gathering region, “aggregation” takes effect based on the company service network with the customer demand as the guidance, generating the value increment effect in the innovation ecosystem and realizing the value creation through the value increment. At the same time, through hotel furniture manufacturers’ ERP system, the company learns about the its production data, including the flow of funds. And this is how the companies achieve network interaction and extended value creation.

Table 4-1 Typical Measures of Furniture Company Transformation

Transformation Initiatives	Representative Companies	Notes
E-mall	Very Home (Taobao), Love Space (MIUI), Geek Beauty, Melody	
Household crowdfunding	Red Star Macalline	Cooperating with Jingdong, Crowdfunding auction
O2O integration	The Family	
Electric commodity brands	Qumei-qu miao, Tata wooden door-door, European-fan	
Internet marketing	Jimei, Lan Jingli Furniture, Wanjia Lighting City, Cool Manju, Slow Life	Open up an official website, or operate on a purely online basis
Product upgrading	Qumei waterborne paint lead	Environmental protection upgrade, function upgrade, process upgrade
Custom furniture	Shangpin, Livy's.	Providing not just custom service
Information-based system	Suofeiya, Master & Zest	Introduction of Oracle, IBM
Industry service	Multiple companies	Designer's marketing ability
Big furniture manufacturers	Deepin, Ikea	From furniture to accessories
Peer union	Ivanti furniture+Yihua wood industry	Cooperation of vertical relationship between upstream and downstream
Different industry cooperation	Golden Hippocampal Home, Huanning Decoration, Guoanju, Gome, Huizhou leaders Union	Wedding, home appliances, banking, and other marketing integration
Robot service	Red Star Macalline	Structural cost reduction

4.2 Value co-creation operation mode – modular decomposition

Hotel furniture industry is paying more and more attention to the customization needs of

customers. The industry relies on the internet, and its hardware facilities are also developing toward the direction of science and technology. In the aspect of strategy formulation, environmental adaptability, process management, overall optimization and other aspects are always taken into consideration. Similar to the idea of software engineering, it is necessary to decompose the overall strategy from top to bottom at levels of the system and the function and pay attention to the top-level design, so as to ensure the maximization of the value of the module.

Modular decomposition draws lessons from management theory and software engineering theory. This theory is essentially a kind of management concept, which takes customer demand as the starting point. Under the sustainable development strategy and macro adjustment of governments, it seeks to achieve a coordinated, accurate, efficient and sustainable development of innovation ecosystem by adopting means of informationization, refining objects, functions and tasks of management, clarifying functions and responsibilities, and optimizing management process.

It can be seen that the method of module decomposition will make the evolution of innovation ecosystem clearer, so that related matters can show an evolution process in a detailed, efficient, fruitful, qualitative manner. However, due to the change of product life cycle and the change of the main body of innovation ecosystem, the module decomposition is not immutable. At the same time, modular decomposition often has to go through a difficult process, during which the balance and running-in between modules is particularly important. Only by dealing with the connection relationship between modules and the update iteration of each module, can the overall function be brought into full play, thus producing the effect of “a whole greater than the sum of the parts”.

In the furniture market, hotel furniture is a special category. According to the quantitative principle, the current furniture target market can be divided into two categories: individual target market and group target market. There are differences in the attributes, costs and profits of the two markets, so they need to be discussed separately. Group target markets such as hotels, office buildings and infrastructures have the characteristics of single transaction and batch business. There is also a part of the group target market involving in open tender. As rules of the bidding process is different from those of the general market operation, it should also be

treated differently.

When applying modular decomposition in the innovation ecosystem of hotel furniture industry, three principles should be followed: the first one is to strengthen the management of stakeholders, that is, in the process of formulating the strategy of company layer, business layer and functional layer, it is needed to set up a core manager in each business or functional module who can oversee the implementation of the plan throughout the process, while providing timely feedback and handling problems encountered during the operation of the module as well as maintaining good communication at all levels. Secondly, it is necessary to determine the attribution of responsibility. After the adoption of modular decomposition in the innovation ecosystem of hotel furniture core companies, there will be more subdivision levels. In order to avoid prevarication among senior managers, module managers, and grass-roots personnel, it is particularly important to clarify the scope of work and the relationship between powers and responsibilities of each module. Clear responsibilities can not only form a binding force on all levels of module personnel and enhance their sense of responsibility, but also bring a sense of mission and sense of belonging to them in the equality of power and responsibility. The third principle is to re-emphasize the decomposition function so as to further improve the service function of each module, enhance the quality of service and economic benefits. The business module, designing module, marketing module, manufacturing module, customer relationship management module and other functions of the core companies of hotel furniture should be divided for a second or even third time. Details are presented in Figure 4-2.

In the innovation ecosystem of hotel furniture manufacturers, the detailed module decomposition is based on the premise of network interaction extension and clear service demand, and it adopts modern scientific and technological means to refine and optimize the service function modules of each company so as to promote the innovation ecosystem, which unified value cycle and overall value interaction among companies.

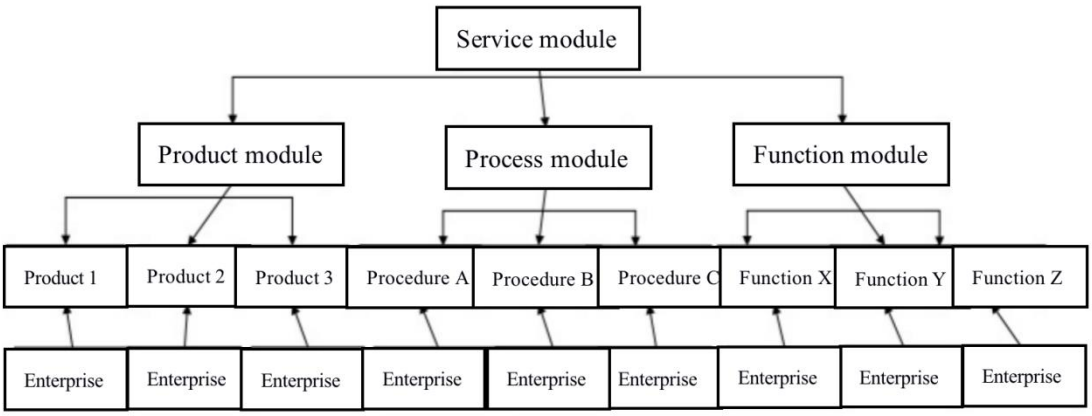


Figure 4-2 Hotel Furniture Company Innovation Ecosystem - Modular Decomposition

The interaction of service modules among companies can be reflected from the following three aspects: Firstly, a number of small modules with independent functions are decomposed to realize the recombination of product modules, produce more refined and high-quality products or services, so as to meet the personalized and diversified needs of customers. Secondly, the specific process is split and refined to obtain multiple subsystem modules in order to realize real-time interaction of process modules. Thanks to that, the company can timely and effectively deal with various unexpected problems. Finally, the expanded functional contents such as innovation service, knowledge service and information service are decomposed and refined to realize the mutual exchange of intelligent modules, so that the company can expand the space.

4.3 Value co-creation operation mode - resource integration and sharing

The openness of the network innovation environment is gradually enhanced with the rapid development of the internet and big data information technology, and more companies begin to recognize the benefits of sharing the innovation resources. However, with the growth of hotel furniture manufacturers and the increase in the types and number of innovative resources, the innovation needs of consumers show a complex and diverse situation. The original resource sharing mode has been unable to meet the actual needs, therefore, in the new situation, the key to solve the problem is to improve the value of the hotel furniture company innovation ecosystem to create the operation mode. The resource integration and sharing mode is the key basic mode. The mode is that during the operation of the innovation ecosystem, through the hotel furniture company platform, each innovation subject can realize the resource integration,

innovate in the resource sharing, and produce the value increment in the innovation, so as to improve the utilization rate of the resource and promote successful transformation and realize the co-creation of innovation ecosystem value.

In the innovation ecosystem of the hotel furniture company, the daily management activities of the innovation system are closely related to the flow of innovative resources. The mode of resource integration and sharing integrates the product information of the innovation subject through the hotel furniture company platform. Management information and resource demand information, which make hotel furniture company platform and company database docking in real time, solve the problem of shortage of internal resources and unequal information. It is helpful to the scientific and effective decision-making of innovation subject.

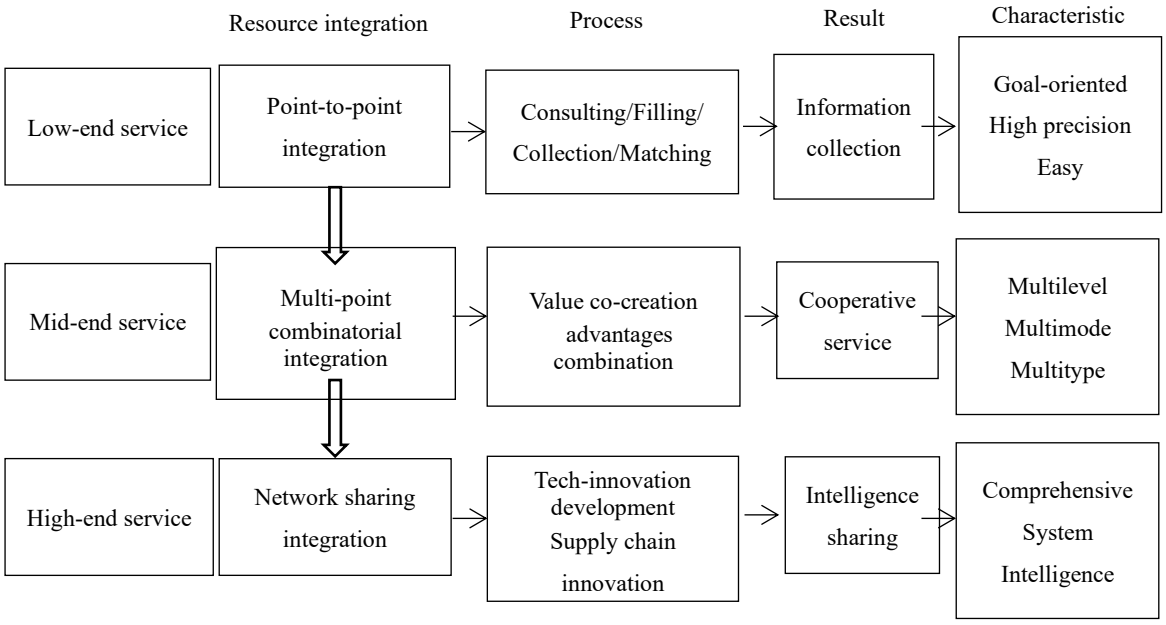
This study holds that the operation mode of resource integration and sharing is based on the network interaction extension and module refinement decomposition, and the hotel furniture manufacturers and their subcontractors, suppliers, intermediaries and customer companies. Through the hotel furniture company platform, they are able to communicate and negotiate, promise each other or reach the cooperation contract, and then realize the relationship integration and resource integration, thus forming a dynamic cycle sharing integrated service network. By using the network service, each innovative subject reorganizes, excavates, creates, shares and reconfigures the integrated resources, which ensures the value of the innovation ecosystem of the hotel furniture manufacturers to create the supply of resources which is needed by innovation co-creation ecosystem. The flaw path of resource integration and sharing mode is shown in Figure 4-3.

The mode of resource integration and sharing is presented in three aspects: one is point-to-point integration. Point-to-point integration is the most primary and least difficult resource sharing, which has strong purpose, high accuracy and high satisfaction, and collects innovative resources to match specific service requirements. The second is multi-point combinatorial integration. This integration has the characteristics of complementary resource, according to the needs of hotel furniture manufacturers, institutions of higher learning and scientific research institutions and other innovative bodies. And integration of interactive multi-level, multi-type of innovative resources is able to improve the ability of creating benefits in the innovation ecosystem of hotel furniture manufacturers. The third point is network symbiotic integration. This integration focuses on value added and network innovation. Relying on digital intelligent science and technology, this thesis actively excavates the innovation needs of user companies, develops innovative resources deeply, systematically integrates and shares innovative resources,

and makes the innovation ecosystem of hotel furniture manufacturers interact and co-exist among various network nodes.

Figure 4-3 Hotel Furniture Company Value Co-creation Mode - Resource Integration and Sharing

4.4 Typical hotel furniture company value co-creation operation case analysis



Founded in 2004, Shangpin Home Furnishing Co., Ltd. is transformed from a technology-based company that relies on high-tech. It is the earliest home furnishing company in the industry. The market for commercial homes is spread all over the country, including 38 directly operated stores and more than 800 franchise stores. The company pays special attention to marketing. On the one hand, it signs the first-line movie star Zhou Xun as its image spokesperson, launches the brand strategy and builds the brand image; on the other hand, it actively develops the franchise stores and expands the development of the furniture market. With the armed and blessing of technology, the company has provided more than 300,000 personalized home improvement solutions for more than 30,000 properties in more than 30,000 families in just a few years. In 2014, the turnover of an experience store in Guangzhou alone could reach 200 million yuan, and was praised by Wang Yang, Guangdong Provincial Party Secretary, as “a model for the transformation and upgrading of traditional industries”. This is so amazing that no one could achieve in the traditional furniture era.

In 1994, the company created the Yuanfang software, which created the prerequisites for the subsequent technological upgrading. In 2004, Shangpin Home Furnishing Company was founded. In 2006, the company turned production outsourcing into independent production, and began to control its own brand quality and production to create a research and development process. In 2007, they implemented a digital barcode management production process control system. In 2009, Shangpin Home Furnishing Co., Ltd. acquired Foshan Shangwei and Xinju.com, and was ready to start from the online and offline, to create a "C2B+O2O" business model by attracting customers online and providing service experience offline.

(1) Current business model

Shangpin's company mission is to be the leader in China's home e-commerce. The company's vision is to create a relaxed home, economical home, comfortable home and high-tech home. Shangpin Home Furnishing Company is based on high-tech software development and solves the problem of consumer goods. Shangpin's products are mainly customized production and sales of all-roof furniture, sales of supporting household products, and design, research and development and technical services for design and information-based solutions for home furnishing companies. At the same time, the pricing of Shangpin is at the mid-end level and can cover a wide range of consumer groups.

A set of reasonable customization process has put forward by the company: online booking (free gauge) to door-to-door gauge (scheme design) to scheme confirmation in the store (sign a contract) to product distribution (installation after sale).

The channel structure of the company is the strategy of direct operation, which is supplemented by franchisee, and it strengthens the control of the channel by adopting direct operation for key cities. On the whole, the channel integrated the online store business model (O 2 O mode), online sales and consumers' offline experience.

The main strength of Shangpin Home Furnishing Company lies in their technology, team, resources and services. Technology exists in the company's design systems, 3D effects display, supply chain and flexible production technologies. The company's team is a core team of design services that is built on the company's mission and vision. The company also has the most complete tens of thousands of product experience halls in China's furniture industry (collecting hundreds of home furnishing companies and thousands of third-party designers), room-type library (collecting tens of thousands of room types data for thousands of real estate projects across the country to establish a "room-type library" and a program library (through the "cloud computing and big data" technology to conduct in-depth research on the behavior and

functional needs of different people in different living spaces, and develop millions of “space-wide solutions” The “program library” is the three major library application systems. The company also offers additional services such as fortune telling, which is in line with Chinese cultural traditions and makes the home layout comply with the basic geomantic principles.

Shangpin’s online store is integrated and operated offline. The online practice is to start from the PC side and the WeChat side together, to conduct one-on-one consulting services and display a good client interface. The offline practice is to open an O2O offline experience hall in major business cities, and cross-border cooperation experience, such as the combination of food and gas-style kitchen gourmet experience.

(2) Main practice of transformation of the Shangpin Home Furnishing Company

1) Successful promotion strategies:

The “Double-Brand” strategy, “Shangpin Home Furnishing Company” and “Weiyi Custom” are all custom-made furniture. This strategy can help them stay competitive, and the franchise and distribution can be separated to some extent. The marketing strategy under the new media takes advantage of the fragmentation and immediacy of the mobile internet, and invites Zhou Xun and Li Bingbing to endorse the brand. In combination with the “free” thinking of the internet, the company has proposed free door-to-door housing, free full-room furniture design, free viewing of furniture placement effects, free on-site installation, free warranty lifetime maintenance service, which can transfer to more profits.

2）The grasp of individualized demand

Shangpin Home Furnishing Company uses game testing to observe user behavior data, using user subscriptions and user communication methods to capture personalized user needs and push them in time. On the design side, the company built an internet-based real-time transaction configuration and interactive design system by building O2O model. At the same time, it established tens of thousands of “room libraries”, hundreds of thousands of “solution libraries” and its own "product database", providing a comprehensive reference solution for consumers who do not know the need; on the production side, a flexible production system consisting of manufacturing execution, CAD/CAM interface, production scheduling and other software has been established to meet the efficient and quick demands of customers with scientific and technological features; on the worker side, the company has revolutionized the traditional custom furniture manufacturers relying on skilled workers to see the drawings. Each production worker is equipped with a computer, allowing workers to support digital technology

according to the computer instructions to implement production operations. This not only grasps the precision of production, but also realizes the timely dissemination of data and the linkage of supply chains.

3) Innovative operation of WeChat platform

First of all, Shangpin gives users personalized names, which can bring unexpected surprises to new users of interest. As shown in the figure below, once a user follows this WeChat official account, it can grasp the user's WeChat name. The display can be a plain text display, or it can be in the form of graphics and screenshots. The second is to manage users deeply. The customer service API interface provided by WeChat public account can be used to develop a set of customer chat system, rather than use the customer service chat window provided by WeChat. Through this window, the company can accurately capture the user's action on WeChat, including what menu the user has just clicked, so as to optimize the menu according to the user's demand. It can initiate a conversation within 48 hours and obtain customer information within that period of time and send friendly messages so as to increase the interaction with the users.

4) Innovation of intelligent manufacturing

In the production process, the company uses information management systems to let computers give orders to people. All the related personnel in the supply chain, including factory operators, resource allocation personnel, and suppliers can execute the order requirements according to the data of the system, and remove the manual communication link. The authenticity and timeliness of the transmission of information are restored (see Figure 4-4). Based on this system, the company has realized the effect of 10 times increase of production capacity, 8% increase of material utilization rate, 27% reduction of error rate and 15 days reduction of delivery cycle. More importantly, each product has completed the sales process before the production link, and achieved zero inventories. See below.

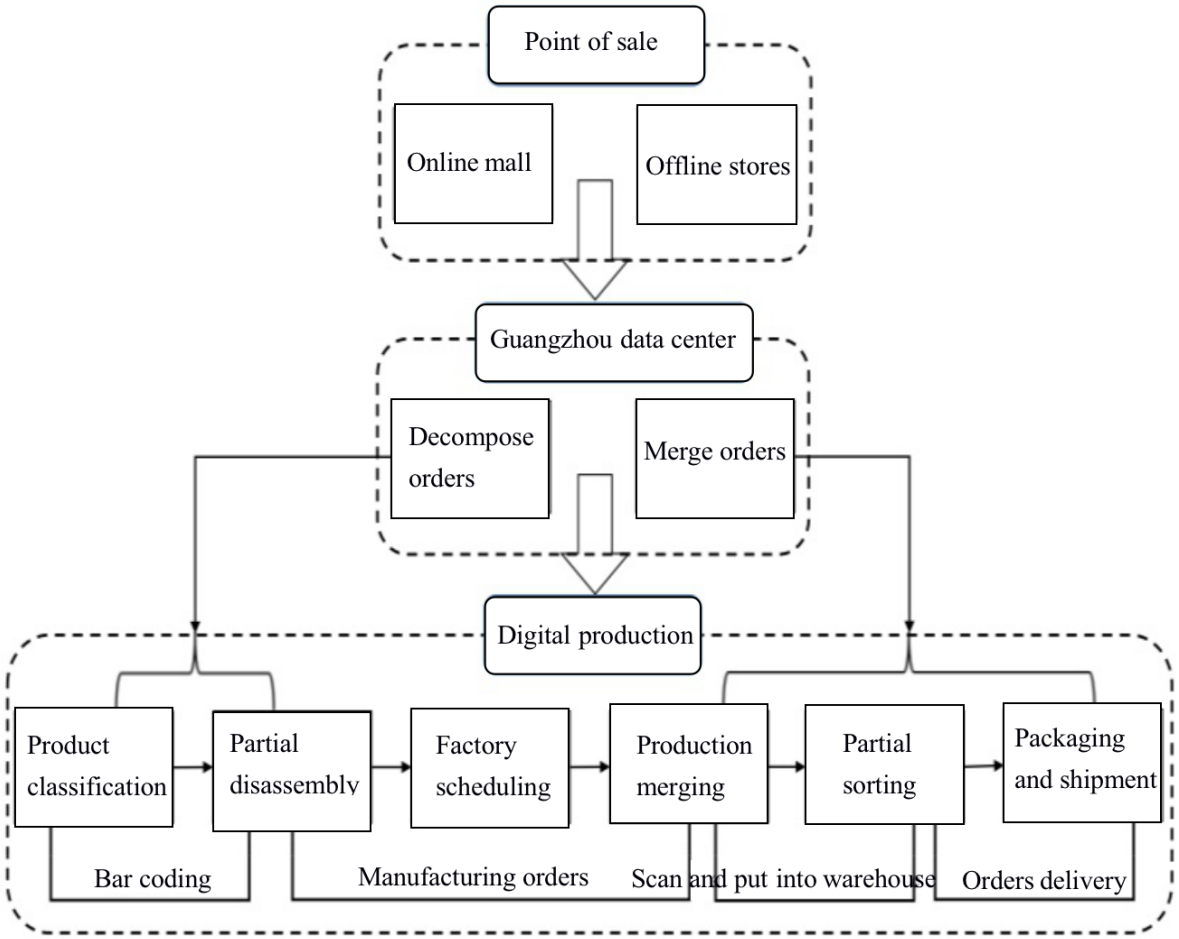


Figure 4-4 Information System for Shangpin Home Furniture Company

At the same time, the intelligent innovation of Shangpin Home Furnishing Company is also reflected in the design side. Shangpin is equipped with a free digital design center in every store in the country. In the store or online mall, all kinds of designers can do personalized computer design for consumers through this system. As long as the needs of consumers (such as space size information, style information, estimated cost, age, etc.) input into the database, the system will automatically load out hundreds or dozens of consumer style design for customers to choose. The company's online mall Homekoo.com has 100000 housing data from about 2000 buildings in key cities across the country, as well as corresponding residential space solutions that include a variety of styles and designs. The design information base building on virtual design not only contains diverse scheme storage to realize the presentation of multi-series products of different styles, structures and materials. It can also combine the size, material, color of furniture according to the personalized needs of consumers, so as to achieve a massive product library.

From the above analysis, it can be found that the existing typical value creation and operation companies are only capable of realizing small-scale personalized customization instead of large-scale one. In the face of the individuation of the demand of the hotel industry and the competitive situation of fragmentation, the problem of high cost of the C2F mode and low customer satisfaction of the F2C mode has not been solved effectively, so it is necessary to find new value and create the operation mode.

4.5 Summary

This chapter builds a value-creation model of hotel furniture company based on the innovation ecosystem. Taking the core companies of China hotel furniture industry as the research object, three aspects of network interaction, module subdivision and resource integration are studied to instruct the initial collection of the influence factors on value co-creation of hotel furniture industry. Moreover, this research studies the key factors of the value co-creation via principal component analysis and fuzzy clustering.

This page is intentionally left blank.

Chapter 5: Innovation Ecosystem and Value Co-creation Evolution of Fanqing Furniture Company

5.1 Brief introduction to Fanqing Furniture Company and its development status

Sichuan Fanqing Furniture Industry Co., Ltd. (hereinafter referred to as Fanqing) is located in Chengdu City, Sichuan Province, China. Founded in 1988, it is a professional hotel furniture company deeply engaging in the furniture market of high-end hotels in China. As a hotel furniture company with professional custom-style, Fanqing is devoted to the furniture development, design, production, engineering and installation of high-end hotels. With its professional production experience, series of home decoration products, excellent after-sale service and competitive sales price, it has become a furniture manufacturer with great core competitiveness in Western China. Since its establishment, Fanqing has undergone multi-level changes and transformation. In terms of company type, Fanqing has grown from a handicraft furniture workshop to a modern furniture company; in the aspect of the target market, its positioning has shifted from the past hotel furniture market to the high-end residential-centered market; in terms of company concept, Fanqing has changed from providing high-quality and high-end furniture products to high-quality and high-end overall solutions. In addition, Fanqing's performance in quality management, project experience, production capacity, talent reserve and development concept in recent years are as follows.

1. Quality management

Fanqing is a professional company which mainly manufactures and sells hotel complete sets of furniture. In its early years, Fanqing has obtained various quality certification qualifications in the industry, and strictly complies with the requirements of the industry in terms of environmental protection, quality, material selection and other standards. Nowadays, as the quality requirements of the whole industry are becoming increasingly stringent, Fanqing

makes adjustments to consumption environment by providing ten-year quality assurance for all its products.

2. Project experience

In the past, Fanqing focused on the R&D and production of hotel furniture market, so it has ripe experience in the design concept, production mode and sales mode of high-end hotels. It has cooperations in furniture preparation projects with nearly 100 five-star hotels. This matches Fanqing's high-end market positioning, and also means that Fanqing has mastered a number of high-end customer resources. Due to the influence of domestic macro-policy environment, the market of high-end hotels has shrunk. Since 2016, Fanqing has gradually begun to shift its market focus from high-end hotels to high-end residential buildings. On one hand, the past experience of high-end hotel projects has given Fanqing some advantages in continuing to specialize in high-end market. On the other hand, the service mode and thinking of organizing customers and individual customers must have different performances and requirements. Therefore, as for the operation of high-end residential projects, Fanqing has both opportunities and challenges.

3. Production capacity

Fanqing's production base is located in Xindu, one of the furniture industrial parks in Chengdu, Sichuan. Geographically, the area is close to the toll station of expressway, only 800 meters away from the high-speed entrance and exit, which brings great convenience to the transportation of furniture products. In terms of production scale, Fanqing's manufacturing center covers an area of more than 60,000 square meters, and nearly 90% of the area is for modern international standard workshop and 10% of the area is for product exhibition center building. It is the largest five-star hotel furniture manufacturing company in the western region of China. In terms of production technology, the company invested nearly 50 million yuan to introduce a complete German intelligent production line to meet the production needs of modern furniture manufacturers.

4. Personnel reserve

With a 30-year history of hotel furniture manufacturing, Fanqing has grown from a small workshop with only a dozen people to a professional team of more than 1600 people, 260 of

whom have middle and senior titles and they are scattered in different departments of the company such as design, manufacturing, marketing and after sales.

5. Development philosophy

According to the stage development strategy, the company will make specific plans to realize the vision gradually, maximize the value of the company, employees and shareholders, and fully take the social responsibility of the economy, society, government, customers, partners and communities.

5.2 Composition of innovation ecosystem of Fanqing Furniture Company

5.2.1 Innovation ecosystem community of Fanqing

1. Technology research and development population of Fanqing

Fanqing has engaged in R&D, production, marketing and after sales, providing integrated furniture solutions. It boasts a flexible management process, which is convenient for offering unified services to consumers. (1) Production technology. Fanqing has fixed furniture supporting production capacity, with all relevant quality management system of national furniture manufacturers. At the same time, the introduction of advanced German production lines lays a solid technical foundation for Fanqing's modernization; (2) Management technology, Fanqing independently developed a set of ERP&OA management system which connects factories, design, marketing and finance. The system controls the cost through budget and final accounts, traces the personnel in charge and the problem of each order through computer labels, and links the background production and manufacturing information with the front-end sales service information. It aims to achieve the purposes of lowest cost control, and tries to improve management quality and efficiency. This system with years of cultivation helps Fanqing basically achieve digital management, which is also one of the core advantages for Fanqing to stand out from other competitors; (3) Design ability. In order to meet consumers' high requirements in design and personalization, Fanqing has been building its ability of self-development and innovation. In addition to attracting excellent local designers, Fanqing has created a professional team of designers and hired foreign design talents to consult and plan for

the company; (4) Technological change in relevant industry. Furniture manufacturing is a typical traditional industry. Information technology development could be the most important opportunity for its industry transformation and upgrading. Recently, the ERP and MRP are widely applied, which could bring inspiration for Fanqing Furniture Company to introduce the advanced technology.

2. Strategic decision-making innovation population of Fanqing

After years of development, Fanqing takes Chengdu as its base, and its sales network covers the whole country. In terms of management mode, Fanqing is transforming its management method from traditional company and family management method to modern company management method, which is embodied in: (1) the transition from product-oriented management to project-oriented management. It plans to explore customer-oriented point-to-point management. (2) the transition from functional management to process management. Functional management emphasizes “matching between people and positions” to adapt to the development of small-scale and start-up companies; process management is an integrated and systematic management, which is based on the establishment of management information system and conforms to the current data construction stage of Fanqing. (3) The transition from decision-making by experiences to systematic decision-making. Experiential decision-making exists in early Fanqing. Production decision-making, market decision-making, employment decision-making and investment decision-making depend on people’s experience and ability. With the rapid development of economy, as there are many things in need of management but people’s energy is limited, the role of data information resources is becoming more and more prominent. (4) The weakening of atmosphere of human relations management. Fanqing has family business lineage, human eroticism inevitably exists. With this regard, business managers recruit talents and insist on empowerment by abilities important positions, rather than empowerment by relations. At the same time, it regularly manages training within the company, and corrects some employees’ deviations from the perspective of ideology.

The national policies and rules for furniture manufacturing industry have been gradually improved and standardized, which plays a steady and positive role in the development of furniture market. In terms of industry standards, the state, government and industry associations

issued the “Trial Measures for the Protection of Furniture Design”, “Limited Standards for Hazardous Substances in Interior Decoration Materials” and “Technical Requirements for Furniture Environmental Products”, to support independent furniture design and green furniture.

Fanqing is positioned as a high-end hotel for high-end consumers, which is different from the general public users. As high-end users have specific and personal requirements for decoration and furniture, consumers are sophisticated and designers are also very dedicated. To finalize the design plan, it is necessary to confirm and communicate with customers for a lot of times. The final solution must be the one that best meets the needs of customers.

The company actively seeks talents and cooperates with universities. At the same time, Fanqing attaches great importance to the training and introduction of talents. Fanqing pays special attention to the cultivation of design talents, production talents, and marketing talents to achieve core competitiveness of products, meet the needs of advanced production lines, and to have a better performance in innovative marketing. Only by managing human resources well can we respond to all changes in the process of change.

Fanqing steps up its exchanges and cooperation with technology companies, and it introduces intelligent VR scheme display system, which is different from traditional scheme display gives customers the most intuitive and three-dimensional design scheme, and provides consumers a new experience. When consumer demand is not clear, watching the effect of multiple design schemes through VR can help customers express their specific design needs. When the communication between designers and consumers is distorted, the idea can be quickly displayed to consumers through VR, which can facilitate the communication for adjusting the details in time. This intuitive display and communication can lead the traditional furniture to the stage of design and marketing, and ultimately enable designers to grasp the needs of consumers more clearly, so that consumers can harvest products that are highly consistent with their own ideas.

(3) Coordinated innovation population of Fanqing

Fanqing uses a complete ERP system from order receipt to product materials, production, sorting, logistics and installation to visualize the internal data. Firstly, Fanqing furniture production management information platform is in charge of order verification and task

decomposition and obtain corresponding data by splitting and processing order information. These data will be received by the corresponding departments of purchase, production, finance, logistics and some other departments, which depends on the inventory status of the warehouse to decide whether to purchase or not. If the purchase is to be made, the order will be placed according to the existing supplier data in the system. The logistics department carries out the material tracking according to the purchase plan and the logistic information will be passed to the production department via the system. The production department arranges production according to the material information, which can save human resources and time cost on maximum limit. Furthermore, according to the production plan of the production department, the warehouse management system will carry out the stocking and delivery plan. Meanwhile, customer order information, raw material procurement, sales and delivery information will be sent to the finance department. Throughout the whole process, employees from various departments can view the duration of each phase, duties content, which could help staff to quickly deal with related issues. The system could realize the information visualization among departments, which means resource sharing could achieve intelligent and systematic production. Customers can learn the real time progress of order through WeChat, APP and other channels. Fanqing's ERP system makes communication more effective between customers and companies, suppliers and companies, departments and departments.

5.2.2 Innovative ecological environment of Fanqing

As mentioned above, the innovative ecological environment is an external factor that affects the operation of the hotel's furniture company's innovative ecosystem. The ecological factors such as innovation infrastructure, policy incentives, and market environment constitute the innovative ecological environment. All of these factors are reactions to the external environment. Only by paying attention to the changes of external environment can companies get an early warning of industry crisis, seek new business opportunities and keep fresh vitality in the process of changes. At the same time, the operation of companies needs the interaction of internal and external environment, mutual adaptation and coordinated development, so as to help companies maintain their advantages in competition. The senior managers' understanding of the external environment is conducive to the full play of the overall situation awareness and

rational thinking and helps to make better strategic decisions. This section will refer to the PEST macro environment analysis method to sort out the external environment situation of Fanqing.

5.2.2.1 Policy ecological factor

As mentioned in the above-mentioned strategic decision-making innovation population of innovative ecological system, the national policies and rules for furniture manufacturing industry have been gradually improved and standardized, which plays a steady and positive role in the development of furniture market. It only mentions the industry standards, and some relevant measures issued by the state, government and industry associations, which are only some relevant policies within the industry. When analyzing, we should also pay attention to the relevant political factors of the external macro environment. In the promotion of development, the state has successively issued the “Light Industry Adjustment and Revitalization Plan”, “China Furniture Industry"12th Five-Year“ Development Plan”, “Light Industry“ Twelfth Five-Year Development Plan”, and “National New Urbanization Plan” (2014-2020) and other plans to promote the faster and better development of the furniture industry. The latest policies such as “Made in China 2025” and “Opinions on Promoting the Leading Role of Brands to Promote the Upgrade of Supply and Demand Structure” are leading the technology integration and update iteration in the furniture industry. In this process, some companies will be eliminated, and some companies will encounter a severe transformation and upgrading situation, which requires the support of the government and industry associations.

National regulations such as “all-around resource conservation” and “eight-point decision on improving Party and government conduct” have strong impacts on the hotel market. The construction and development of high-end hotels are closely related to the original market performance of Fanqing. The introduction of these policies not only challenges the operation of high-end hotels, but also directly affects the construction speed of high-end hotels, cutting down the market share. However, the requirements of the quality of hotel furniture keep constantly improving.

5.2.2.2 Market ecological factor

Furniture materials are diversified. In the past, wood-based furniture raw materials have

gradually developed into a collection of various furniture materials such as logs, plates, and composite materials. As for the standard of furniture materials, beauty and durability are required, and the requirements of environment-friendliness and materials are gradually improved. At present, China's furniture industry is on relatively small scale and still dominated by small and medium-sized companies, which brings furniture manufacturers less efficiency and more cost in production, and hinders the effective use of limited resources. Meanwhile, furniture produced by furniture manufacturers is featured by large capacity and low price. Furniture industry belongs to labor-intensive industry with low technology, which relies on cheap labor to gain competitive advantage. The main selling point of furniture products in Europe and America is technology. Compared with them, China's furniture manufacturers are seriously lack of competitiveness. Currently, Chinese furniture industry is facing two periods of rapid growth: the first is the growth of quantity, and the second is the growth of quality. Recently, the economic environment of furniture industry is developing towards optimized industrial structure, efficient value creation and innovative operation mode.

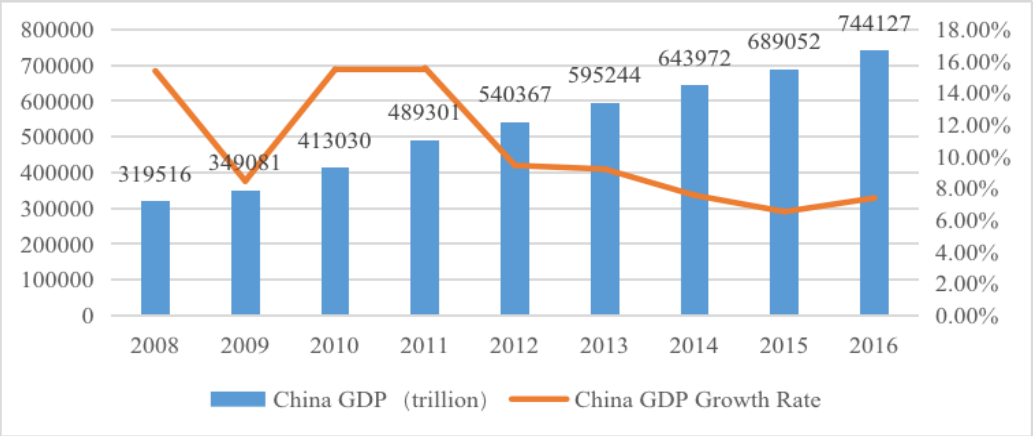


Figure 5-1 China GDP Data

Source: Collating public data

The demand of the furniture has been increased. (1) The overall economic environment in China has entered into a stage of slow growth (see Figure 5-1). Nevertheless, the performance of China's service industry is still good. On the one hand, the introduction of Eight Regulations of the Central Committee has brought sales shocks to the high-end hotel industry, but the national consumption power is constantly improving. On the other hand, the state makes efforts to encourage the development of tourism, which means that the construction and investment of

infrastructure will bring certain benefits to the market. And there is also the phenomenon that hotel industry will be updated every few years. (2) The tourism industry is growing steadily (see Figure 5-2 and Figure 5-3). The tourism income level and the number of tourists in Sichuan Province and the whole country have entered a stable stage. It can be inferred that the construction demand of the hotel will also affect the demand for hotel furniture to a certain extent, and enter a relatively stable stage.

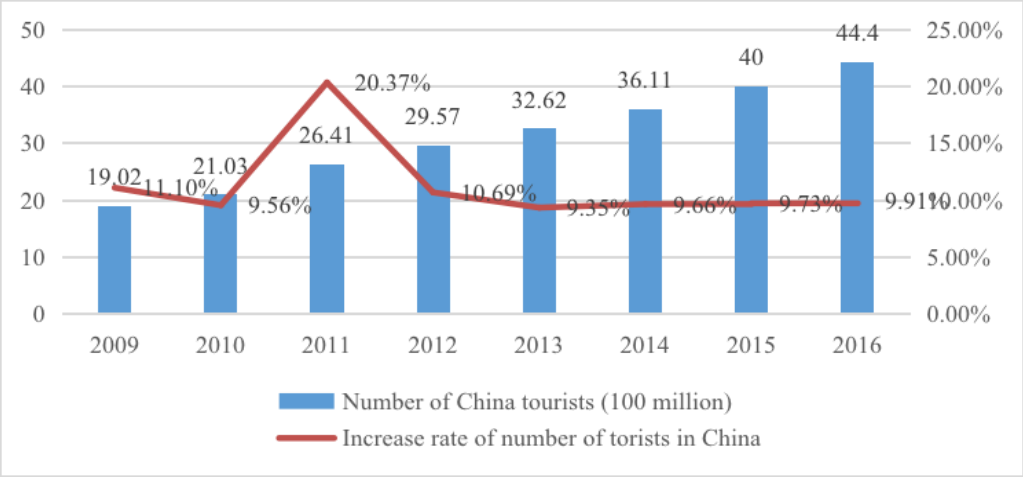


Figure 5-2 Changes in Total Tourists Number

Source: Collating public data

The quality of the furniture has been improved. In recent years, the life standard of Chinese people has largely improved, and their consumption habit is changing quietly. The fine decoration of housing space has been added to a cultural taste, and the popularity of furniture products is the best interpretation of this phenomenon. As the number of tourists increases, the living standard improves, and various theme hotels emerge, hotels have higher requirements for the hotel furniture. Not only the durability of furniture is required, people's requirements for furniture are also moving towards health, environmental protection, brand development, and even put forward their own requirements for the design of furniture.

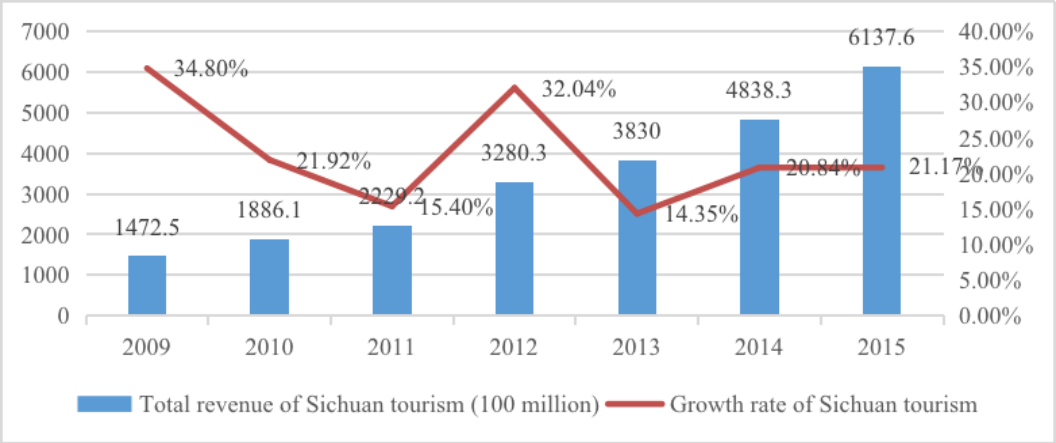


Figure 5-3 Changes in Total Tourism Income

Source: Collating public data

Since 2006, according to the statistical bulletin of China's tourism industry, for five-star hotels in China, on average, they will increase 19300 guest rooms every year, the cost of each room furniture is about 100000 yuan, and the total cost of furniture they increase every year is about 1.93 billion yuan; for four-star hotels, on average, they will increase 27800 guest rooms every year, the cost of each room furniture is about 60000 yuan, The total cost of furniture they add each year is about 1.668 billion yuan. Overall, the average annual demand for new furniture for five-star and four-star hotels is about 3.6 billion yuan, as shown in Figure 5-4. In July 2014, at the meeting of the Standing Committee of the State Council, Premier Li Keqiang proposed to promote the reform and development of the tourism industry, to increase the driving force for the development of the tourism industry, to continue to build and improve the infrastructure of tourist attractions, and to increase efforts for the elderly, folk customs, health and other special tourist attractions. Therefore, we believe that the expansion of star hotels will continue.

Although the growth rate of five-star hotels is slowing down gradually, the five-star hotel is better than other four-star and three-star hotels. Although the five-star turnover has decreased by 13.6% since the introduction of the “three public consumption” ban in 2013, the wedding and business consumer groups are gradually becoming the mainstay of five-star hotel consumption. With the saturation of first-tier cities, five-star hotels in the central and western regions, especially in Sichuan and Yunnan, will have market potential. At the same time, it is predicted that there will be an alternating market situation in the future replacement of hotel furniture, and it is necessary to seize the opportunities of the annual market conditions. It is

predicted that there will be a wave of peak demand of replacement furniture demand peaks in 2017 or 2018, as shown in Figure 5-5.

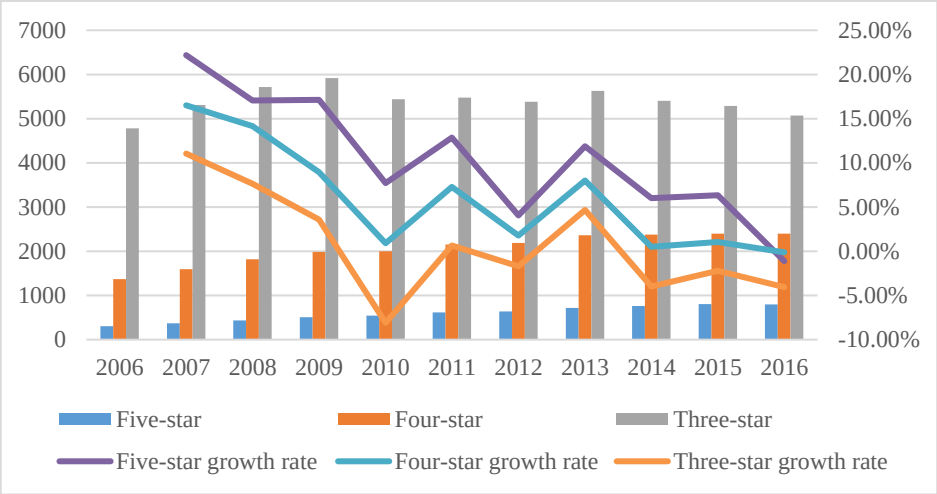


Figure 5-4 Number and Growth of National Star Hotel

Source: Luo (2019)

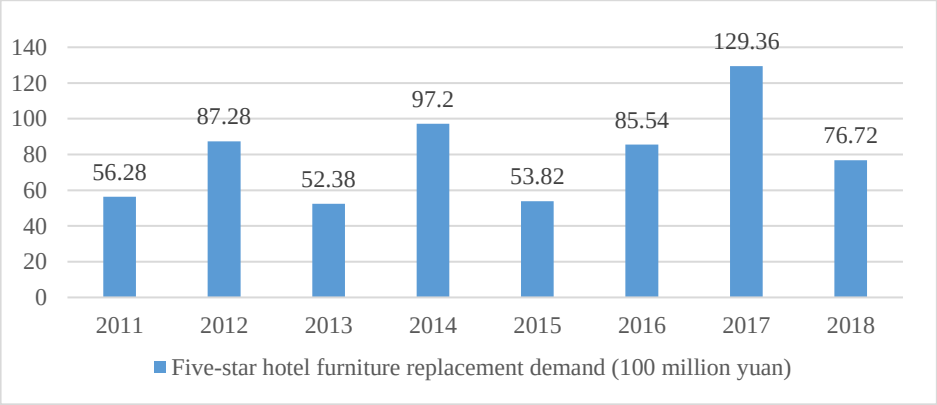


Figure 5-5 Five-star Hotel Furniture Replacement Needs

Source: Luo (2019)

5.2.2.3 Infrastructure ecological factor

Furniture products have a wide range of styles and specifications, and the specifications of furniture are also related to the place where they are placed. Therefore, the standardization, modularization and disintegration of furniture components are conducive to better meet the needs of consumers. At the same time, furniture materials are diversified. In the past, wood-based furniture raw materials have gradually developed into a collection of various furniture materials such as logs, plates, composite materials, and the like. As for the furniture material

standard, not only the requirements of beauty, durability, environmental protection and material are also improving. At present, the popular furniture in the market is panel furniture, whose final product is assembled by customers according to their hobbies and needs.

Furniture equipment is advanced. Since the furniture industry jumped from the traditional manual stage to the modern mechanical stage, the upgrading level of furniture production equipment is remarkable. The equipment is gradually complete, the production efficiency is steadily improved, and the trend of introduction is remarkable. Furniture R&D ability is relatively weak. At present, many modern furniture designs in our country refer to the situation of foreign design, lacking unique furniture design level and experience. Many furniture manufacturers do not have special designers and departments. The road of leading Chinese furniture design with Chinese characteristics still needs to be developed.

With the change of national consumption concept, furniture products need to meet not only the needs of consumer use, beauty, environmental protection, quality, but also the needs of identity and personality matching. Consumption concepts are refined, and an enterprise needs to cater to a variety of tastes of consumption concepts. Nowadays, many furniture manufacturers tend to use information, technology, and social text to standardize, modularize, and split the furniture components to better meet the consumer needs. Due to the more labor costs and less dependence of China's furniture industry, it has brought an extraordinary unfavorable development environment to the Chinese furniture manufacturing industry. On the other hand, with the improvement of the scientific level of production, the furniture manufacturing industry has witnessed the upsurge of introducing advanced production lines, which has changed the situation that many production workers were required to operate in the past. However, blind introduction has also led to various adverse consequences.

Furniture industry chain has gradually improved. China is a big country in the production and sales of furniture products. The production market and sales market are large, and they are relatively concentrated, forming several furniture clusters. At the same time, the infrastructure of furniture logistics has been improved, which greatly improves the speed of furniture logistics and reduces the cost of logistics.

Through the above analysis of the political, economic, technological, social and cultural

environment, it can be found that, on the whole, China's furniture industry has slowly transited from high-speed development to medium-high-speed development. The industry is facing a new economic situation and is entering a period of adjustment. To maintain the momentum of the furniture industry, efforts should be made in the design of furniture products, the development of new materials, the adoption of new equipment, the management of production and manufacturing, and the training of professionals.

In the new situation, Fanqing is generally facing the problems of shrinking the main market of high-end hotels and the urgent situation of transformation and upgrading. Therefore, in the context of grasping the macro trend, Fanqing started to shift the focus of the market since 2014. At the same time, Fanqing pays attention to the training and introduction of talents. It lays emphasis on designing talents to achieve core competitiveness of products, on producing talents to meet the needs of advanced production lines, and on marketing talents to facilitate innovative marketing. Only by maintaining human resources can we respond to all changes in the process of change.

5.3 Factors analysis of value co-creation of Fanqing Furniture Company

Through the previous analysis on several aspects of the company, we find that there are some problems in the company. At the same time, the rise of the internet has brought many new opportunities to all walks of life. The confluence of these challenges and opportunities stimulates Fanqing to choose value creation for strategic transformation, which includes two factors: "push" and "pull".

5.3.1 Driving factors of value co-creation of Fanqing Furniture Company

(1) Channel Internalization

Traditional furniture company channels are offline channels, which are mainly composed of scattered and scale-free single stores, large-scale furniture stores and independent flagship stores. These offline channels have the advantages of accurate traffic and super experience. But there are pressures such as high rent and labor costs. With the deepening of the internet to the

furniture industry, the development of online channels and the combination of offline channels have gradually developed into the “standard equipment” of modern furniture manufacturers. Some furniture manufacturers with sufficient channel resources of direct stores choose to cooperate with internet home decoration companies by opening up online channels, and some brand furniture manufacturers choose to cooperate with internet home decoration companies. In the past, the offline market, which was mainly responsible for sales, was transformed into a place for customers to experience. Online channel has become a new way for customers to understand companies, contact companies, understand products, design sales and order payment. Although the initial Internet channel construction may be “herd behavior”, companies will find that the opening of internet channels makes consumer communication more convenient and frequent during the process. On the one hand, it creates conditions and foundations for consumers to “talk” to companies. On the other hand, it may cause certain discomfort to customers if it failed to meet consumers’ needs to “express”. Therefore, the Internet channel promotes the development of company value creation.

(2) Demand emotionalization

According to Maslow’s hierarchy of needs, people’s needs are divided into the needs for survival, the need for security, the need for socialization, the need for respect, and the need for self-realization. With the improvement of economic environment and people's living standards, the thesis holds that consumers are also human beings, if put into the context of business environment, the demand level of consumers also presents a pyramid-like stratification. In recent years, the improved “online e-commerce era” has satisfied the “social needs” and “respect needs” of consumers to a large extent, while absorbing consumers into companies to create value together is more likely to meet the “self-fulfillment needs” of consumers. Because the “need for self-fulfillment” here is a “sense of achievement” where self-will and ideas are implemented willingly by others. The final product is not only the crystallization of the company, but also the result of consumer participation and creation, which is a very attractive part.

(3) Hardware technicalization

There is a gap between furniture manufacturers and furniture demanders, which is

characterized by opaque information and limited consumer identification. And furniture is a low-frequency consumer goods. Moreover, Few consumers are experts in furniture industry, therefore, most consumers are not very clear about their demand for home furnishings, for example, they may have a general effect of home decoration, but they do not know how to describe, or there can be a deviation between the description and the understanding of the company. Luckily, new technologies such as VR, smart home and 3D display have emerged in furniture industry, which creates a foundation for companies to understand consumers. With VR, customers can feel the actual effect of the selected furniture scheme in advance so as to make satisfactory and definite consumption decisions; with smart home, customers can enjoy a scientific and technological lifestyle and modern home decoration effect; with 3D display technology, customers can intuitively feel the actual experience of individual furniture products at home. Those technologies not only enrich the consumer experience, guide the consumer to determine the final plan, but also stimulate the consumer to devote more ideas and inspiration in this process, which are valuable experiences to enhance the value of products. Companies should record the opinions and feelings of consumers in the process of their experience, and confirm and solve them.

(4) Service concept

Different from the traditional economy, the direction of economic development in the Internet era is obviously not the same as it was in the past. Facing the change of economic form, the strategic consideration of companies must be changed accordingly. In the past, emphasis was placed on products, and there was no worry about sales, so long as the products were good enough. That is when the consumer’s demand for products mainly focused on their functional uses and performances. At that time, consumers did not have other derivative needs or any personalized needs. Now, consumers are no longer satisfied with the mass performance of products, but are increasingly pursuing personalization, differentiation and higher living standards. In the past, the management mode of companies was business management, focusing on internal production and operation. In most companies, it was also sales management in a narrow sense. Now the development of the times requires us to lay stress on the interior, and to maintain the exterior relations. Integrating the management of the interior and exterior relations

into a network system of relationship management is of great significance to the development of companies. Customer relationship management is the basic requirement of the internet era, and its value to the operation and maintenance of customers is often beyond imagination.

5.3.2 Pulling factors of value co-creation of Fanqing Furniture Company

(1) Strategic obstacles

The talent reserve is insufficient. The company has more than 1600 employees, most of whom are production workers and managers. There are still many old employees. They lack the perception and creativity of fast iteration furniture products, which is not conducive to the innovation and creation of furniture products. Consumers themselves are the main body that knows their needs best, so to play the role of value creation is equivalent to introducing a group of sales and design personnel who know the customers best. This process avoids the complicated recruitment process and lots of training cost. In this sense, value creation can make up for some human shortcomings.

Marketing means need to be updated. Although Fanqing has laid out a series of e-commerce platform construction, but the application of the platform is still in the initial stage, failing to give full play to the greatest advantages of e-commerce platform, which brings certain obstacles to customer service. Complying with the development trend, seeking the appropriate marketing means and methods is the focus of Fanqing. In addition, the shift from the focus of the hotel market to the high-end residential market also puts forward new requirements for marketing means.

(2) Personal motivation

Zi Fanqing, the chairman of Fanqing, took over the company when it was a traditional small furniture factory and experienced the rapid development of Chinese business environment from traditional closure to fast development. 2015 is the most changeable year for Chinese furniture manufacturers. Mr. Zi was not satisfied with the company’s current scale of development, and he was keenly aware of the urgency of the transformation of furniture manufacturers. Based on the present, he then made up his mind to seize the opportunity of long-term trends, and determined to build the company into a modern furniture high-end overall

solution provider that can withstand the scrutiny of the times. For this reason, he paid visits to Italy, France and other fashion furniture design countries for many times, and shelled out to bring in advanced German production equipment, and led his team to study the development trend and management means of the company. His artistic instinct, technological innovation and overall concept have successfully developed the company. Therefore, adhering to a high-quality, high-level, high-quality company culture, Fanqing has been recognized by a large number of high-end customers.

(3) Peer pressure

With the spread of the future of manufacturing, the "Made in China 2025" plan and furniture industry transformation upsurge, many internet furniture manufacturers and brand furniture internet have taken measures and actions to build new core competitiveness. If Fanqing is not able to move forward, it will be a kind of retrogression in the business rules of “not to advance is to go back”. The strategic department of Fanqing is keenly aware of the importance of the whole market environment and excellent companies to customers, and this emphasis is not only on service optimization, product improvement, but also on an emotional connection. This provides an opportunity for Fanqing's transformation and upgrading, re-consideration of user status and re- utilization of user resources.

5.4 The C2F2C value innovation model evolution process of Fanqing Furniture Company

Through the key influence factors classification of the value co-creation in the hotel furniture innovation ecosystem, as well as research and data analysis, four factors are found: information service sharing, industrial aggregation development, organization coordination management and industry-university-research cooperation. Therefore, the Fanqing needs to make its strategic development centering on the four aspects. First of all, it improves the innovation ecosystem of Fanqing Hotel Furniture Company in four aspects, and then explores the value innovation model, and finally proposes a suitable development strategy for the company. The idea of development strategy construction: improve the innovation ecosystem → explore the value innovation model → propose a development strategy. In the process of

building this idea, Fanqing company mainly expressed its idea in C2F2C value co-creation mode of Fanqing furniture company.

After the improvement of ecosystem, Fanqing's value co-creation model need to be further explored, in which companies and customers create value together. Therefore, it proposes different scales but comprehensively coordinated customized production from offline to online. To meet the needs of hotel furniture customers, each product should be positioned distinctively and it is needed to provide more customized products and services. The success of companies' customization cannot be separated from the continuous evolution of customization capabilities. The key direction of future strategy is to enhance Fanqing's customization capability, which needs to realize the strategic planning of the full value chain by means of design, manufacturing and market. Based on its successful experience in recent years it builds the C2F2C development strategy, which has solved the contradiction between customization and standardized production. It has successfully shortened the product supply chain cycle, improved the accuracy of the splitting and reduced the labor cost and material cost, which make companies to have stronger core competitiveness. Figure 5-6 shows the development strategy of the company.

First, starting from the C-end of C2F, it established an internet-based C2F platform, including Weibo, WeChat, official website and other marketing platforms, which aims at attracting customers to the Fanqing's innovative ecosystem via serving them by personalized ways. Moreover, it converts this personalized demand into production data through ERP system, and combines the TOPSOLID simulation manufacturing system and Fanqing existing intelligent manufacturing equipment to do information production to realize the standard technology development. Manufacturing equipment and this standardized production could meet customers' needs and achieve the objective of mass production. Ultimately, it realizes the improvement of production quality, the shortening of product delivery time, the reduction of overall price, the improvement of customer satisfaction, the greatly reduced cost of the company, and the realization of win-win value co creation. The specific construction strategy and construction model are as follows.

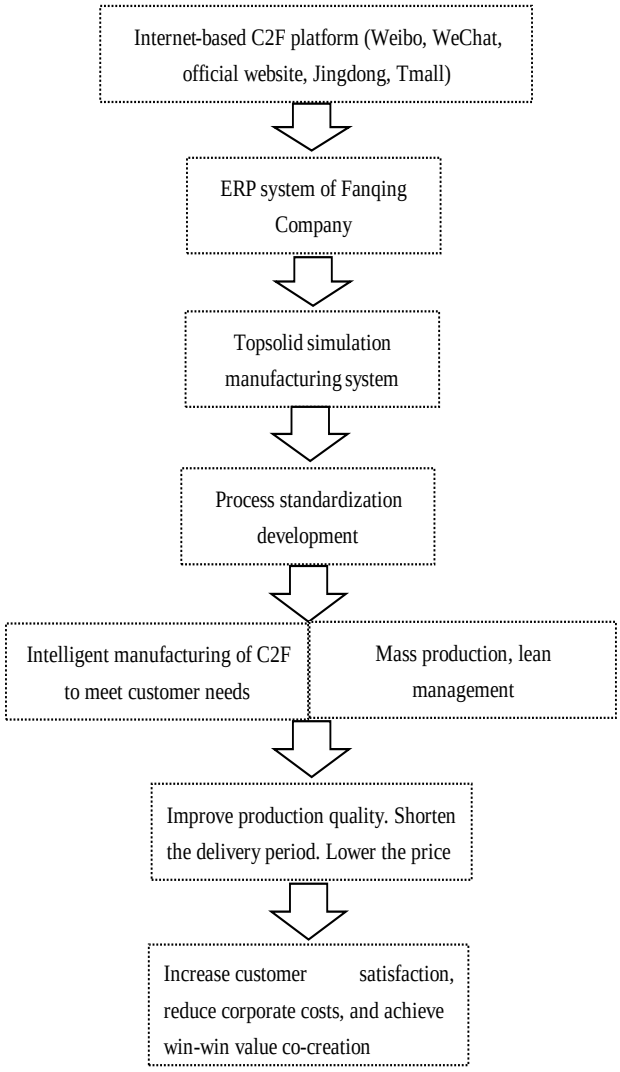


Figure 5-6 Thoughts on the Development Strategy of Fanqing Furniture Company

Source: From indepth interview and documents of the company

5.4.1 The improvement of value innovation model of Fanqing Hotel Furniture Company

According to the preceding development strategy, Fanqing needs to improve its innovative ecosystem from four aspects: information service sharing, industrial convergence development, organization, coordination and management, and co-existence of industry, university and research.

(1) Coordinating and supporting innovation population

In Fanqing's innovation ecosystem, information construction has gradually become a new height of business strategy development of hotel furniture company. The degree of grasp and

utilization of information among innovators determines whether companies can grasp new opportunities in competition, especially with the continuous development of big data technology. Companies should take advantages of various customer resources and data to strengthen the linkage effect in the innovative ecological community, fully share information, use the information between upstream and downstream companies to upgrade the service of the whole industry, and meanwhile enhance the competitiveness of companies.

The innovative ecological community based on information service sharing is mainly constructed for the information validity, technology level and innovation development degree that affect value creation. After sharing and exchanging various innovative resources and information through the innovative ecological community established, companies can absorb and tap their own potential through integration, thus laying a foundation for value creation. In the aspect of implementation, Fanqing can establish its relevant guarantee mechanism from the following three aspects. Firstly, the establishment of information guarantee mechanism. relevant management policies for resource sharing should be made within the company to guarantee the security of information sharing among information subjects and ensure the accuracy and confidentiality of information. At the same time, the well-established policy management also includes the maintenance, use, update and related protocols between different information systems, which can ensure the stability of operation in the process of information sharing. Secondly, the establishment of resource aggregation platforms. Every subject or object has its own innovative resources, however, how to gather these resources together and enhance information communication among companies need to establish an aggregation platform, which can provide relevant information and conditions for each theme of the innovative community. Finally, the establishment of dynamic combination mechanism of service resources. It aims to promote the value creation and strategic development needs of companies. It uses the network extension and interaction value creation operation mode mentioned above to combine the upstream and downstream development chains of companies and standardize the whole process of production, manufacturing, after sales and service. In these processes, some resources will be reorganized and dynamically allocated, which can continuously provide information and resources for innovative ecosystems.

(2) Strategic decision-making innovation population

1) Improving the innovative ecological community of industrial aggregation development

In the process of development, hotel furniture manufacturers are faced with low degree of industrial convergence, low degree of resource integration and weak capacity of resource docking, which may lead to extensive industrial development and fail to coordinate the development of a unified industrial chain. In order to improve the phenomena, Fanqing needs to establish a complete supporting service system, an industrial aggregation ecosystem of mutual integration and coordinated development. It integrates dispersed resources, extends the value chain of Fanqing, brings the innovation of the whole cluster from single innovation to product innovation, improves the comprehensive utilization of resources, meets the personalization needs of customers, and realizes mass customization are the primary tasks of Fanqing's development.

The convergence and development of industry can be directly integrated with the operation mode of value creation. It can not only give full play to the core advantages of companies, reduce the cost of companies, but also excavate new profit models, bring about the common development of upstream and downstream companies, and optimize the overall layout of Fanqing Hotel Furniture Company. Based on the current development, efforts should be made to seize the needs of hotel furniture customers, meet the personalized needs as breakthrough point, agglomerate the core advantages of companies upstream and downstream, achieve mass customization, develop industrial chain cooperation to tackle key problems, seek the best mode of production, establish a network of joint relations between companies, promote research and development and innovation collaborative management, and ultimately achieve innovation. At the same time, aggregate the superior resources of upstream and downstream companies, create the value of modular decomposition of innovation ecosystem, build complementary industrial technology chain relying on the core advantages and industrial foundation of each sub-module, promote the organic coupling between different links, promote technological innovation and development, and ultimately improve the whole innovation ecological community.

2) Improving the innovative ecological community of organizational coordination and

management

Innovation ecosystem of hotel furniture manufacturers is composed of many kinds of innovation units. Innovation units are featured by their complexity and diversity, which will lead to problems of coordination and balanced management among the various subjects during the management of innovation ecosystem. Fanqing also faces this problem, so we need to solve the problem at the root, establish a perfect organization and coordination management mechanism, realize the sound development of each theme, and maintain the internal dynamic platform and external dynamic balance among various innovative ecological communities.

Fanqing innovation ecosystem is an open and flat system. Its organization and coordination management are based on the value creation model. Therefore, it is necessary to improve the relevant incentive policies, partner selection, and innovation of coordination mode in order to ensure the good operation of the ecosystem. Efforts should be made to stimulate the concept of value creation between innovators and partners to form common development goals, and corresponding collaborative management processes and rules should be formulated and improved to enhance the innovation efficiency among collaborators.

3) Improving the innovative ecological community of industry-university-research cooperation

Due to the limited resources and energy of individuals in the process of company development, it is necessary to cooperate with more scientific research institutions and universities, especially to form corresponding innovative ecological communities with the value sharing as its objective. Therefore, Fanqing combined its own characteristics to build an industry-university-research cooperative ecological community with linkage effect.

Based on the operation mode of value co-creation, Fanqing needs to accelerate the improvement of innovative ecological community from three aspects: symbiotic environment, symbiotic model and symbiotic unit, so as to maximize the realization of value. In the early stage, it is necessary to create a good symbiotic environment with cooperative institutions, including technological, political and economic environments to provide positive energy exchange and guarantee for cooperative institutions, whose the main purpose is to ensure a good environment for innovation. The second stage is to create a well symbiotic unit, find the

appropriate cooperative stores, optimize the combination of cooperative points, establish an effective docking mechanism, make good use of the advantages of product application of companies and product research and development of scientific research institutions and theoretical basis, and combine them together to maximize the realization of common value creation.

5.4.2 The C2F2C model evolution process of Fanqing Hotel Furniture Company

(1) The first stage: F2C model

It proposes that the traditional commodity circulation model is: factory - brand company – distributor – retails - consumer. Due to many intermediate links, the cost increases step by step. Consumers always pay a high price on the products. Therefore, with the development of e-commerce, Fanqing Furniture Company has learnt the F2C model, hoping to occupy the market at a low price in this mode.

F2C (factory to customer), refers to an e-commerce mode of from the factory to customer directly. It establishes a direct way between manufactures and customers, reducing the cost of intermediary links and allowing manufacturers to directly provide consumers cost-effective products. This model realizes the integration of products and services and creates great value for the companies. In the process of F2C, Fanqing develops products based on the company's inherent model and standards for hotel customers to choose. It does not accept customization and factory production management is simple. The design tools such as 3DMAX or CAD drawing software are used. Fanqing applies F2C one-way sales and simultaneous production Inventory. The business risk lies in product backlog, which is a hidden danger of the company's huge losses. It only has simple traditional management and low requirements for informatization. At the same time, F2C's sales platform has satisfied the traditional marketing, that is, the direct sales team sells to customers and the customers in the central and western regions purchase the low-price hotel furniture in the factory directly (factory sales department). The customer resources are all held by the sales staff. Due to the vicious competition in the industry, the sales staff is highly mobile and the customer resource security management is low. As the quality of sales staff is generally not high, they keep blindly meet the various

requirements of customers, which brings a low profit to factory. Under such circumstances, Fanqing soon realizes that the model is with F as its core and to provide quality products to consumers centering on production. However, in the hotel furniture industry, it cannot just provide products to consumers oriented on itself. In the process of value co-creation, hotel furniture manufacturers are facing an important problem: how to meet the needs of consumer-driven customization, and how to give full play to the advantages of low cost and high efficiency of mass production.

(2) The second stage: C2F model

When pondering the above issues, Fanqing holds that the C2F model should be implemented with C as its core. Undoubtedly, the C2F model gives Fanqing a glimmer of hope. This model is able to meet the individual needs of consumers with the help of real time internet connectivity. But it needs to open the channels if this model implemented. Previously traditional e-commerce operating models were mainly B2B (business to business), C2C (customer to customer) and B2C (business to customer. Innovative e-commerce operating models mainly include O2O (online to offline) and B2B (business to business). As the existence of intermediate links in these operating models, the factory finds it difficult to know the individual needs of consumers. The C2F is the fruit of the development of the national economy, the improvement of people’s living standards and the personalized requirements of hotels. Therefore, the personalized design of the hotel must adapt to and match this kind of rigid demand, but the needs of the personalized customers are different. The unconditional satisfaction of customers' needs will inevitably lead to a significant increase in costs and a decrease in efficiency, which cannot satisfy the needs of customers and make informationization more complicated. Then, to meet the various increasing personalized needs of consumers, it is necessary to establish more real-time and direct communication channels between companies and consumers. Therefore, Fanqing has cooperated with Topsolid Company of France Dassault Group to introduce ERP system, including customer relationship management system, which helps to solve the problem on the channels.

During the transition period from F2C to C2F, the company encountered great difficulties. It used to guide customers to purchase the company’s inherent products from the factory,

however, it turns to the customization now, which results in dramatically increasing cost, and the number of personnel needed in each position is greatly increased. The cost is high and the efficiency is low so that the company's operations are in trouble. In this case, the company proposed C2F2C.

In the C2F mode, there is another problem: the important condition for the implementation of the C2F model is that the consumer needs are convergent that there would be some commonality. Under such conditions, the factory can lower production cost by producing in enormous quantities. However, things like this will not happen in reality. Customers' needs are different. They decide the products they need according to their economic conditions, hobbies, habits and other variables, which leads to great difficulty in controlling the production cost of the company. To tackle this problem, the factory modularized the product parts through the Topsolid system. The modularization of product parts means that the requirements of customers can be dynamically matched by the components that make up the product can be easily assembled and dissembled according to the different customers' needs. The way of individualized reorganization makes the customized production convenient and fast, with high service efficiency and low service cost.

(3) The third stage: C2F2C model

According to the attributes of customization and the definition of delivery, quality, cost and other factors, C2F2C model is incubated naturally. Although the model has been made, considering the problem of C2F at the beginning - to meet the customer's customization needs, but also to take into account the benefits of the factory, Fanqing's ERP system has emerged in this contradiction. In the C2F2C phase, Fanqing first sorts out the needs of all hotel projects, extracts commonality on the basis of customization and establishes system processes, such as management and execution system from contract to data generation. Next according to the commonality, the non-standard will be converted into a standard construction, and then the standard will be further converted into data. According to the database center, the information system will be constructed and finally the informatization will be implemented to optimize management.

Fanqing's C2F2C strategy is a combination of C2F and F2C, which not only reduces the

intermediate links of furniture products sales to customers, but also meets the personalized needs of contemporary consumers, and conforms to the trend of the times. C2F is centered on consumers' personalized needs. After the company produces such products, customers can customize and purchase their favorite products online on Yinxiang Space Decoration website. C2F can meet the different needs of different consumers for different commodities and the biggest advantage of F2C is to reduce the intermediate links. For consumers, they can buy the products with cheapest price, enjoy the most direct after-sale service, and learn about relevant information of the specific products. When proposing this strategy, Fanqing's takes the initiative to clarify who the company serves and consider how to solve customer problems in an outstanding way and how to establish and maintain customer relationships as well as how to enable customers and companies to efficiently co-create value. Finally, Fanqing should dig and attract the customers in the previous stage, and then directly use the complicated factory model to do production that meet the customers' needs and deliver the orders to the customers. For the hotel furniture products, Fanqing, as an integrated company of front-end sales, production and design, and back-end services, needs to meet the personalization customers' needs and transform these large-scale needs into standardized production in the factory. Finally, the final products will be sent to the consumers. This is the core idea of the C2F2C development strategy.

The C2F2C model (see Figure 5-7) can improve overall efficiency and shorten delivery time, but there are still some problems in terms of cost and efficiency. There are several problems in the furniture industry: customer demand is not convergent, so in the personalized customization, the product has a small amount, a large number of demands, which is in contradiction with mass production. How to achieve "duo kuai hao sheng" (multiple varieties, fast delivery, good quality, and low cost) is a problem that the company needs to solve.

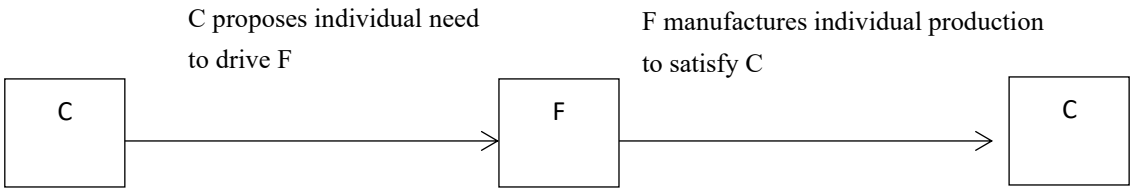


Figure 5-7 The C2F2C Model

Source: From indepth interview and documents of the company

In reality, there are few companies that can satisfy this requirement, and only a few of them have solved this problem well. Fanqing Hotel Furniture Company has been exploring the value innovation mode in recent years, and finally solved the contradiction between personalized customization and large-scale production from the backstage production and manufacturing through the change of technical methods. Its production capacity has increased more than five times, material utilization rate has increased from 70% to more than 90%, error rate has decreased to less than 1%, and delivery cycle has been shortened for more than 50%. As shown in Figure 5-8, Fanqing has designed standardized product manufacturing process, and introduced advanced simulation system in the process of sheet-breaking, which has realized intelligent manufacturing from theory to reality. Next, we excavate and analyze the value co-creation model of Fanqing, and then adopt it in the future development strategy.

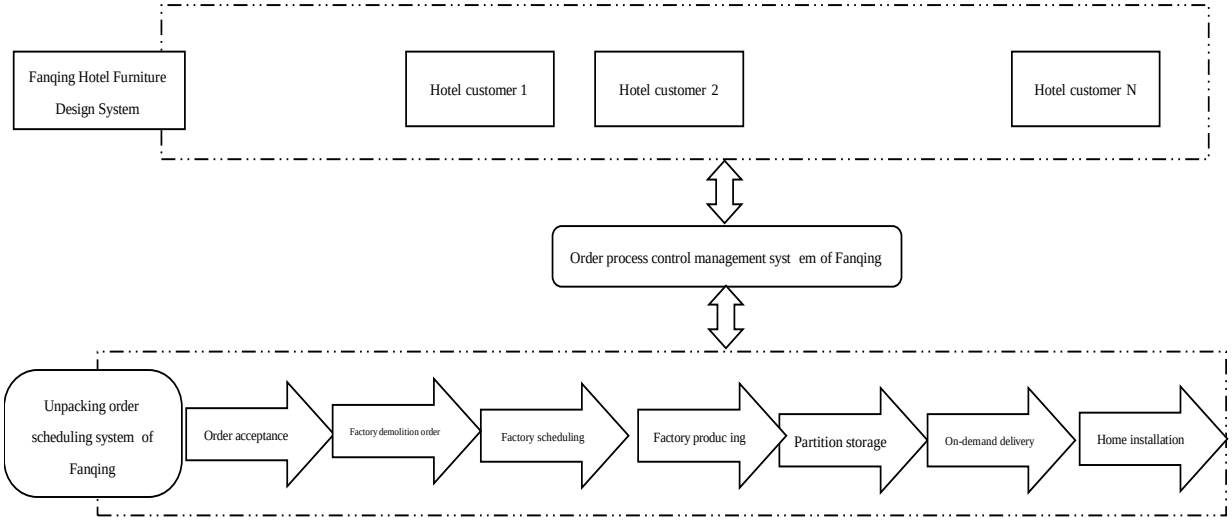


Figure 5-8 Fanqing Hotel Furniture Company Business Process

Source: From indepth interview and documents of the company

Fanqing Hotel Furniture Company has three core business systems in mass customization: furniture design system, process control management system and order dismantling production system. In the process of value co-creation and customized production, the most fundamental task is to carry out value analysis centering on the needs of customers, and regard the needs of consumers as its core task of production and operation activities. It has mainly undergone three stages of evolution:

The first stage is mainly the traditional phase of offline value creation. In the early stages of the phase, there is a “point interaction” between the design system and the consumer.

Companies can meet the small-scale customization of a single product, cultivate the core software design capabilities of companies. At the same time, companies can carry out flexible production according to their own production capacity, and the products customers need can be provided in the long term.

The second stage is the combination of online and offline value creation in the later stage. Customers can participate in the value creation of the company through various means, and realize “face-to-face interaction”, through which customers can have more sense of pleasure and respect and the company is able to adopt more personalized marketing methods to complete the overall product of the medium-scale customization. At the same time, the efficient synergy ability of companies is gradually formed.

The third stage is the value creation stage of comprehensive collaboration as shown in Figure 5-9, which is affected by information technology and changes in consumer demand. In order to meet the transition from medium-scale customization to large-scale customization, the company must make changes to analyze the whole value chain and integrate products.

Fanqing has gone through three stages from small-scale customization to mass customization, but with the expansion of customer demand, companies cannot expand large-scale production through customized production, which will inevitably lead to the increase of human resources and costs. In the hotel furniture industry, every customer has individualized product demand. Therefore, it is necessary to change the value creation mode and transform the customized production mode into the standardized production mode on the original basis.

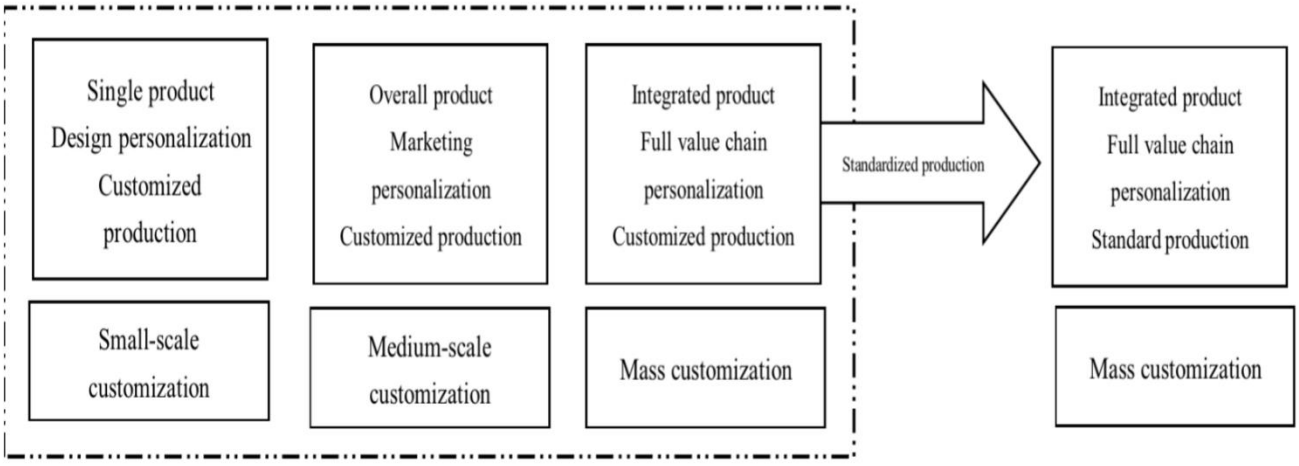


Figure 5-9 Three Stages from Small-scale Customization to Mass Customization

Source: From indepth interview and documents of the company

Fanqing's existing production business system and the operation process of value flow show that the transformation of non-standardized customized production into standardization mainly concentrates on three core business systems: furniture design system, process control management system and order dismantling production system disassembly single scheduling system. Intelligent manufacturing is realized by means of information technology, which combines design, process control and order dismantling process. And it is the development direction of future value creation of Fanqing and the core direction of Fanqing's future development strategy.

After the early information exploration of Fanqing, the company cooperated with Topsolid Company to develop a three-dimensional simulation modeling product based on hotel furniture company. It is a high-performance three-dimensional modeling, a simulation of production management scheme (geometric modeling, assembly, structural calculation, motion simulation). These powerful features, which meet the needs of producers, provide a digital solution for sketching, design and production. Fanqing can import the parameters of its hotel furniture products into the system, which can directly simulate the modeling, and output the relevant configuration of splitting orders, which can directly reduce the time cost and production cost in the production supply chain of companies and greatly improve customer satisfaction. Therefore, Fanqing puts forward the development strategy of C2F2C based on value creation, which enables customers to directly communicate with factories and then factories directly provide service for customers. The super model omits the supply chain management of each link in the middle, and directly meets the individual needs of customers. Through the simulation design, it realizes the standardized production of individual needs. In the hotel furniture market, there are fewer customers, more batches and changeable demand, which improve the production scale of Fanqing. Therefore, this model of value creation needs to be further studied and continuously improved in next five years and Fanqing's C2F2C development strategy of Fanqing can be constructed on this basis.

5.5 C2F2C value co-creation strategy of Fanqing Furniture Company

Based on the "Internet + Intelligent Manufacturing" two-way integration, the mass customization development strategy of C2F2C realized by value share is adopted by the company. Customer demands are directly sent to production plants and make unified production, and the channel cost and premium are removed. Such a super model is abbreviated as "C2F2C".

Fanqing's development strategy C2F2C is divided into two parts: C2F model and F2C model. C2F means Customer-to-Factory, and it has the advantages of short-chain supply, first place of consumption, accurate data and multi-functional services. However, how to use such a good mode to make a difference is a key point, we must also accurately establish and build the core competitiveness of C2F and solve the nodal problems affecting the landing operation, which are the two key issues to ensure the successful practice of C2F. F2C mode is short for Factory-to-customer, which refers to that the factory delivers the designed products to the consumers directly through the specific channel after they are manufactured by the factory. It reduces the cost created by intermediate links and retails, provides consumers with the most cost-effective products and maximizes the value of consumers. For the factory, reducing the intermediate links is equivalent to reducing the cost. On the other hand, the factory could better understand the consumer needs through directly communicating with consumers, which could produce relevant products according to consumers' demands to form a large-scale consumption pattern.

Fanqing's C2F2C strategy of is the integration of the C2F and F2C, which not only reduces the intermediate links of furniture products sales to customers, but also meets the personalized needs of contemporary consumers, and conforms to the trend of the times. C2F is centered on consumers' personalized needs. After the company produces such products, customers can customize and purchase their favorite products online on Yinxiang Space Decoration website. C2F can meet the different needs of different consumers for different commodities and the biggest advantage of F2C is to reduce the intermediate links. For consumers, they can buy the products with cheapest price, enjoy the most direct after-sale service, and learn about relevant information of the specific products. When proposing this strategy, Fanqing's takes the

initiative to clarify who the company serves and consider how to solve customer problems in an outstanding way and how to establish and maintain customer relationships as well as how to enable customers and companies to efficiently co-create value. Finally, Fanqing should dig and attract the customers in the previous stage, and then directly use the complicated factory model to do production that meet the customers' needs and deliver the orders to the customers. For the hotel furniture products, Fanqing, as an integrated company of front-end sales, production and design, and back-end services, needs to meet the personalization customers' needs and transform these large-scale needs into standardized production in the factory. Finally, the final products will be sent to the consumers. which not only reduces the intermediate link of furniture product sales to customers, but also meets the personalized needs of contemporary consumers, and conforms to the trend of the times, which is the core idea of C2F2C development strategy. The construction of C2F2C development strategy has three core objectives:

Firstly, we should change the value innovation mode with customers to create value together with customers: conceptually, we should build a zero-distance marketing concept between factories and users, at the same time, we should strengthen the cooperation among companies in the industry, and solve the difficulties between factories, channels and users, so as to gradually popularize this value innovation mode. We should change the form of industrial chain, develop new town industry aggregation, reduce the cost of production process, make every effort to standardize and carry out standardized and large-scale investment and production with various suppliers, and strictly control the process. This can improve the satisfaction of users, which is the basic premise for Fanqing’s development in the long run. Finally, the company change the marketing model, that is, the collocation of production and purchase in the process of value definition. That collocation contains two parts, one is created by companies themselves, the other is provided by business partners.

Secondly, the company should change the value creation mode between upstream and downstream, and realize the coordinated development of the whole supply chain. The future development direction of Fanqing is to strengthen the symbiotic relationship with other partners in the production process of hotel furniture integrated products and promote the common development of information. A value-creating platform should be built for front-end and back-

end supply chain companies, and the original policy-oriented aspects should be converted into other means that can be directly realized to partners. When a partner enjoys the benefits brought by the coordinated development of supply chain, he can directly transform the benefits of change to consumers, so consumers can buy the best products at the most reasonable price. In this way, a collaborative cycle of value creation model of the whole supply chain is formed, and ultimately a win-win situation is achieved.

Finally, an "innovation ecosystem" of Fanqing should be built: customers can fully connect with the factory, put forward their demand, and receive the products with high satisfaction. The core of this process lies in the fact that Fanqing, as a link, undertakes the communication between the front-end and the customers' needs, while the back-end coordinates and cooperates with the industrial chain, carries out technological innovation within the company, and finally meets the customer's needs. Therefore, the formation of such an innovative ecosystem is the third goal of Fanqing's development strategy.

Focusing on the above three objectives, this research puts forward the following four strategic directions: establishing the database of the whole process, improving the degree of informatization of the company, integrating core business processes to optimize company interests, strengthening the ability of technological innovation and improve the ability of personalized customization.

5.5.1 Establish matrix project management

As the products are featured by small production scale and quantities, diversified specifications, high production speed, high quality, and the production organization requires high quality, high production speed and efficiency, it is suggested to establish an appropriate organization department to design products, strictly monitor every work flow from production to outflow.

(1) Pitching matrix project management model. The current functional structure of Fanqing is coordinated among departments, and information between departments is not smooth enough, which hinders the smooth communication among departments, affecting the development of the organization. Matrix project management mode should be established to

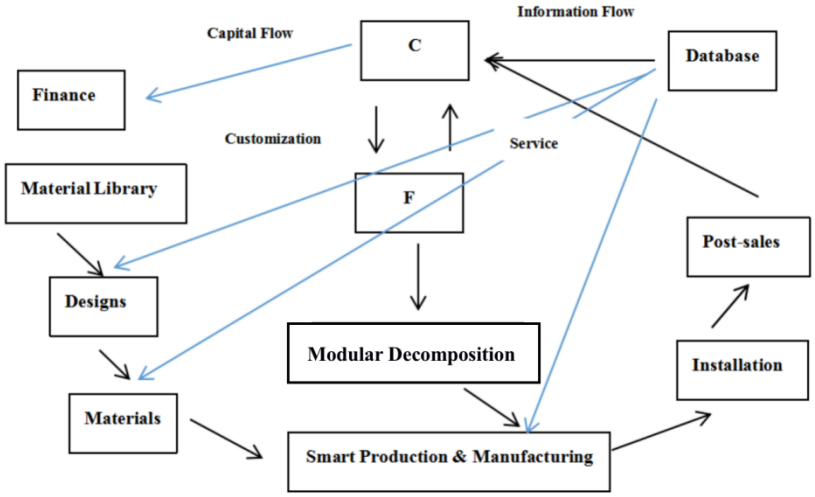
adapt to the development of new situation. Getting rid of the traditional centralized organization structure, delegating authority and increasing the opportunities for grassroots employees to participate in decision-make could establish a rapid response mechanism and greatly improve the efficiency of decision-making.

(2) Establishing a project team. According to the inner-operation situation and market changes, a special project team composed of various professionals from various departments is established. The project horizontal system and vertical leadership system form a matrix management. The main responsibilities of project matrix management point personnel are personnel organization, inter-professional coordination and control, major events initiative reporting and receiving department leaders to make good preparation of resources and countermeasure in advance. Project personnel focus on procedures, plans, performance tracking and results evaluation, implementing all-round control to form a more flexible and adaptable horizontal cooperation around departments.

(3) Specifying the operation. A product project team that is responsible for the product updating and supervises the whole process of the new product from the aspects of development, design, production, offering, contract management, and after-sale service will be established by manufacturing department. The project team can be composed of three specialists and includes some workshop department personnel when needed, including two specialists responsible for confirmation, development, design and customer docking service of new product, and one for production monitoring implementation, information delivery, contract management and service.

5.5.2 Integrate core processes for standardized production

Based on the internal & external competition faced by the company and market changes, Fanqing has reconstructed its core element processes, including the business process, the management process and the element process (as shown in Figure 5-10). New plans on these three business procedures are made according to the development process of C2F2C.



Note: F—factory; C—Consumer

Figure 5-10 Integrate Core Processes

Source: From indepth interview and documents of the company

The business process of Fanqing consists of material supply & storage, design, manufacturing, installation and post-sales. The process is client-oriented and is conducted according to the demands of installation clients. It ensures each link selects materials and designs products according to clients' demands. As the key to the whole process, factory converts such individualized demand into standardized large-scale, customized production. The key lies in modular sub-division, which breaks down a product into components and raw materials through the information flow provided by the database. Next, such information is transmitted to the smart manufacturing equipment and CNC equipment to eventually manufacture products through volume production. Afterwards, the information is given to the client as feedback through installation and after-sale to provide the client with products and relevant services. The client then leads capital flows to finance. Then, the company completes the cycle of the whole process and integrates the capital flow, information flow and physical flow.

The management process consists of designs, manufacturing, installation and the links essential to daily operation management, as well as the management and control operation of such links, including the organizational activities for the prediction, decision-making, planning and control processes. Optimizing the management process ensures the maximization the roles of human resources, which improves the accuracy of decision-making and the efficiency of

management activities.

The element process comprises the capital flow, information flow and physical flow of market-value companies. Each element is transmitted to several links in the C2F2C mode. These links process or affect various elements and change their properties to meet specific clients' demands. Hence the flows of these elements tend to be accompanied by relevant machine operation and equipment operation, such as the whole process from materials, production and installation to post-sales. The information flow runs through the whole process and serves clients through the constructed database.

Fanqing's development strategy in the future requires that Fanqing keeps optimizing these three elements to maximize the utilization rate of various elements in the operation mode of C2F2C and achieve scientific management and smart manufacturing.

5.5.3 Set up whole-process database

Fanqing improved its capacity of large-scale customized production by cooperating with Topsolid Company in research and developing information products, which substantially reduced the time and costs of non-standardized production process and converted it into the means of standardized production. One key technology lies in the construction of the database. The company cooperated with Topsolid Company and made a supporting resource plan for partial hotel furniture products and core manufacturing parameters. It is necessary for the company to enhance the construction of database, cooperate in constructing basic databases for more products and adapt to more smart manufacturing equipment. Only in this way can the company make fast adaptation to market changes and achieve high efficiency in the R&D, designing and manufacturing processes.

On the other hand, Fanqing, as a part of C2F2C, should construct CRM (Customer Relationship Management), which is a tool to manage customer relationship. It aims to cut sales costs, increase revenue, improve customer satisfaction, profitability and loyalty, and find new customers. This research mainly studies the management of contracts and customer information. It collects the data concerning stocks, product R&D designs and maintenance to meet the demands for fast R&D and designs. In addition, it ensures timely update and maintenance of

client resources and assists the front-desk department to conduct personalized sales through data. At the same time, the company makes efforts to promote the decomposition of modularity of intellectual manufacturing and the subdivision of technological process, and conduct orderly arrangement and optimization within the organization with the module as its core. It improves the production efficiency and lowers the difficulty of operation.

Due to the introduction of new manufacturing equipment and means into the production and manufacturing processes within the company, the company should continuously improve its information level, collect the data concerning the whole process from designing to production, manufacturing, installation and service. In addition, the company should excavate and analyze data to find the production mode that saves costs, improves customers' satisfaction, increases the production efficiency and lowers the rate of product errors. Only in this way can the company achieve sustainable development. CRM can achieve this result because it performs data backup of potential customers in the system, and then explores the target customers among these potential customers and follows on the contract reviewing and registering. After the completion of above activities, the customers' electronic receipt is uploaded to the ERP system. Therefore, in the whole process of Fanqing, CRM is equivalent to an auxiliary subsystem of the C2F2C strategy.

In the internal production and manufacturing process of the company, due to the introduction of new manufacturing equipment and methods, it is necessary to continuously improve the level of informationization, collect the entire process database from design, production, manufacturing, installation and service. Data are supposed to be deeply analyzed to find production modes that can save costs, increase customer satisfaction, improve production efficiency, and reduce product error rates, so that the company's sustainable development can be maintained.

5.5.4 Achieve lean production comprehensively

The fundamental reason for Fanqing's success in achieving large-scale customized production and implementing C2F2C value mode inside hotel furniture manufacturers lies in its breakthroughs in technological innovation capacity. Thanks to years of explorations, the

company realized smart production on Topsolid simulation software. It is still necessary that the company enhance its explorations into the capability for technological innovations. And the company's explorations are centered on the following four directions.

(1) Improve the capacity of personalized product design system

Design is a crucial link for a hotel furniture company. The most important thing before clients contact different suppliers is to perceive the product. In order to improve the design capacity of personalized product system, Fanqing needs to combine with the development trends of smart manufacturing and serve customers in a more transparent manner. For instance, the company should reform technological means to enable the customer to calculate the manufacturing cycle of a product scientifically and automatically during his participation in product design. In addition, the complete product chains should be combined with the automatic order dismantling, automatic calculation for the material plan and production plan, as well as the introduction of advanced CNC equipment technology via the design system. It enables the customer to see the whole product cycle in the design phase. It is necessary that Fanqing combines the design system and improves the technological ability of designing systems in the future to lay a foundation for scientific management and smart manufacturing.

(2) Improve the modular decomposition ability of the order dismantling system

Currently, Fanqing has achieved the ability of modular decomposition at an initial stage. This process, which includes artificial decomposition of CAD graph, arrangement of materials based on production and manufacturing experience and scheduling of the manufacturing plan and cycle, may occupy lots of human resources. It is undoubtedly a waste of resources and inefficient method. Based on the improvement of the current ability of modular decomposition and order separation, the company replaced past resources of over ten laborers and improved the work efficiency by about six times through computer simulation. It is thus necessary to enhance the technological ability in this regard. The primary strategic development of Fanqing lies in perfecting more databases for complex products, constructing an accurate database through historical data of product manufacturing and batching, introducing the system of modular decomposition and order separation and constructing an individualized large-scale production database for Fanqing. In addition, the company should continue to explore the new

order separations system and improve the calculation efficiency of the orders separation system. Meanwhile, the optimized data should be adjusted according to the data of practical operation to reduce the rate of errors in product manufacturing and form core competitiveness unique to Fanqing.

(3) Improve the professional ability of process control system

Thanks to the improvement of capabilities of the aforementioned designs and modular decomposition system, Fanqing has obtained the conditions for scientific manufacturing. However, more procedures need to be connected in the implementation process. It is thus necessary for the process control system to ensure the design and production plans are implemented in the ideal direction. Currently, some parts of Fanqing's process management & control system still need to be operated by artificial methods. It is necessary for Fanqing to integrate the practical experience of production and management, convert it into scientific management and promote the orderly and stable management of the process control system.

(4) Improve the capacity of coping with organizational reform

After a series of business process changes and information innovation, the internal organization and coordination of Fanqing company will inevitably change, especially after C2F2C super model is adopted, the structure of Fanqing company will become flatter. Hence the capacity of handing reforms within the organization needs improvement and the capacity of internal management and coordination needs effective support.

In particular, Fanqing achieved large-scale individualized customization by technological means, which substantially decreased links as the order-separation, scheduling and manufacturing plan and reduced the use of human resources. In addition, the company is shifting from artificial manufacturing management to digital production and it is developing toward smart manufacturing. Such reforms in technology inevitably lead to the key changes in management. It is necessary for the factory directors and managerial staff learn new scientific and technological means and conduct scientific production management through smart manufacturing. Therefore, the coordinated management within the organization needs to be developed and planned from the following aspects.

The aforementioned directions are key aspects for Fanqing to promote C2F2C

development strategies in the future. Through the breakthrough of the main core technical ability between personalized customization and personalized demand, Fanqing has developed integrated capacities to integrate customer attraction, customer transformation and customer service. In addition, Fanqing has applied the aforementioned technological advantages of production and manufacturing to serve the clients of hotel furniture manufacturers featured with a small order and numerous batches. This practice eliminates the bottlenecks of production for the company, reduces company costs and achieves smart manufacturing and scientific management.

5.6 Summary

This chapter takes Sichuan Fanfang Furniture Company as the research object and conducts the case study in this thesis. Firstly, it summarizes the development status of Fanqing. Then, it studies the innovation ecosystem and the C2F2C value co-creation development of the company based on the previous theoretical research. Finally, the C2F2C value co-creation model of Fanqing Furniture Company is analyzed from the four aspects.

This page is intentionally left blank.

Chapter 6: Implementation of Fanqing's C2F2C Value Co-creation Strategy

Fanqing has gone through a series of stages during the implementation process. After analyzing its own needs, Sichuan Fanqing Furniture Co., Ltd. builds ERP management system to meet the needs of its development and support its digital and information construction. With the information management of Fanqing's all furniture products as the core, the company aims to reinforce the whole process of front-end program design, real-time quotation, fast ordering, equipment data docking, production scheduling, bar code management, and intelligent three-dimensional warehouse management. After the completion of the information system in Fanqing Furniture Company, the company development needs will be met.

In order to realize its needs successfully, Fanqing introduced ERP management information system which has helped the company to achieve information management from customers to factories to customers. In this system, the whole process is divided into 9 subsystems: WeChat information management subsystem, production management subsystem, warehouse management subsystem, installation logistics after-sale management subsystem, financial management subsystem, design software interface, report management subsystem, procurement management subsystem, contract management subsystem. Although the company has promoted digitalization and has applied domestic and foreign software such as YFang, WCC, it can only produce BOOM single data and production files on the plate structure and cannot be used for large-scale structural data output for curved surfaces and arcs of hotel furniture under the requirements of mass customization, so that the TOPSOLID WOOD emerges as times requires.

Fanqing cooperated with Topsolid Group of France's Dassault Group. With Topsolid as the design core, Fanqing launched the design and manufacturing plan, built various types of hotel furniture production lines, and purchased the Italian Safran flexible spraying production line and the German HOMAG woodworking production line. It also introduced the 32mh

flexible production system from the Italian hotel furniture industry chain to optimize the multi-type traditional production line of the company into an intelligent one. With its high-quality design concept and the accumulation of the company's furniture industry for forty years, Fanqing has achieved a significant increase in customer satisfaction and a significant drop in company costs, making the company an unexpected winner with strong competitiveness in China's hotel furniture industry. In 2015, the sales revenue of Fanqing exceeded 300 million yuan. In 2016, Fanqing launched "Topsolid-ERP" comprehensive solution. Thanks to the cooperation with the Italian company and high-quality design concepts, Fanqing earned more than 250 million yuan of sales revenues in the second year. Fanqing launched "Mali" kitchen which costs millions of yuan in 2003, and this program symbolized China's ability of manufacturing internationally top-level cupboards. The company launched integrated solutions in 2005. It then introduced the construction techniques of Tellmach, a German home decoration technology of a top-level home decoration brand, which shortened 50 years' explorations for the company. In addition, the company cooperated with German Jonbau-Tell in launching authentic German construction. In addition, Fanqing invited Lino to design the world's first home decoration experience center, bringing the home decoration industry into the era of experience. Fanqing set up 50 outlets in Beijing and other outlets throughout over 200 cities in China, at the same time, Fanqing energetically expanded its international market. It set up the Department of International Business that manufactures the products whose design and quality are similar to those of high-end Italian brands at lower costs. Fanqing made 600 million yuan of sales revenues in 2018, making it the champion of domestic integrated furniture, and that owes to the value co-creation model that it has been following.

6.1 Network interaction extension value co-creation model

As mentioned above, the value creation model of network interaction extension includes customer information flow, production data flow and capital flow. In this paper, capital flow is not the focus of our discussion. In the implementation of C2F2C, C will be the focus of this study.

6.1.1 Set up customer attraction platform via internet

Companies always formulate strategies based on what customers need, and that includes both products and services. Among them, the establishment and maintenance of customer relationship is a very important part. So Fanqing holds the view that it is necessary to build a customer attraction platform through the internet before cooperating with Topsolid, a French Dassault group. The purpose is mainly to make the target market pay as much attention to the enterprise as possible, and to let them recognize the brand concept. The company spares no efforts in the promotion stage of winning customers. Specifically, it aims at increasing the browsing volume of official websites, the attention rate of service numbers, and the arrival rate of experience halls. This important link has also been designed into the company's ERP system - Wechat information management subsystem, which targets at constructing network nodes between a company and clients and setting up a platform for the company to create a marketing window for bilateral interaction. There are two core functions: notifications push management and order progress tracking. The details are as below.

(1) Notifications push management

The notifications push function is mainly to let customers learn the company. This function is a combination of online and offline. Online function includes the company's official website, online flagship store, and the company's official Weibo; offline function represents experience store, which allow customers to have more experience of the company's products.

An official website is the most solemn online image of a company. It is primarily in charge of online promotion, communication products, company image, sales and post-sales. The image should be friendly and specially-designed as the website is supposed to leave a good first impression on consumers. A part of Fanqing's client groups consist of medium-to-high-level clients. Hence the design interface should be different from other competitors and reflect a distinctive style of its own. Fanqing's official website seeks to accentuate characteristics such as modern design, friendly interface and 3D display.

Fanqing also set up flagship stores online, however, these stores do not sell furniture and they just aim at promotion through popular platforms, such as JD.com and Tmall.com. The

primary designs of these stores match those of the official website.

In addition, the Fanqing's official Weibo account (Chinese Twitter) is followed by over 220,000 fans. It could publish furniture knowledge, furniture designs and the promotion of marketing activities. Meanwhile, it could release promotion videos and news conference. Fanqing could launch new products and play product promotion videos on its official Weibo account as well. In general, the Weibo platform can be used as a company's publicity channel. In this aspect, Lei Jun, MIUI's CEO, sets an example. With a large number of his Weibo followers, his updating of MIUI's new events always attracts a lot of attention. Therefore, in the future, Fanqing Company can launch new products and product publicity on its official Weibo, and can also cooperate with some well-known bloggers on Weibo for proper promotion. When it is necessary, Fanqing could make comments and re-forward the Weibo of some real-time news or publish relevant topics to reflect Fanqing's distinctive and outstanding quality.

The furniture experience gallery is used for a furniture company to display furniture samples and the effect of home decoration designs offline. It can be set up by releasing the site, constructing the venue and cooperating with developers. The store enables customers to experience the brand image and product effect, which stimulates their desires for purchasing and making orders. Fanqing's offline furniture gallery is still in the layout. According to the condition of current furniture galleries, the following ideas can be adopted by Fanqing to construct a furniture gallery.

1) Display several typical design styles and the design performances of products;

2) Display the resumes of senior technicians and designers: Post some masterpieces of them on walls, making clients satisfied and relieved.

3) Enrich each design with certain connotation: Meet clients' emotional imagination and package products (Assisted by the connotation, even the same design will be more splendid).

4) Scenario description for product recommendation: What the client is purchasing may not be a type of furniture, but a longing for a lifestyle. If there are some scenarios added to the product recommendation, it is more likely to stimulate the customers' desires to purchase.

5) High-level café in the store for customers to rest: This idea is enlightened by IKEA.

IKEA constructs catering and children's entertainment facilities near experience stores. So can Fanqing. For instance, Fanqing can also build a resting area like café to make it convenient for clients to sign contracts, select furniture and rest. It offers clients the superb experience that matches with their status.

(2) Order progress tracking

The order progress tracking contains customer tracking and staff tracking. In this part, Fanqing mainly implements the order tracking function through its internal APP, official WeChat account and sales center. First, company employees will use the company app to connect front-end and back-end and management activities in order to achieve more efficient employee management, business training and background control. It can also be connected with the company's data to achieve order tracking. Secondly, through the official WeChat account, the company implements data-based management of user behavior, one-to-one consulting services and promotion services, notifications push on time (distribution of valuable information to target customers), customer order progress inquiry, after-sale feedback. It could also send holiday and birthday wishes and has some other functions. WeChat is actually a channel for companies to communicate with customers. The company can promote related products, and customers can feedback the use of products. But it is categorized in the order tracking module because the huge number of WeChat users, making it a very important tracking tool. This is just a query channel online. The company has a dedicated sales center as well. The sales center works on promotion, business sales and provides after-sale service. Sales center will regularly formulate company improvement and customer plans. Therefore, customers can also go to the sales center to check orders.

In addition to the above efforts on customer attraction and customer satisfaction, it is also needed to manage the customers. The company has its own customer management system. The customer management system consists of three parts: first, based on the behavior of the customer, different marketing plans are developed; second, customer information and product progress reminders are managed; third, after-sale problems are integrated and analyzed at intervals to extract the reasons of satisfaction and dissatisfaction for optimization.

6.1.2 Fully meet clients' demands based on database

After the company has attracted customers, it should transfer the customer flows to the real buyers. Learning customers' needs is a very important stage. To achieve this goal, the company first needs to learn the customer, classifies the customer, and then expands the market. In this process, it is necessary for the company to make full use of CRM system.

(1) Learn and classify clients

High-end clients are potential clients who have high requirements on design techniques, and have a high credit level and a strong payment capacity. As cream on the cake, these clients are of a small number but valuable. The advantages of high-end clients reflect in the following aspects: insensitivity towards the price, which ensures high profits based on high quality and advanced techniques; a wide range of human resources, which is favorable for driving the business with other high-end clients working in office buildings and other companies. As long as these clients are satisfied, they are easy with the transaction process. On the other hand, high-end clients face the following challenges: high requirements on designs and techniques; lack of energy of going through transition process (which means some trivial matters are handed over to other persons). All competitors are well-aware of the Pareto Principle and are all moving towards the high-end market if conditions permit. Generally speaking, high-end clients represent the following core characteristics: trusting in foreign brands and feeling good about themselves.

The development of mainstream clients refers to developing popular clients, whose concepts of values, social background and economic conditions naturally differ from those of high-end clients. Hence Homekoo's marketing strategies for the medium-to-low-end market cannot be applied by Fanqing. Conversely, luxury brands, financial institutions, high-end housing property, luxury automobiles and high-end clubs' exploration on high-end clients is worthy of Fanqing's consideration and can help it to find the suitable means of marketing.

(2) Find clients

Measures can be taken to find out whether the company can reach cooperation with golf courses, high-end clubs, luxury clubs, villa districts, VIP lounge at airports, sales centers of

overseas property, sales representatives of reputed vehicle and wrist watch brands, representatives of financial products, training of aristocratic schools, conference salesmen, consultation companies, company business meetings and EMBA study classes. For instance, if the company undertakes work of furniture decoration for one place, it could receive promotional support in return. It is necessary to search for promotional support from these places and fields to form brand influences.

The potential customers can be found not only in the aforementioned sites. It is necessary that the company do not neglect the salesmen of the above sites, who know better about their clients in the respective domain. These clients may introduce Fanqing to their clients through a casual word.

(3) Understand customers' needs

This stage is divided into three phases: preparation before contact, understanding of customers' needs, and satisfaction of customers' needs.

Preparation before making contacts: Improving business personnel’s qualities (knowledge on furniture + company product + concepts of values + personal image); cultivating common hobbies (high cultural literacy, profound knowledge connotations and participation in various elegant activities); having high service awareness (change the means and skills of sales based on clients’ demands and hobbies); collecting customer’s background before negotiation (it is better to know about their hobbies and styles).

When relevant personnel communicate with customers, they are supposed to understand their needs and record accordingly. Since the customer spends time on learning about products, they certainly have a demand for the product, so such a client can be classified as a potential customer. At this point, the sales personnel are required to make a rough judgment on the customer’s preferences through the chat, and then introduce appropriate product to the customer depending on their preference. However, many customers are now skeptical about personnel’s recommendations, so it is needed to find common ground by trying to figure out through their talks. In short, the company should try to understand customers' needs as much as possible. On top of these, it must find ways to meet the customers' needs.

Fanqing introduced the Customer Management System (CRM). The system consists of

three parts: firstly, it develops different marketing plan based on customers' behavior before customers choosing the brand; secondly, it manages customer information and production progress reminder; thirdly, it analyzes the after-sale problems at different intervals, and extracts the reasons for satisfaction and dissatisfaction for later optimization. The specific process is to firstly register potential customers, including customer basic information, communication time, pre-ordered products, communication time, key points of transactions and other information. Among these customers, the company should then search for customers who have the intention to cooperate, and register the customer's basic information, communication information, and gauge information. This is followed by a very important step in controlling the customers' needs: the project manager registers the first draft and the key points of the customer contract and uploads the electronic document, which is used to for general manager to review. After the contract register completed, the system automatically sends a message to the general manager for review, and then automatically sends the review result message to the project manager. If the contract review is passed, the project manager can sign the contract with the customer according to the preliminary draft information; otherwise, the review information will be negotiated with the customer and the contract will be revised and re-planned. The contract review information will be modified in the system. When the customer places an order, the company will assign the designer to the customer through the ERP system. In this process, the customer can communicate with the designer and ask the designer to provide the solution first. The designer could negotiate with the customer to make changes, which could meet the customers' needs while achieving value co-creation.

6.2 Modular decomposition value co-creation model

A very significant value co-creation model for Fanqing is C2F2C. According to the three principles of modularity mentioned above: strengthening the management of stakeholders, clarifying the rights and responsibilities, and emphasizing the refinement function. In the specific implementation process, Fanqing will decompose model to achieve the goal of intensive, standardized, informationized production and enhancement value co-creation of consumer satisfaction. Modular decomposition is mainly embodied in intelligent manufacturing. Fanqing is divided into 9 departments and 12 functional modules according to different

functions. Each part performs its duties to achieve delicacy management. From the beginning of contact with customers to the order processing and after sales, Fanqing has carried out modular decomposition. It includes CRM management, order management, procurement management, financial management, production management. Under this ERP system, there are many subsystems such as Wechat subsystem, Contract/Order subsystem, Report Management subsystem and Design Software Interface subsystem, which are used to realize related functions of the system. Fanqing Furniture Company put production technology, drawings, BOM data, customer information, contract review data into the corresponding system, which is an important process of this ERP system. Fanqing uses 12 functional modules, from receiving orders to production and after sales, the whole process will pass through the company's ERP system. Fanqing's production factory is like a smart factory, which achieves advanced and systematic management through information system and realizes large-scale production with minimum labor. In this process, the coding information mentioned above is particularly important. By identifying each coding on the component, the component can be managed in series from material consumption, production, sorting, logistics and installation to ensure the coordination between personalized customization and mass production. There are seven main system processes: CRM management, order management, purchasing and warehousing management, raw material outgoing management, production planning management, production process management and production logistics management. Each process has its corresponding principal department with the unified responsibilities and powers.

The company has relevant APP to manage employees and uses CRM system to manage customer relationship. In the CRM management process, CRM system collects data of spare materials, product development and design, and maintenance among different customers, which can ensure the needs of rapid development and design, and also update and maintain customer resource in time. It can assist the front-end department to personalize sales via data analysis. At the same time, the modular decomposition of intelligent manufacturing and the subdivision of process flow are pushed. Taken the model as the core part, the orderly scheduling and optimization of the internal organization are conducted to improve the production efficiency and reduce the operation difficulty. The first two principles of modularization are achieved. For functional subdivision, Fanqing also designs product manufacturing and customer interaction on the basis of basic departments functional subdivision. It mainly comprises two aspects: refined scheme design and personalized customized production.

However, as mentioned earlier, BOOM single data and production files are generated on

board structure, which cannot output structured data of large-scale curved surface, arc surface and various shapes of hotel furniture under the mass customization demand. So the TOPSOLID WOOD is generated.

TOPSOLID WOOD is the only fully integrated CAD/CAM digital solution tailored for woodworking industry. It is based on parasolid kernel for accurate modeling. Its research, development and application are indispensable parts of refinement. It can even be said that TOPSOLID makes it possible for Fanqing to truly realize the value co-creation of modular decomposition. The application is mainly divided into four steps:

(1) Basic data preparation

In TopSolid system, the basic data mainly includes material data, workshop process and process route. Material data is an Excel form which contains material code, material name, color and other data from ERP. With this Excel form, material database with the same information can be established in TopSolid and MES systems. Workshop process is to sort out and establish a workshop process table including process code and price calculation rules, to provide data support for the process route of parts and components in TopSolid, and to provide data for the MES price statistics. The process route is to set the process route for each component according to the workshop process schedule. In TopSolid modeling, the process route is defined into the model so that it covers such data derived from BOM and then imports it into MES system for production management.

(2) Modeling data preparation

Modeling data preparation mainly includes five contents: form template, drawing template, material texture database, cutter library and line library. Data transmission among TopSolid, MES and ERP is through electronic forms, so it is necessary to confirm the format and content of form template in the modeling preparation stage to facilitate data docking later. At this stage, the ERP docking form is the form exported to the ERP system after TopSolid disassembles the form, which is used for purchasing materials; the electronic saw cutting form is exported to the electronic saw for optimizing the cutting materials, but also the source of information about the label content; and the production form is the form used by the workshop department. Drawing template mainly includes construction drawings and component drawings, which are used for site installation sketches and scanned drawings in workshop production. Material texture database is about the name, coding, texture and profile of material. This part guarantees the accuracy of data when docking ERP system and the standardization and recognizability of drawings. In the process of furniture manufacturing, the cutter library establishes the cutter

coding rules with high recognition, which is easy to be adopted when modeling. Meanwhile, it is used for MES cutter management as well. In TopSolid system, a custom cutter is created for modeling design. Line library establishes line coding rules with high recognition, which is easy to be adopted when modeling and improves the degree of standardization.

(3) Modeling specifications

Modeling specifications mainly include product information definition, material data definition, edge information, veneer splicing information, processing rules, processing information definition, and other attribute information.

(4) Data storage structure

Data storage structure includes storage level and storage content. There are four storage levels, which are established for better management and query. Storage content is usually in the folder of the product number, including model file (.top), BOM file (.xls), drawing file (.dft), program file. In order to ensure the neatness and orderliness of the files in product folder, the following ways can be used:

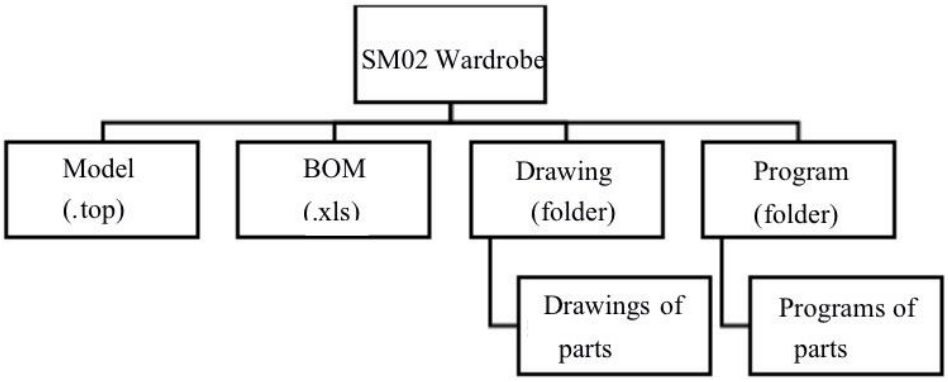


Figure 6-1 Storage Content Structure

Through the above step-by-step decomposition in Figure 6-1, Topsolid can customize the corresponding complete solution from integration to processing according to the customers' needs. Intelligent digital solution promotes the interaction between designers and production engineers, which could avoid computing errors to a large extent and save a lot of time. At the same time, Topsolid's CAD/CAM integration interface is also an advantage of the software. It can be directly used from design to processing without intermediate format conversion. It can be seen from its decomposition steps that it is complementary to ERP and the exported data can be imported directly according to the limited format. Fanqing has invested a lot in modular decomposition and intelligent manufacturing, and the function can meet the customers' needs

and achieve customer satisfaction, while the factory has also achieved cost control and sustainable development.

6.3 Resource integration sharing value co-creation model

The resource integration sharing value co-creation model is embodied in three aspects: First, point-to-point integration. It is the first-level, least-difficult resource sharing, with high purpose, accuracy, and satisfaction, which collects innovative resources to match specific service needs. The second is multi-point integration. This integration has the characteristics of complementary resources. According to the needs of innovative subjects such as hotel furniture manufacturers, higher education institutions and scientific research institutions, it integrates multi-level and multi-type innovation resources to improve the synergy among innovation entities in the hotel furniture company's innovation ecosystem to create benefits together. The third is network symbiotic integration. This integration focuses on value increment and network innovation. Relying on digital intelligent technology, this type of integration aims at actively exploring the innovation needs of users, deepening the innovative resources development, systematically integrating and sharing innovative resources and achieving interactive symbiosis of hotel furniture company innovation ecosystem among various network nodes.

Informatization refers to production management through coding information. The intelligence of Fanqing is reflected in the transformation from man-directed machine to machine-directed machine. In this respect, Guangzhou's Shangpin Home Furniture Company is ahead of the curve of intelligence. Its operator only needs to input the command into the computer and then the machine will quickly and accurately complete a series of operation, such as drawing, cutting, drilling and spraying, which improves production efficiency and reduces the error rate.

6.3.1 Customers' involvement in the design

(1) Precision design

A furniture company improves and produces a large number of data in the operation process, including product design solutions, product information, product data, management

data, client information and the information of house types. Data can be linked and managed fast through big data technology and cloud computing. In addition, the data of all links can be applied to guiding the operation of other links to make it more efficient. For instance, the database of design solutions includes the data of house types for common properties in Southwest China and the data of varied design solutions. A client can browse the design effect automatically produced by inputting the information of relevant properties. After the client makes detailed adjustments and changes, the database immediately produces a really individualized furniture design plan. Besides, the backstage production end will produce production data according to the plan solution once the client determines his demands and places an order at the design end. It then sends instructions for the procurement of raw materials, production costs and production materials to ensure linkage and fast response of the whole company chain.

In addition, the company system produces valuable information for the referential design database according to the client's individuality, profession, characteristics and the final design solution. It helps to launch a desirable solution to new clients for the next time. The whole process is characterized with automation, intelligence, precision, high efficiency and controllability.

Fanqing attaches importance to the construction of company databases. It constructed three databases that achieve linkage and automatically allocate the optimal solution. It is favorable for improving efficiency, promotes the whole consumption process and promotes new consumption.

The three databases are the design solution database, the product database and the database of client information. Firstly, the design solution database should include a large number of high-quality design plans, which are summarized and concluded by style, space and house type. These design solutions are made by top-level designers. In addition, top-level designers from home and abroad are invited to make a series of design plans for common house types. The solution database displays the design prototypes and references with the highest quality in the fastest manner. Furniture items and space (such as kitchen, living room and cloakroom) modules are essential to the database. A new design can be achieved by reorganizing modules, so it helps to meet a client's special demands. Design costs can be lowered through a high-quality solution database in subsequent operation.

Secondly, the product database collects the information of products produced by the company. Such product information should include the picture materials and word materials.

Word material comprises product techniques, materials, product modules and the concepts of product designs. For one thing, it helps to know the client. For another, the database helps the company to achieve informational and standardized management of the whole system.

The third is the database of client information. On the one hand, the database includes clients' information. On the other hand, it includes the information of real clients (clients who make transactions or are making transactions). Such information should cover all categories as complete as possible, including fundamental information (such as the house type) and preference information. Constructing the database not only contributes to knowing clients' demands in advance and producing products with higher client satisfaction, but also helps to maintain client relations.

When the company constructs a certain number of databases and develops a strong capacity of data excavation, company marketing will be more efficient to both the client and the company. The company no longer needs to drive consumption through a large amount of human resources, capital and labor. In addition, it costs less for consumers to seek the best "supplier" and the best experience. This is the means that best meets the development needs of the times.

(2) Individualized and Customized Production

Individualized customization and scale effect can be coordinated through flexible production. Customization means manufacturing according to the division of production rules and small-scale production. It also exists in the individualized customization of traditional furniture manufacturers and generally makes independent production according to different needs. The independent production of independent products is only suitable for companies with a limited number of orders.

Scale production means the unification of production rules and large-scale production. It is suitable for large-scale factories to manufacture the same products. Individualized customization and scale effect are at opposite ends, yet are unlikely to be entirely different. It is necessary to divide the common features into detailed sub-modules. The more sub-modules there are, the better the production efficiency and costs can be optimized. And that is the connotation of flexible production. It perfectly solves the contradiction between individualized customization and large-scale production.

Fanqing abides by the following procedures when establishing flexible production chains: (1) Taking orders. The order information of each sub-system is automatically summarized and

handed to the general order management system after the client determines the design solution and signs the contract; (2) Spliting the order. Each order is divided into the sub-order with varied specifications according to the principles of preliminary setting and generates the unique encoding information for production to make it convenient for subsequent tracking and processing. (3) Arranging for production: The production plan for each order should be arranged according to the principle of efficiency maximization; (4) Plant production: The plant starts production activities according to procedures and the plan for production scheduling; (5) plant installation: The encoding information of each component is identified and the components from the same order will be gathered together; (6) Packing for delivery: In the whole production process, products are not manufactured according to every single order, but produced by components. This production means of combination—division—recombination substantially improves production effectiveness.

6.3.2 Upstream and downstream supply chain

For the furniture industry, especially the hotel furniture industry that implements the C2F2C strategy, the downstream always should be attached importance to, that is, to improve customer satisfaction.

Different from the after-sale service link of traditional manufacturing industry, Fanqing's after-sale service does not start with delivering products to the customer's home, but the whole after-sale phase after the client places an order. after-sale service system includes work order management, service quality management and maintenance management.

Order management: Fanqing's after-sale service starts when the client places an order. Firstly, the client's information and data of the order are created on various channels, including text message, WeChat and enterprise APP. Order verification and task decomposition processing are carried out by the Fanqing Furniture Production Management Information Platform, and the work order information is split and processed to obtain corresponding data. The data will be received by the corresponding procurement, production, finance, logistics and other departments. The inventory status of the warehouse will then decide whether to purchase. If the procurement is to be made, the order is placed according to the existing supplier data of the system. The logistics department track materials according to the procurement plan, meanwhile, the information is passed to the production department by the system, and the production department arranges production according to the material information to maximally save human and time resources. On the grounds of the production plan, the warehouse

management system will carry out the stocking and delivery plan. All customer order information, raw material procurement, and sales and delivery information will be sent to finance department. Throughout the process, staff from various departments can view the duration of each phase, the content of their duties, and quickly deal with related issues. The visualization of information among departments is realized via a system, and resource sharing is achieved to realize intelligent and systematic production. The client then grasps order schedule in a real time manner through WeChat and APP.

Service quality management: Fanqing conducts SLA time effectiveness control. SLA is the abbreviation of Service-Level Agreement, which means the agreement at the service level. The SLA rules should be defined effectively and include the commitment of providing clients with the time needed by different nodes. The rules guarantee service quality and improve client satisfaction. Fanqing also applies Automatic business processing. Automation rules are flexibly configured according to a company's different business demands to save the time of labor and improve the service efficiency. Procedural monitoring of work orders is also conducted. The operation and status in different time periods from an order's beginning to ending are clearly recorded, allowing working personnel to clearly know the whole process of service processing.

Maintenance management: Fanqing keeps maintaining for furniture products for a fixed period after they are delivered to the client. (1) The company telephones the client to inquire about their using feelings after products have been delivered for one month; (2) Courtesy reception activities are held regularly and clients are invited for participation; Fanqing's client resources are at an even level, which makes the activity appealing. The after-sale service of the company is directly related to the customer's satisfaction and praises for the brand. A good post-sale service can create word-of-mouth and be converted into the productivity for the next deal. It is a key link for increasing benefits.

Consumers have very high requirements for after-sale service of furniture manufacturers. There are two main reasons: First, the furniture is expensive durable goods with long service life, which is frequently used; second, lots of furniture is often customized according to the space where they are placed, and need to be installed and repaired by professionals instead of customer selves. A client undergoes several procedures in the Fanqing's after-sale process, including waiting for production after placing an order, door-to-door installation and post-phase maintenance. These procedures happen in the phase of client operation. A client's satisfaction is achieved through favorable client experience (see as below).

1) Waiting

The company should accomplish the product delivery within a standard period of time stipulated by the contract, excluding overdue cases caused by force majeure and factors related to the client. The client may have the same worries as those of common furniture demanders, such as when they can use the furniture and how the quality of the furniture is. Referring to Fanqing's practice, clients' orders can be displayed along with the process through WeChat service account, just as the update of logistics information, to achieve a totally transparent process. In addition, a channel can be created for the client to have bilateral communications with the company in this process to solve clients' doubts in a real-time manner.

2) Installation

The period of installation is an important date for delivery products. It is another node for workers to offer door-to-door services and have close contacts with the client. Core nodes are listed as follows:

A. Transparent installation: Live-streaming monitoring is provided in this process to make the whole furniture production process well-documented and make the company capable of handle varied possible emergencies.

B. Cleaning keeping after installation: After the installation is completed, an externally hired cleaning-keeping company or self-constructed team will be sent to clean the client's house and get rid of the intervention from construction wastes to leave a good impression on customers.

C. Automatic detection: If the conditions permit, the detection of harmful elements, such as formaldehyde, can be implemented and the detection report shall be eventually delivered to the customer. It provides clients with safety and health guarantee through data. Meanwhile, it also avoids unnecessarily conflicts in this aspect.

D. Exquisite letters or Wechat messages and mails: After installation is completed, a letter, which includes product information, company introduction, maintenance news, after-sale channels and wonderful greetings, would be handed to the client. The letter should be exquisite and designed, which aims to create a professional and friendly service atmosphere and enable client to make subsequent consultation and recommendation conveniently.

3) Maintenance

At this stage, the furniture has been used for a period of time. The client has deep understanding and knowledge of the functions and forms of the product. No one can guarantee products are 100% satisfactory to the client. According to research findings, clients are more

loyal than common clients, if their complaints receive satisfactory treatment. It is necessary that the company control the last link in face of possible dissatisfaction and doubts.

A. Integrate the service system: The tasks of the order management system cannot be discontinued after products are delivered to the client, because of the need to cope with possible feedback from the client anytime and anywhere. The client should make feedback on WeChat, through telephone or at the store according to the current situation. It is thus necessary for the company to integrate these communication entrances and avoid the embarrassments of making the client repeat or wait during the communications through different channels at different time periods.

B. Form knowledge strategies: Strategies are formed to unify the statement and give precise and sincere answers to clients. The company should make unified regulations and deployment for the list of common questions and automatic services and enable every customer server to have access to the list of knowledge. It guarantees the consistency and accuracy of answering doubts for the company. A good knowledge process is the core factor for excellent services.

C. On-time professional return visit: To maintain product performances, it is of vital importance to keep good relations with clients. The company should arrange a return visit within a given time after the transition to test the condition of the product and eliminate potential safety dangers.

4) Reflections

The experience of serving every customer is valuable. The company can abstract the following information from completed orders: analyze specific clients' demands—enrich the database of design solutions; customers' opinions and information—improve company services; other information abstracted by the customer—optimize company procedures. The company attaches importance to analyzing the underlying reasons to make continuous iteration and optimization whether clients are satisfied or not.

A. Integrate post-sales: The company has diversified channels of communications, including its WeChat service account, official website, the period of reflection, telephone calls and offline outlets. It is thus necessary for the company to regularly integrate the after sales of each channel. In addition, the company should pay attention to recording clients' feedback and consultation in a real-time manner. First, there should be a comprehensively display on what problems are more frequently reflected and what deficiencies there are; second, standardized

answers should be formed to the problems most frequently asked by clients, and the interface should be optimized and updated in time.

B. Agility analysis: It is necessary to cultivate working qualities of customer service staff. Apart from the basic qualities of answering customers' doubts in time, customer service staff should be capable of making agility analysis and fast reactions to customers' negative feedback. It is needed to answer the client's questions and make records and analysis at the same time.

C. Immediate reactions: The first action made after discovering a problem is a common challenge faced by traditional companies. It is a dynamic reaction process and tends to follow the path of discovery – recording – analysis – optimization - action. For one thing, the company should make up for dissatisfied customers, sincerely inform customers of the optimization made by the company and thank for their valuable opinions. For another, the company should accurately transmit the demands for improvement to relevant departments in time, so as to improve the next customer's experience.

6.4 Difficulties in the strategy implementation

Due to the application of new technologies, the company needs to make certain adjustments. The adjustment of the general organizational structure will involve personnel changes, which will lead to the redistribution and adjustment of rights, status and interests, thus involving the interests of every member in the company. For example, if Fanqing introduces an ERP system, it may incur laid-off employees and work redistribution. Perhaps parts of employees are unwilling to move to positions that they are not familiar with. Therefore, the change could break their sense of identity with work and generate a certain degree of anxiety and insecurity. At the same time, the standardization of business processes is also a goal of change, however some people may have inertia ideas and are not willing to change.

6.5 Summary

This chapter focuses on the implementation of the C2F2C strategy in Sichuan Fanqing Hotel Furniture Co., Ltd. Based on the above value co-creation model, it analyzes three aspects: network interaction extension, modular decomposition and resource integration. The

implementation of the C2F2C strategy in Fanqing Furniture Company is clearly expounded in this chapter from three aspects.

Chapter 7: Conclusion

7.1 Research conclusion

For studying and improving the innovation ecosystem and promoting further development of the study of hotel furniture manufacturers, this thesis, targeted on personalized and dispersed requirements of customers, seeks to realize low cost and high efficiency of mass production, meet the personalized needs of customers, and solve the existing network operational mode's problem of "High cost of C2F model, and low customer satisfaction of F2C model". It conceived the C2F2C development strategy of creating value between hotel furniture manufacturers and customers based on Fanqing Hotel Furniture Company's over three years' practical experience of solving the contradiction between individualized demand and mass customization.

This strategy has made it possible for Fanqing to achieve lean management, meet needs of customers, improve customer satisfaction and reduce cost of companies. It has realized win-win value between companies and customers, and explored an effective way to improve technological innovation ability and international competitiveness of hotel furniture manufacturers in China. Its primary theories and practical conclusions are demonstrated as below.

(1) This thesis summarizes the contents related to the innovation ecosystem of hotel furniture manufacturers and analyzes the relations between hotel furniture manufacturers' innovative ecology community and process. It then studies the external and internal innovative ecological environment of hotel furniture manufacturers, the value innovation mode and value flows in hotel furniture manufacturers. Afterwards, it analyzes the value co-creation operation modes of three types of hotel furniture manufacturers and cites Homekoo as a typical case of studying small-scale company home furniture manufacturers. Hence the research findings have comparatively high values of theoretical reference.

(2) The theory of value co-creation has been taken into strategic development system by an increasing number of fields and companies. Although many companies have accumulated rich practical experience in value co-creation, few studies conduct professional analysis and discussions about the traditional furniture manufacturing industry. This research cites Fanqing's example to conduct a case study. It starts with analyzing the business process nodes of furniture manufacturing industry from the perspective of transition and studies about the launch, implementation and results of value co-creation. It is hoped that the research findings of this thesis can provide referential values for the strategic transition and value co-creation solution of furniture manufacturers.

(3) Interviews and questionnaires were conducted with 25 hotel furniture manufacturers. Based on that, the core influence factors for the innovation ecosystem of hotel furniture manufacturers are concluded. In addition, these key factors are analyzed through literature review and mathematical models. On this basis, influence factors are then combined with the operation mode of value co-creation through summarization and deep research. It puts forward a new value co-creation mode for hotel furniture manufacturers and lays a theoretical foundation for the development strategies suitable to current environment.

(4) Fanqing constructs the C2F2C development strategy based on value co-creation and its over three years' practical experience. This strategy aims to solve the problems in current network operation mode: high costs in the C2F mode and low customers' satisfaction in the F2C mode. This research excavates the current innovation and operation modes of Fanqing based on the key factors of aforementioned value co-operation. It then builds a matrix mode for project management, and has achieved intensive production and standardized techniques to win over and serve clients by informational means. Apart from achieving smart manufacturing, it has also managed the quality and delivery dates of products by precise production means. Based on meeting customers' individualized demands, it has also enhanced customers' satisfaction, substantially reduced the production costs for the company, achieved win-win cooperation between the company and customers and realized the value co-creation of C and F through ecosystem innovation.

7.2 Research limitations and suggestions

The development of scientific technology and the improvement of people's living standards provide consumers with diversified products choices. It also brings companies diversified modes of channels and complex business management decisions. Although this research demonstrates the practice of value co-creation from the perspective of furniture company, it only studies some notable problems, and there might be some potential factors that have been neglected. It has the following limitations:

(1) This research studies Fanqing and obtains the theoretical results of the value co-creation of furniture manufacturers through development of Fanqing. Each furniture company faces a distinctive internal and external environment in the implementation process. It is thus necessary to select an appropriate means of transition based on the real conditions. In addition, case study is added in the next step to make the conclusions drawn by the comparative analysis of cases more adaptable.

(2) In terms of the case study, Fangqing's transition practice is in the later stage of exploration, so it is hard to collect data for comparison, ending up with no specific data for strengthening relevant points. Hence a traceable research direction can be continuously focusing on Fanqing's development and making complementary research.

(3) The direction of C2F2C development strategy put forward by this research is only related to Fanqing's years of explorations and development. The capacity of integrating industrial knowledge and information is essential to operate and manage the C2F2C mode. Hence there are high thresholds for relevant competitors. Enterprises carrying out this strategy must have higher comprehensive strength and risk control ability, which brings limitations to the research in this field.

This page is intentionally left blank.

Bibliography

Aarikka-Stenroos, L. & Jaakkola, E. (2012). Value co-creation in knowledge intensive business services, a dyadic perspective on the joint problem-solving process. *Industrial Marketing Management*, 41 (1), 15-26.

Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*, 84 (4), 98-107.

Adner, R. & Kapoor, R. (2010a). The future of competition: Co-creating unique value with customers. *Research-Technology Management*, 47 (3), 62.

Adner, R. & Kapoor, R. (2010b). Value creation in innovation ecosystems, how the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal*, 31 (3), 306-333.

Adner, R. & Kapoor, R. (2016). Innovation ecosystems and the pace of substitution, re−examining technologies−curves. *Strategic Management Journal*, 37 (4), 625-648.

Agrawal, A. K. & Rahman, Z. (2015). Roles and resource contributions of customers in value co-creation. *International Strategic Management Review*, 3 (1-2), 144-160.

Andonova, V. (2006). Mobile phones, the internet and the institutional environment. *Telecommunications Policy*, 30 (1), 29-45.

Annabelle, G. & Michael, A. C. (2014). Industry platforms and ecosystem innovation. *Journal of Product Innovation Management*, 31 (3), 417-433.

Arnould, E. J. (2008). Service-dominant logic and resource theory. *Journal of the Academy of Marketing Science*, 36 (1), 21-24.

Asheim, B., Coenen, L., & Henning, M. (2003). *Nordic SMEs and Regional Innovation Systems*. Oslo: Nordisk Industrifond.

Asheim, B. & Coenen, L. (2005). Knowledge bases and regional innovation systems: Comparing nordic clusters. *Research Policy*, 34 (8), 1173-1190.

Barron, D. N. (2001). Organizational ecology and industrial economics. *Industrial and Company Change*, 10 (2), 541-548.

Becker, G. S. (1965). A theory of the allocation of time. *The Economic Journal*, 75 (299), 493-517.

Bolton, R. & Saxena-Iyer, S. (2009). Interactive services, a framework, synthesis and research directions. *Journal of Interactive Marketing*, 23 (1), 91-104.

Buesa, M., Heijs, J., Pellitero, M. M., & Baumert, T. (2006). Regional systems of innovation and the knowledge production function, the spanish case. *Technovation*, 26 (4), 463–472.

Chang, P. L. & Shih, H. Y. (2004). The innovation systems of Taiwan and China, a comparative analysis. *Technovation*, 24 (7), 529-539.

Chen, K. & Kenney, M. (2007). Universities/Research institutes and regional innovation systems, the cases of Beijing and Shenzhen. *World Development*, 35 (6), 1056–1074.

Chung, S. (2002). Building a national innovation system through regional innovation systems. *Technovation*, 22 (8), 485-491.

Cleff, T. & Rennings, K. (2000). *Determinants of Environmental Product and Process Innovation—Evidence from the Mannheim Innovation Panel and a Follow-Up Telephone Survey*. Heidelberg: Physica-Verlag.

Council on Competitiveness. (2004). *Innovate America: Thriving in a World of Challenge and Change*. Washington, D. C.: Council on Competitiveness.

Cao, J. D., Peng, F. Y., & He, T. T. (2008). Research on ecological evaluation index system of national innovation strategy. *Science and Technology Progress and Countermeasures*, 25 (5), 114-116.

Doloreux, D. (2002). What we should know about regional systems of innovation. *Technology in Society*, 24 (3), 243-263.

Estrin, J. (2008). Closing the innovation gap, reigniting the spark of creativity in a global economy. *Business Horizons*, 52 (5), 513-514.

Etgar, M. (2008). A descriptive model of the consumer co-production process. *Journal of the Academy of Marketing Science*, 36 (1), 97-108.

Fan, A. J. & Liu, Y. Y. (2006). Quantitative analysis of the influencing factors of technological innovation in China's high-tech industry. *Economic and Management Research*, (10), 58-62.

Fang, E. (2008). Customer participation and the trade-off between new product innovativeness and speed to market. *Journal of Marketing*, 72 (4), 90-104.

Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan*. Wellington: Printer Publishers.

Fukuda, K. & Watanabe, C. (2008). Japanese and us perspectives on the national innovation ecosystem. *Technology in Society*, 30 (1), 49-63.

Füller, J., Katja, H., & Faullant, R. (2011). Why co-creation experience matters? Creative experience and its impact on the quantity and quality of creative contributions. *R & D Management*, 41 (3), 259-273.

Furman, J. L., Porter, M. E., & Stern, S. (2002). The determinants of national innovative capacity. *Research Policy*, 31 (6), 899-933.

Gael, P., Thomas, D., Michel, D., Marie-Beno, T. M., Pierre, S. J., & Olivier, T. (2018). The plurality of values in sustainable agriculture models: Diverse lock-in and coevolution patterns. *Ecology and Society*, 23 (1), 21-34.

Gao, M. (2004). Empirical analysis of the influencing factors of technological innovation in the electronics industry. *Economic Latitude and Longitude*, (1), 75-78.

Geoffrey, B., Joyce, T., & James, M. (2018). Evolution of business models in regenerative medicine, effects of a disruptive innovation on the innovation ecosystem. *Clinical Therapeutics*, 40 (7), 1084-1094.

Gong, H. & Nie, R. (2002). Construction principles, organizational structure and promoting measures of regional innovation system. *Soft Science*, 16 (6), 22-25.

Grönroos, C. (2008a). Service logic revisited, who creates value and who co−creates. *European Business Review*, 20 (4), 298-314.

Grönroos, C. (2008b). Adopting a service business logic in relational business-to-business marketing: Value creation, interaction and joint value co-creation. *Industrial Marketing Management*, 40 (2), 240-247.

Grönroos, C. (2009). Marketing as promise management: Regaining customer management for marketing. *Journal of Business & Industrial Marketing*, 24 (5/6), 351-359.

Guo, L. (2009). Research on industrial ecological innovation based on path dependence model. *Science and Technology Management Research*, (5), 216-218.

He, T. T. & Zeng, D. M. (2008). Theoretical framework and operational mechanism of knowledge innovation ecosystem. *Journal of Information*, 27 (6), 23-25.

Heidenreich, M. (2005). The renewal of regional capabilities, experimental regionalism in Germany. *Research Policy*, 34 (5), 739-757.

Heinonen, K., Strandvik, T., Mickelsson, K., Edvardsson, B., & Sundstr, M. E. (2010). A customer-dominant logic of service. *Journal of Service Management*, 21 (4), 531-548.

Hemmert, M. (2004). The influence of institutional factors on the technology acquisition performance of high-tech firms: Survey results from Germany and Japan. *Research Policy*, 33 (6-7), 0-1039.

Henisz, W. J. (2010). The institutional environment for economic growth. *Economics & Politics*, 12 (1), 1-31.

Hippel, E. V. (2001). Perspective: User tool kits for innovation. *Journal of Product Innovation Management*, 18 (4), 247-257.

Holbrook, A. & Wolfe, D. (2002). *Knowledge, Clusters and Regional Innovation, Economic Development in Canad*. Kingston, Ontario: Queen's School of Policy Studies.

Hu, S. H., Huang, L., & Du, D. B. (2016). Practice of constructing a global science and technology innovation center—Analysis based on the triple helix and innovation ecosystem perspective: A case study of Silicon Valley. *Shanghai Economic Research*, (3), 21-28.

Huang, L. C., Zhang, S. Q., & Wang, J. W. (2007). A new perspective on management, an ecological analysis of health evaluation research in high-tech zones. *Science and Management of Science and Technology*, 28 (3), 5-9.

Huang, L. C. (2000). Discussion on the research content of regional innovation system. *Scientific Research Management*, 21 (2), 43-48.

Huang, L. C. (2003a). Characteristics of regional technology innovation ecosystem. *China Science and Technology Forum*, (1), 23-26.

Huang, L. C. (2003b). Research on regional technology innovation system, thinking of ecology. *Science Research*, 21 (2), 215-219.

Huang, L. C. (2004). Innovative community and its characteristics. *Scientific Management Research*, 22 (4), 4-6.

Huang, L. C. (2008). Research on the health assessment of regional technology innovation ecosystem. *Science & Technology Progress and Policy*, 25 (8), 146-149.

Huang, L. C. & Zhang, H. C. (2006). Analysis of the evolution of technological innovation population in the communication equipment manufacturing industry based on ecology. *Chinese Management Science*, 5 (5), 143-148.

Hwang, V. & Mabogunje, A. (2013). The new economics of innovation ecosystems. *Stanford Social Innovation Review*, 8 (6), 123-125.

Iansiti, M. & Levien, R. (2004). Strategy as ecology. *Harvard Business Review*, 82 (3), 68-78.

Intarakumnerd, P. (2011). National innovation system in less successful developing countries: The case of Thailand. *Research Policy*, 31 (8), 1445-1457.

Kashan, A. J. & Mohannak, K. (2017). The role of knowledge integration in capability development and emergence of innovation ecosystem. *International Journal of Innovation & Technology Management*, 14 (5), 15.

Kim, W. C. & Mauborgne, R. (2005a). Value innovation: A leap into the blue ocean. *Journal of Business Strategy*, 26 (4), 22-28.

Kim, W. C. & Mauborgne, R. (2005b). Blue ocean strategy: From theory to practice. California Management Review, 47 (3), 105-121.

Kim, W. C. & Mauborgne, R. (2014). Blue ocean leadership. *Harvard Business Review*, 5, 60-72.

Lambert, D. M. & Enz, M. G. (2012). Managing and measuring value co-creation in business-to-business relationships. *Journal of Marketing Management*, 28 (13-14), 1588-1625.

Lee, J. D. & Park, C. (2006). Research and development linkages in a national innovation system, factors affecting success and failure in Korea. *Technovation*, 26 (9), 1045-1054.

Levine, S. H. (1999). Products and ecological model. *Journal of Industrial Ecology*, 3 (2-3), 47-63.

Li, C. Y. & Liu, L. J. (2007). Production mechanism and structure model of industrial innovation system. *Science and Science and Technology Management*, 28 (1), 50-55.

Li, W. (2014). Innovation 3.0 and innovation ecosystem. *Science Research*, 32 (12), 1761-1770.

Li, X. (2009). China's regional innovation capacity in transition, an empirical approach. *Research Policy*, 38 (2), 338-357.

Li, X. J. & Zhan, Y. F. (2010). Innovative ecosystem—A new idea of innovation management. J*ournal of University of Electronic Science and Technology of China*, 10 (1), 45-48.

Li, Y. R. (2009). The technological roadmap of cisco's business ecosystem. *Technovation*, 29 (5), 379-386.

Liu, X., White, S., Baark, E., Mowery, D., & Wu, G. (2001). Comparing innovation systems: A framework and application to China's transitional context. *Research Policy*, 30 (7), 1091-1114.

Liu, Y. J. (2004). *Cluster-based Innovation of Small and Medium-sized Companies*. Beijing: China Industrial Economics Press.

Liu, Y. J. & Luo, F. Y. (2004). Behavioral ecology research on enterprise technology innovation cluster behavior—Proposal and conception of an analysis framework. *China Soft Science*, (1), 68-72.

Liu, Y. J. & Yi, Q. P. (2005). Regional technology innovation ecological economic system disorder and its approach to balance. *Systems Engineering*, 23 (10), 97-101.

Liu, Y. J. & Yi, Q. P. (2006). Agglomeration behavior of innovation units in clusters from the perspective of behavioral ecology. *System Engineering*, 24 (9), 38-42.

Luan, Y. Y. (2015). The transnational innovation ecosystem of high-tech enterprises: Structure, formation and characteristics. *The Theory and Practice of Finance and Economics*, 28 (149), 113-116.

Lundvall, B. A. (1992). *National Innovation Systems, towards a Theory of Innovation and Interactive Learning*. London: Pinter.

Luo, Y. F. & Guo, C. Y. (2009). Application of robust principal component analysis in performance evaluation of regional technology innovation ecosystem. *Statistics and Information Forum*, 24 (5), 36-41.

Luo, Y. F. & Zhang, Y. (2008). The evolution of the life cycle of Olympic science and technology clusters and its impact on regional innovation systems. *Industrial Technology and Economy*, 27 (3), 29-32.

Lusch, R. F. & Vargo, S. L. (2006). *The Service Dominant Logic of Marketing: Dialog, Debate and Direction*. Armonk: Routledge.

Lusch, R. F. & Vargo, S. L. (2011). Service-dominant logic: A necessary step, *European Journal of Marketing*, 45(7/8), 1298-1309.

Lyons, P. & Brennan, L. (2019). Assessing value from business-to-business services relationships, temporality, tangibility, temperament, and trade-offs. *Journal of Service Research*, 22 (1), 27-43.

Mack, P. & Rogers, E. M. (1985). Diffusion of innovations. *Technology and Culture*, 26 (1), 109.

Madhavaram, S. & Hunt, S. D. (2008). The service-dominant logic and a hierarchy of operant resources, developing masterful operant resources and implications for marketing strategy. *Journal of the Academy of Marketing Science*, 36 (1), 67-82.

Malerba, F. (2002). Sectoral systems of innovation and production. *Research Policy*, (31), 247-264.

Malerba, F. (2003). Sectoral systems and innovation and technology policy. *Revista Brasileria de Inovação*, 27 (4), 49-67.

Malerba, F. (2005). Sectoral systems of innovation, a framework for linking innovation to the knowledge base, structure and dynamics of sectors' economics of innovation and new technology. *Journal of Services Marketing*, 21 (3), 19-27.

Massis, A. D., Audretsch, D., Uhlaner, L., & Kammerlander, N. (2017). Innovation with limited resources, management lessons from the German Mittelstand. *Journal of Product Innovation Management*, 35 (1), 125-146.

Melton, H. & Hartline, M. D. (2015). Customer and employee co-creation of radical service innovations. *Journal of Services Marketing*, 29 (2), 112-123.

Mercan, B. & Goktas, D. (2011). Components of innovation ecosystems, a cross-country study. *International Research Journal of Finance and Economics*, 76, 102-112.

Miao, H. & Huang, L. C. (2007). A preliminary study on the health evaluation of regional technology innovation ecosystem. *Science and Technology Management Research*, 27 (11), 101-103.

Miao, H. & Huang, L. C. (2008). Research on regional technology innovation ecosystem health assessment. *Science and Technology Progress and Countermeasures*, 25 (8), 146-149.

Mitra, J. (2005). Regional innovation policy for small−medium companies. *Journal of Small Business & Company Development*, 12 (1), 140-144.

Nagaoka, S., Kondo, M., Flamm, K., & Wessner, C. (Eds.). (2009). *21st century innovation systems for Japan and the United States: Lessons from a decade of change: Report of a symposium*. Washington, D.C.: The National Academies Press.

Narula, R. (2002). Innovation systems and 'inertia' in r & d location, Norwegian companies and the role of systemic lock-in. *Research Policy*, 31 (5), 795-816.

Nasierowski, W. & Arcelus, F. J. (2003). On the efficiency of national innovation systems. *Socio-Economic Planning Sciences*, 37 (3), 215-234.

Nelson, R. (1993). *National System of Innovation, a Comparative Study*. New York: Oxford University Press.

The Organization for Economic Cooperation and Development. (1996). *The Knowledge Based Economy*. Paris: OECD Publications.

Padmore, T., Schuetze, H., & Gibson, H. (2004). Modeling systems of innovation, an company-centered view. *Research Policy*, 26 (6), 605-624.

Padmore, T. & Gibson, H. (1998). Modeling systems of innovation: A framework for industrial cluster analysis in regions. *Research Policy*, 26 (6), 625-641.

Papaioannou, T., Wield, D., & Chataway, J. (2009). Knowledge ecologies and ecosystems? A empirically grounded reflection on recent developments in innovation system theory. *Environment and Planning C: Government and Policy*, 27 (2), 319-339.

Paredes, M., Barrutia, J., & Echebarria, C. (2014). Resources for value co-creation in e-commerce, a review. *Electronic Commerce Research*, 14 (2), 111-136.

Pavitt, K. (1996). National policies for technical change: Where are the increasing returns to economic research. *Proceedings of the National Academy of Sciences of the United States of America*, 93, 12693-12700.

Pavitt, K. (1998). The social shaping of the national science base. *Research Policy*, 27, 793-805.

Payne, A. F., Storbacka, K., & Frow, P. (2008). Managing the co-creation of value. *Journal of the Academy of Marketing Science*, 36 (1), 83-96.

Piller, F. T. (2006). Toolkits for idea competitions: A novel method to integrate users in new product development. *R & D Management*, 36 (3), 307-318.

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: Free press.

Prahalad, C. K. & Ramaswamy, V. (2010). Co-creation experiences, the next practice in value creation. *Journal of Interactive Marketing*, 18 (3), 5-14.

Prahalad, C. K. (2004). The future of competition, co-creating unique value with customers. *Research-Technology Management*, 47 (3), 62-62.

Ramaswamy, V. & Ozcan, K. (2018). What is co-creation? An interactional creation framework and its implications for value creation. *Journal of Business Research*, 84 (3), 196-205.

Rogers, E. (1995). *Diffusion of Innovations*. New York: Free Press.

Romer, P. M. (1999). Increasing returns and long-run growth. *Journal of Political Economy*, 94 (5), 1002-1037.

Rosenbaum, M. S. & Massiah, C. A. (2007). When customers receive support from other customers, exploring the influence of intercustomer social support on customer voluntary performance. *Journal of Service Research*, 9 (3), 257-270.

Rostow, W. W. (1959). The stages of economic growth. *The Economic History Review (New Series)*, 12 (1), 1-16.

Schumpeter, J. A. (1934). *The Theory of Economic Development, an Inquiry into Profits, Capital, Credit, Interest and the Business Cycl*e. London: Oxford University Press.

Seppo, K., Haapasalo, H., & Tolonen, A. (2018). Cost-efficient co-creation of knowledge intensive business services. *Service Business*, 12 (4), 779-808.

Simanis, E. & Hart, S. (2009). Innovation from the inside out. *Mit Sloan Management Review*, 50 (4), 77-86.

Spohrer, J. & Maglio, P. P. (2008). The emergence of service science, toward systematic service innovations to accelerate co-creation of value. *Production & Operations Management*, 17 (3), 238-246.

Sternberg, R. (2010). Innovation internets and regional development—Evidence from the European Regional Innovation Survey (ERIS). *European Planning Study*, 2010 (8), 389-407.

Sun, B. & Lin, T. T. (2011). A review of systematic research on technological innovation. *Scientific Management Research*, 29 (2), 16-20.

Tansley, A. (1947). The early history of modern plant ecology in Britain. *Journal of Ecology*, (35), 130-137.

Thomke, S. & Hippel, E. (2002). Customers as innovators, a new way to create value. *Harvard Business Review*, 80 (4), 74-81.

Tidd, J. & Bessant, J. (2018). Innovation management challenges: From fads to fundamentals. *International Journal of Innovation Management*, 22(5), 1840007-1-1840007-13.

Todtling, F. & Kaufmann, A. (2001). The role of the region for innovation activities of SMEs. *European Urban Reg Study*, 8 (3), 203–215.

Vallaster, C. & Sylvia, V. W. (2018). Brand strategy co-creation in a nonprofit context, a strategy-as-practice approach. *Nonprofit and Voluntary Sector Quarterly*, 47 (5), 984-1006.

Vargo, S. L. & Lusch. R. F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68 (1), 1-17.

Venkat, R. & Francis, G. (2010). Build the co-creative company. *Harvard Business Review*, 88 (10), 100-109.

Viotti, E. B. (2012). National learning systems, a new approach on technological change in late industrializing economies and evidence from the cases of Brazil and South Korea. *Technological Forecasting & Social Change*, 69 (7), 653-680.

Wang, F. S. & Jiang, W. (2005). Some thoughts on China's industrial technology innovation capabilities. *Commercial Research*, (1), 85-87.

Wang, W. J. (2000). Strengthening the protection of intellectual property rights and promoting the construction of national innovation systems. *Science and Technology Progress and Countermeasures*, 17 (7), 122-123.

West, J. & Iansiti, M. (2004). Experience, experimentation, and the accumulation of knowledge: The evolution of r & d in the semiconductor industry. *Research Policy*, 32 (5), 809-825.

Wolfe, D. (2003). *Clusters Old and New, the Transition to a Knowledge Economy in Canada's Regions*. Kingston, Ontario: Queen's School of Policy Studies.

Wu, L. (2006). Innovation management mode of enterprises. *Science and Technology Economic Market*, (12), 174.

Wu, W. (2006). *On the nonlinear mechanism of company technology innovation system*. Doctoral Thesis, Dalian University of Technology.

Wu, W. Z. & Chen, Q. J. (2012). The future development of customer participation research under the co-creation value model. *Modern Management Science*, (4), 18-20.

Wu, Y. J., Lv, X. B., & Tian, X. F. (2014). Construction of evaluation index system for innovation ability of high-tech zone: Based on the analysis of Wuhan Donghu high-tech zone. *Library and Information Guide*, 24 (24), 140-142.

Xiao, T. (2006) Innovation is a complex ecosystem. *East China Science and Technology*, (6), 48-49.

Yu, Y. & Sun, H. M. (2010). Research on the efficiency evaluation method of industrial innovation system based on dea analysis method. *Science and Technology Management Research*, 30 (2), 53-55.

Zhang, H., Gordon, S., Buhalis, D., & Ding, X. (2017). Experience value cocreation on destination online platforms. *Journal of Travel Research*, 57 (8), 1093-1107.

Zhang, L. F. (2009). Research on the operation mechanism of high-tech company innovation ecosystem. *China Science and Technology Forum*, (4), 57-61.

Zhang, T. C., Jahromi, M. F., & Kizildag, M. (2018). Value co-creation in a sharing economy: The end of price wars. *International Journal of Hospitality Management*, 71 (4), 51-58.

Zhang, Y. S. & Zheng, H. (2009). Research on risk assessment of innovation ecosystem of high-tech enterprises. *China Science and Technology Forum*, (4), 57-61.

Zhang, Y. S. (2008a). Analysis of the boundary and structure of the innovation ecosystem of high-tech companies. *Soft Science*, 22 (11), 95-98.

Zhang, Y. S. (2008b). Research on risk identification and control of innovation ecosystem in high-tech companies. *Journal of Finance and Economics*, 29 (3), 113-116.

Zhang, Z. H. (2003). *Research on industrial innovation system for "China Optics Valley"*. Doctoral Thesis, Wuhan University of Technology.

Zhang, Z. H., Hu, S. H., Jin, X., & Xie, Z. Q. (2006). Construction and analysis of industrial innovation system model. *Scientific Research Management*, 27 (2), 36-39.

Zhou, Q. & Chen, C. X. (2008). An empirical study on the suitability of regional technology innovation ecosystem in China. *Science Research*, 26 (1), 242-247.

Zhuang, W. M. & Gong Y. J. (2005). *Industrial Technology Innovation.* Shanghai: Oriental Publishing Center.

Zhao, J., Liu, X. L., Sun, H. Y., & Ma, X. M. (2015), Production mechanism and structure model of industrial innovation system. *Science and Science and Technology Management*, (1), 18-27.

Zwass, V. (2010). Co-Creation, toward a taxonomy and an integrated research perspective. *International Journal of Electronic Commerce*, 15 (1), 11-48.

This page is intentionally left blank

Webliography

Courvisanos, J. (2003, September 17). *Innovation for Regional Communities: A Research Framework*. Retrieved September 7, 2019, from http://researchonline.federation.edu.au/vital/access/HandleResolver/1959.17/42376

Langeard, E., Bateson, J., Lovelock, C. H., & Eiglier, P. (1981). *Services Marketing: New Insights from Consumers and Managers*. Retrieved September 25, 2019, from https://trove.nla.gov.au/work/26034403?q&versionId=31367169

Luo, Z. J. (2019, January 9). *2018 China Upscale Newly-opened Hotel Statistic Report*. Retrieved May 20, 2019, from https://mp.weixin.qq.com/s/EeKvgYLiibGtY1FG34gyyg

Thom, N. & Rohrbeck, R. (2009, December 6). *Technology Foresight in the ICT Sector—Exploration of New Business Opportunities*. Retrieved September 7, 2019, from https://www.researchgate.net/publication/236897747_Technology_Foresight_in_the_ICT_sector_-_Exploration_of_new_business_opportunities

This page is intentionally left blank.

Appendix

1 Research questionnaire on the value co-creation of hotel furniture industry

Respectable leaders: Greetings! This questionnaire is designed to study the influence factors focused by hotel furniture manufacturers. Please fill out this questionnaire according to the conditions of your company. Your answers are crucial to our work. Thanks for your energetic support and cooperation!

Part 1: Basic information about yourself

The information will be used for classified statistics and will not affect you personally. Please fill in the information correctly.

1. Sex: male □ female □
2. Age:
3. Department:
4. Position:
5. How long have you been working in the company? ____ year(s) ____ month(s)
6. How long have you been working in this industry? ____ year(s) ____ month(s)

Part 2: Basic information about your company

1. Company name:
2. Establishing time: ____ (year) ____ (month)
3. Location: ____ (nation) ____ (province) ____ (city)
4. Major business area:
5. Company Type: State-owned company □ Private-owned company □ Foreign-funded □ company □ Joint venture □ Collective company
6. Sales of the Company:

Less than 10 □ million □ 10-30 million □ 30-50 million □ Over 50 million

7. Number of employees:

Less than 10 ☐ persons ☐ 10-50 persons ☐ 50-100 persons

100-500 ☐ persons 500- ☐ 1000 persons More ☐ than 1000 persons

8. Forms of cooperation:

☐ Consulting ☐ Practice base ☐ Merger and acquisition ☐ Training ☐ Outsourcing

☐ Cooperative Other ____

Part 3: Innovation ecosystem

Please choose the number that best reflects your attitude based on the actual situation

1=Strongly Disagree 2=Disagree 3=Normal 4=Agree 5=Strongly Agree

	Strongly Disagree	Disagree	Normal	Agree	Strongly Agree
1. The government has corresponding policies to support company innovation.	1	2	3	4	5
2. The government builds platforms for company innovation.	1	2	3	4	5
3. The company works closely with research institutions.	1	2	3	4	5
4. The research institutions have beneficial research results for the company.	1	2	3	4	5
5. The company cooperates closely with colleges and universities.	1	2	3	4	5

	Strongly Disagree	Disagree	Normal	Agree	Strongly Agree
6. Colleges and universities have beneficial research results for the company.	1	2	3	4	5
7. Suppliers have made great technological changes.	1	2	3	4	5
8. Technological change of suppliers promotes company innovation.	1	2	3	4	5
9. Complementary companies have made great technological changes.	1	2	3	4	5
10. Technological change of complementary companies promotes company Innovation.	1	2	3	4	5
11. The development of information technology industry promotes the innovation of the company.	1	2	3	4	5
12. The company accommodates and accepts a variety of different opinions and encourages open thinking.	1	2	3	4	5
13. The company has a good cultural atmosphere of innovation.	1	2	3	4	5
14. The company carries out patent layout in the industry.	1	2	3	4	5

	Strongly Disagree	Disagree	Normal	Agree	Strongly Agree
15. Hardware facilities in the company promote innovation.	1	2	3	4	5
16. Software systems (such as ERP, MIS systems, etc.) in the company promote innovation.	1	2	3	4	5
17. The company pays attention to the introduction of talents.	1	2	3	4	5
18. The company trains its employees in new knowledge and skills.	1	2	3	4	5
19. The company system has been standardized.	1	2	3	4	5
20. Standardization of company system promotes innovation.	1	2	3	4	5
21. The information transmission between the various departments of the company is rapid and accurate.	1	2	3	4	5
22. Communication between suppliers and the company is rapid and effective.	1	2	3	4	5
23. The company provides channels for customers to exchange information.	1	2	3	4	5

	Strongly Disagree	Disagree	Normal	Agree	Strongly Agree
24. Customers are willing to respond their using experience and personalized needs to the company.	1	2	3	4	5

2 Outline of interview with hotel furniture manufacturers

The interview was conducted with Chengdu's hotel furniture manufacturers centered on value co-creation. It aims to find out related information of Chengdu's hotel furniture manufacturers in the operation process, including interest allocation, assessment of cooperative partners, building of the sense of trust, means of monitoring, management mechanism, status of the research group, cooperation universities and companies, the assistance provided by the government, the quality of service platforms and the attitudes of third-party cooperation. Particularly, with Fanqing Hotel Furniture Company as the case study subject, senior managers and department directors of Fanqing were interviewed from March 2017 to May 2019 for ten times with 1.5-2 hours each time.

1. Could you please talk about your understanding of the development of Chengdu's hotel furniture industry?

2. What roles does the government play in the development process of Chengdu's hotel furniture industry? What assistance is provided?

3. What aspects are primarily considered by an company for selecting cooperative partners? What are the contents and means of company assessment?

4. What is the company's ability of sustainable development in the operation process? What is the profiting mode? How are profits allocated in company cooperation?

5. What universities are cooperating with the company? What roles do they play in university cooperation? What is the primary direction of cooperation? Does an company have its intellectual property rights?

6. Does an company have its own research team? What is the annual ratio of investment spending to research?

7. How does an company maximize its values? What are the factors that increase company values?

8. What is an company's attitude towards cooperating with investment companies? What is the difficulty in cooperation?

9. What are the requirements on the service platform? How is the professionalism and quality of the service platform? What are the problems met in the process of using the platform?

10. What interest-related subjects does the company involve in?

11. How does the company think about value co-operation? How does it understand value co-creation and its experience in value co-operation?

12. What mechanisms have been built by the company in the operation process? What aspects are these mechanisms related to?