

# Developing Circular Business Models in Chinese Furniture Industry

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## **Abstract**

Chinese furniture industry is facing serious problem of limited virgin resources, environmental pollution and has an overall low profit rate. Implementing the circular economy in the industry is necessary and will contribute to its economically sustainable growth. Exploring and understanding these limited business models and conditions under which resource efficiency can be enabled and secured, especially the interrelations between barriers hindering the implementation and dissemination of circular business models, is needed. The research on the exploration and understanding of the implementation in reality could serve as a foundation to develop and refine the applied circular business models and then pave the way for a further and sound development of circular economy in Chinese furniture industry, and as well as its theory generation. This study seeks to explore and gain a better understanding of the concept of the circular business models in Chinese furniture industry via a process consisting of literature research, qualitative data collection through interviews, and case studies.

Circular business models practice such as circular supply, product-as-service, product life extension, and resource recovery business modes are identified in Chinese furniture industry. Existing practices are facing barriers to scale up; meanwhile they show potential in terms of reducing raw material consumption, increasing resource efficiency and solving problem of environment pollution. Furniture manufacturing and process companies, furniture retailers and used products recycling collector, local governments and recovery and recycling companies are the main actors and stakeholders involved in the circular business models implementation. Barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors were identified to be institutional, market based, organizational, individual and technological at both the external and internal levels. More barriers found at the external level, which market based ones dominate. Used furniture products related barriers are identified under technologies barriers sector as well. Barriers are varied with business models. Current China's circular business models implementation is still at its early stage. More external changes are desired from all circular business models implementing companies, especially on policy related and on consumers' behaviors.

**Keywords:** Chinese Furniture Industry, Circular Business Models Implementation, Circular Economy, Barriers

## Executive Summary

Current Chinese furniture industry is facing serious problem of limited virgin resources, environmental pollution and has an overall low profit rate. To tackle the problem of limited raw resource supply and environmental issues, China's furniture industry needs to close the loop of material and resource and seek innovations in the areas of processing, developing circular products, and circular business systems. Implementing the circular economy in the industry is necessary and will contribute to its economically sustainable growth. Therefore, it is in a great need for new business models based on circular economy thinking, such as reusing, remanufacturing, recycling and sharing. However current real world examples of circular business models implementation in China's furniture industry and research related with it is very limited. And there are very little circular economy initiatives showed in Chinese furniture industry from the bottom to up.

Exploring and understanding these limited business models and conditions under which resource efficiency can be enabled and secured, especially the interrelations between barriers hindering the implementation and dissemination of circular business models, is therefore needed. The research on the exploration and understanding of the implementation in reality could serve as a foundation to develop and refine the applied circular business models and then pave the way for a further and sound development of circular economy in China's furniture industry, and as well as its theory generation. This study seeks to explore and gain a better understanding of the concept of the circular business models in China's furniture industry by a case study. In particular, it asks:

- What is the current status of implementation of circular business models in China's furniture sector?
- What are the barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors?

Through a process consisting of literature analysis, qualitative data collection by conducting semi-structured interviews, and case studies, it was possible to gain an overview of current status of implementation of circular business models in China's furniture sector and barriers to its implementation and dissemination in China's furniture selling and recycling sectors.

Circular business models practice such as circular supply, product-as-service, product life extension, and resource recovery business modes are identified in China's furniture industry. Existing practices are facing barriers to scale up, meanwhile based on explored cases in the thesis and interviews, it shows that implementation of circular business models has potential in terms of reducing raw material consumption, increasing resource efficiency and solving problem of environment pollution. Furniture manufacturing and process companies, furniture retailers and used products recycling collector, local governments and recovery and recycling companies are the main actors and stakeholders involved in the circular business models implementation.

The main barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors on a wider scale were identified to be institutional, market based, organizational, individual and technological at both the external and internal levels. More barriers found at the external level, which market based ones dominate, including lack of back-up policy for circular business models implementation, unfavorable consumer behaviors and lack economics of scale. Internal barriers are lack of funds for scaling up and lack of manpower on quantity and quality. Used furniture products

related barriers are identified under technologies barriers sector as well. Barriers are varied with business models. Current China's circular business models implementation is still at its early stage. More external changes are desired from all circular business models implementing companies, especially on policy related and on consumers' behaviors.



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# 1 Introduction

## 1.1 Background and Problem Definition

In order to reduce our dependency on raw materials and decouple growth from resource constraints, there is a growing consensus around the world that we have to reduce consumption and its material intensity, as well as to move away from current linear economic system to a circular economy, one that is based on closing material and resource loops. One evident example is China's furniture industry, which is facing serious problem of limited virgin resources, environmental pollution and has an overall low profit rate (IBIS world, 2015; Cheng et al., 2014; Wang & Wu, 2013). Implementing the circular economy in the industry is necessary and will contribute to its economically sustainable growth (Wang & Wu, 2013). Current Chinese furniture industry is under high-speed development and limited raw resource supply is its main concern for continuous growth.

To tackle the problem of limited raw resource supply and environmental issues, China's furniture industry needs to close the loop of material and resource and seek innovations in the areas of processing, developing circular products, and circular business systems (Cao et al., 2004). Therefore, it is in a great need for new business models based on circular economy thinking, such as reusing, remanufacturing, recycling and sharing. A variety of business models like circular supplies, resource recovery, product life extension, sharing platforms and product as a service promise to improve resource efficiency and contribute to circular economy with the support of disruptive technologies (Accenture, 2014).

However current real world examples of circular business models implementation in China's furniture industry and research related with it is very limited. And there are very little circular economy initiatives showed in Chinese furniture industry from the bottom to up. So exploring and understanding these limited business models and conditions under which resource efficiency can be enabled and secured, especially the interrelations between barriers hindering the implementation and dissemination of circular business models, is therefore needed. The research on the exploration and understanding of the implementation in reality could serve as a foundation to develop and refine the applied circular business models and then pave the way for a further and sound development of circular economy in China's furniture industry which highly relies on raw material consumption with tons of wastes generated every year, and as well as its theory generation (Høgevold & Svensson, 2012).

## 1.2 Aims and Research Questions

This study seeks to explore and gain a better understanding of the concept of the circular business models in China's furniture industry by a case study:

- First aim of this research is to explore the current state of circular business models practice in China's furniture industry by identifying key actors in and key stakeholders for circular solutions;
- Second, provide a better insight into the implementation of the circular economy concept and find out the barriers hindering the implementation and dissemination of circular business models in China's furniture sector.

Considering the aims of the research, thereby the following research questions will be examined in the thesis:

- What is the current status of implementation of circular business models in China's

furniture sector?

- What are the barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors?

### 1.3 Scope

In order to address the aims and answer the above research questions, the thesis takes on four tasks:

- Conduct a comprehensive literature review of the circular economy concept in China's furniture industry sector including overview China's furniture industry, identify challenges for its sustainable development as outlined in the literature and the need for circular thinking to support the development;
- Map stakeholders involved in the industry, operation mechanism and their responsibilities, to have a better understanding on how the current business settings shape elements related to circular economy. Findings from interviews would be put into context for analysis. The author adopted desk research and semi-structured interviews to map the supply chain. Desk research including scientific articles, reports and publications related to furniture industry chain in China.
- Select circular business models according to principles designed by the researcher in order to reflect the current circular business models implementation of the industry;
- Identify key elements of selected circular business models and barriers to the implementation and dissemination of existing circular business models by conducting qualitative semi-structured interviews. The results of task 2 and 4 are the main information source for answering research questions.

The study focuses on the whole value chain of furniture industry and the concept of circular economy in general and with case studies from the whole life circle of furniture products. The relative wide scope is adopted with a purpose of better representing applicability of the circular economy concept and to address the limited availability of cases.

Mapping the current state of circular business models practice in China's furniture industry in the researcher focuses on sectors direct related with the life circle of furniture products: furniture manufacturing and processing companies, furniture selling sector and products recycling sector. Scope on the value chain is narrowed down to China's furniture selling and recycling sectors when searching for the barriers to the implementation and dissemination of existing circular business models in China. However, identifying key actors in and key stakeholders for circular solutions focuses on the whole value chain of furniture industry.

As there is no established definition of circular business models, this thesis includes a variety of aspects as part of circular business models: Aldersgate, 2012; Ellen MacArthur Foundation, 2013; and Bocken, et al. 2014. However, in order to gain a structured overview of circular business models, 5 types of circular business models established by Accenture were adopted as presenting the case studies: circular supplies, resource recovery, product life extension, sharing platforms and product as a service.

### 1.4 Limitations

The novelty of the circular business models in China's furniture industry concept was a significant limitation for the research. Although the concepts of circular economy in China and circular business models innovation are relatively well researched, implementation of integrating them into the China's furniture industry are constantly emerging and there are very limited cases available at the moment of writing.

Availability and scheduling of interviews proved to be a challenge, especially with business representatives from the top level of the companies who relatively have a more overall understanding regarding the business model and history of the companies, and considering the time-zone differences between Europe and Asia. Instead of business representatives from top level, employees with a good understanding of the companies were also considered as interviewee in the research.

The field of information and communication technologies (ICT) has characteristics of extreme dynamic and rapid evolution, thereby the selected cases of business models in the thesis may have already changed. It is also very possible that new implementations come out and would be better suited for the research, especially business models applied in the field of online/offline used furniture products recycling.

## **1.5 Audience**

This thesis was completed in partial fulfillment of the requirements of MESPOM, Erasmus Mundus Masters course in Environmental Sciences, Policy and Management for IIIIEE, the International Institute for Industrial Environmental Economics at Lund University with a principally intention for academic audience.

Further, stakeholders involved in China's furniture industry such as manufacturing and processing companies, retailers, and used products recycling companies related with the topic of the research could benefit from this thesis. The analysis and discussion could let the targeted audience get a better understanding of possible circular solutions and related common barriers, along with other actors such as potential investors and etc. considering engaging with circular economy ideas.

Policymakers and regulators may gain a clearer picture of China's furniture industry and the concept of circular economy, and its contribution to the region's sustainable development.

## **1.6 Thesis Structure**

Chapter Two explains the methodological approaches used in this thesis and outlines the overall research process including literature review methodology, case studies methodology, and the analytical framework.

Chapter Three offers a literature analysis to provide the results of task one and two gives a general overview of China's furniture industry including overviews of China's furniture industry challenges for its sustainable development as outlined in the literature and the need for circular thinking to support the development. Stakeholders involved in the industry are mapped as well as their responsibilities, operation mechanism and the state of the art of circular economy practices in China.

In Chapter Four business models innovation case studies are presented: WeiYou, Nine Shells, and WJQY. And the findings related to the cases from primary and secondary data are organized and presented under the framework of the business model canvas.

Chapter Five presents state of art of implementation of circular business models in China's furniture sector and identifies barriers to circular business models implementation and dissemination with the combination of the findings from the previous chapters and the literature review.

Chapter Six discusses and reflects on research process, adopted methodologies, analysis and generalizability of the findings.

Conclusions are given in Chapter Seven, and with answers to the research questions, highlights main research contributions and suggestions for future research.

## **2 Methodology**

The chapter outlines the methodological approach taken in the research. Considering the novelty of the research, an exploratory qualitative case study approach was adopted in the thesis (Yin, R. K., 1994). Information was required and processed by triangulation and therefore collected by different methods (Denzin, 1978). Research process, methodologies applied for case study and interviews, and the analytical framework, were described in section 2.1, 2.2, 2.3 and 2.4.

### **2.1 Research Process**

The research process involved four steps. Firstly, a consolidation of existing knowledge from desktop research and literature analysis was carried out. The literature research was aimed at identifying overarching themes and investigating current status of implementation of circular business models in China's furniture sector by providing an overview on China's furniture industry and identifying stakeholders involved. Academic articles in English were achieved mostly from LUBSearch and Google Scholar. National Knowledge Infrastructure of China (CNKI) for those in Chinese as it is the largest and continuously updated Chinese journals database in the world (University of Sheffield, 2016). Kipling Method, which also known as 5W+1H(what, where, when, who, why and how) questions, was chosen as a tool for organizing and presenting the results of literature review as "it is useful in collecting information or grasp the situation and correctly define it" (Patrycja, 2014; Kipling, 1902; Reid & Smyth-Renshaw, 2012; Srivastava, 2013).

Second, the empirical part of research was based on case study approach. This implied identifying case studies and choosing interviewees from selected cases: WeiYou Furniture Limited Company, Nine Shells APP and WJQY IT Limited Company. The cases of circular business models were chosen according to principles designed by the researcher taking into account the diversity of circular business models presented in different taxonomies in the literature and the conceptual frameworks for describing the key elements of business models. Detailed description regarding case selection presented in the sections 2.2.1, 2.2.2 and 2.2.3 respectively.

Next, in-depth semi-structured interviews were carried out to collect empirical data with seven individuals (see, Appendix A). Interviews subjects were chosen and conducted in order to have a broad representation of circular business models implementations on the basis of their motivation, application and key elements of their business models and with a purpose to identify barriers to the implementation and dissemination of circular business models. The research was discussed with business representatives from selected cases and non-business representatives from relevant stakeholders who both contributed to the final outcome. Interview objects selection principle and the interview process presented in section of 2.3. Findings from business interviews presented within the framework of business model canals, which described in section 2.2.3.

In the end, a combination of the results through the first three steps was carried out. The findings from the business interviews were triangulated with findings from the non-business interviews and literature reviews. It summarized and compared selected business model cases and identified and analyzed barriers to circular business models implementation and dissemination based on previous literature review and results of interviews. Analytical approach applied for barriers analysis described in the following sections 2.4.

## 2.2 Case Study Methodology

### 2.2.1 Circular Business Models

For the purpose of this thesis, Osterwalder’s (2010) definition for a business model is used: *A business model describes the rationale of how an organization creates, delivers, and captures value* (Wu, 2015; Osterwalder, et al., 2010).

Accenture (2014) identified 5 circular business models, which contribute to generate resource productivity improvements in innovative ways: circular suppliers, resources recovery, product life extension, sharing platforms and product as a service. Meanwhile they also identify ten disruptive technologies support business model innovation and divide into three categories: Digital, Engineering and Hybrid. It is worth to notice this is blankness in digital techs supporting the model of resource recovery. Five business models and their characteristics are described below.

- Circular supplies: Provide renewable energy, bio based or fully recyclable input material to replace single-lifecycle inputs.
- Resource recovery: Recover useful resources/energy out of disposed products or by-products.
- Product life extension: Extend working lifecycle of products and components by repairing, upgrading and reselling.
- Sharing platforms: Enable increased utilization rate of products by making possible shared use/access/ownership.
- Product as a service: Offer product access and retain ownership to internalize benefits of circular resource productivity.

Accenture’s framework of five circular economy business models represents the whole supply chain of a business from procurement to end-of-life disposal. Cutting through the complexity of business, it divided business models into five categories. In order to help audience to understand how the companies have been able to base their business models on circular flows of resources, it was adopted for screening circular business models innovation cases in the thesis.

### 2.2.2 Business Model Canvas

As the business model can hardly be defined in a single category, a further description of business models was the presence of business activities in a simplified analytical framework with showing how the business models bring the sustainability profit and meet consumer needs. Osterwalder’s (2010) Business Model Canvas provided one of the theoretical frameworks applied for this research project. This framework presents a useful overview of the building blocks of a company’s business model and was served to analyze selected cases and nine building blocks consisting in the framework are described in Table 2-1.

Table 2-1 Business Model Canvas Framework

Value proposition	Customer Segments	Characterizes the deferent groups of individuals or organizations an enterprise plans to reach and serve
	Value Propositions	Depicts the products and services that create value for a particular Customer Segment
	Customer Relationships	Describes the sorts of connections a company sets up with particular Customer Segments

Value creation and delivery system	Key Resources	Describes the most imperative resources needed to make a business model work
	Key Activities	Describes the most essential things a company must do to make its business model work
	Key Partnerships	Portrays the network of suppliers and partners that make the business model work
Value Capture	Channel	Explains how a Company communicates with and reaches its Customer Segments to deliver a Value Proposition
	Revenue Streams	Means the money a company creates from every Customer Segment (costs must be subtracted from revenue to create profit)
	Cost Structure	Describes all costs required to manage a business model

Source: Adapted from (Wu, 2015; Bocken, et al., 2014; Osterwalder, 2010)

Therefore, for each case, overview, background of circularity and description of elements in business model canvas will all be presented in later chapter.

### 2.2.3 Case Selection

Circular business models selected among companies partly or fully practicing circular economy thinking in their business in China’ furniture industry based on Accenture’s framework of five circular business models: circular supplies, resource recovery, product life extension, sharing platforms and product as a service and aimed to cover different types of related business models in order to better represent applicability of the concept and to address the limited availability of cases. Cases for research were mainly identified via desk research including scientific articles, reports and other publications related to circular economy implementation in China’s furniture industry, and via ‘snow-balling’. In the end, due to the limitation of available cases in terms of the research scope and the accessibility of the interviewees in terms of location, time and contacts, three circular business models were selected and they are WeiYou Furniture Limited Company as the representative as product-as-service business model, Nine Shells APP and WJQY IT Limited Company as representatives of models of product life extension and recourse recovery. How each case selected is also be described relatively in Chapter Four. This limited sample was considered sufficient for the basic purposes of this research.

## 2.3 Interview Methodology

As stated above interviews subjects were chosen and conducted in order to have a broad representation of circular business models implementations on the basis of their motivation, application and key elements of their business models and with a purpose to identify barriers to the implementation and dissemination of circular business models. In-depth semi-structured interviews were conducted because the interview objects may take different directions as their difference in nature. A standardized questionnaire based on the interviews subjects was used during the interviews, but room for more open discussion was also available as semi-structured interviews allow for the researcher to choose to stick strictly to the interview guide or to follow up answers with new questions outside of the original script depending on the interview situations (Kvale & Brinkmann, 2009) and allow the interviewees to freely present their perceptions on the research topic. The interview questionnaires (see Appendix B) were sent to the interviewees before the meeting if required.

Total number of business interviews was seven semi-structured interviews were carried out to collect empirical data with seven individuals (see Appendix A). Four were from selected cases with an already implemented circular business models and three were with non-business

representatives who were identified as professionals among stakeholders representing links of the value chain. All seven interviews were conducted face to face with maximum two persons at a time. Each interview took about 50 minutes on average. All the interviews have sound and written records.

The interviewees were determined to be business representatives who fully practice business models of the selected cases. As the main aim of the research was to have a general picture of circular business models and their perspectives on business barriers, no specific business segment or sector was chosen. The selection of the non-business representatives was based on desk research, as well as recommendations from the business representatives. Findings from the non-business interviews were used to triangulate findings from the business interviews, therefore only specifically similar or contrary statements are disclosed.

## 2.4 Barriers Analysis Framework

Analysis of barriers to the implementation and dissemination of circular business models in China’s furniture industry is based on a framework by Bastein et al. (2014) from the research project: POLFREE - Policy options for a resource efficient economy. Within the research project, the researchers focused on the barriers that business may experience upon increasing their recourse efficiency and set up a framework which consists 5 types of barriers: institutional, market based, organizational, behavioral and technological (Bastein et al., 2014). A circular economy contains more than resource efficiency as stated above, however, the framework is suggested to be presented also in developing sustainable business models (Bastein et al, 2014; Henriksen, 2012), therefore it is suggested to be relevant and adopted in this research (Westblom, 2015).

The framework developed by Bastein et al. (2014) were based on data mainly from the Eurobarometer survey about barriers for SMEs to resource efficiency innovation from 27 European countries and Eurostat Community Innovation Survey conducted in 2008. Barrier types, definitions and examples are presented in Table 2-2. The framework was used to analysis the collected information with a focusing on creating what types of barriers and classifying.

Table 2-2 Business barriers to the uptake of resource efficiency measure

Barrier type	Definition	Examples
Institutional	Caused by political institutions	Lack of environmental policy and weak, no enforcement of regulations
Market	Related to market conditions	Lack of demand from the market, unfavorable market structures, costs related to risks, subsidies and etc.
Organizational	At firm level related to organizational structures & systems such as company strategy or focus	Lack of funds, lack of labor capabilities and lack of expertise of managers
Behavioral	Individual’s behavior within the firm i.e. attitudes and values	Lack of attention to subject, lack of information, and lack of commitment
Technological	Insufficient or too costly technology	Lack of equipment, lack of available technologies or processes from the market

Source: Adapted from Bastein et al., 2014.



### 3 Literature Review

#### 3.1 China's Furniture Industry

The purpose of this section is to provide an overview on China's furniture industry and to identify key actors and stakeholders involved in the industry, then to explore current status of implementation of circular business models in China's furniture sector.

##### 3.1.1 Overview: Volume of Production

Current Chinese furniture industry is under high-speed development. By the end of 2012, Zhu Changling, President of China Furniture Association states China's furniture industry production had reached 1.13 trillion Chinese Yuan and kept as the world's first furniture production and consumption country 5 years in a row from 2008, see Table 3-1. He expects the output value of furniture industry would pass the value of automobile industry during 2015-2020. After passing Italy in 2004, China has become the largest furniture exporter in the world (IBIS world, 2015). The Chinese furniture industry consists of around 50,000 companies and over 5 million employees (Lan & Wang, 2013).

Cheng et al. (2014) believes the fast growing of China's furniture industry are mainly due to adaptation of the export-oriented strategy to develop its processing trade by virtue of its national cheap labor resources (Cheng et al, 2014). Agreeing with the price advantages from cheap labor cost and Cao et al. also added that competitive advantages of products made in China also benefits from lower operational costs, which are the result of frugal manufacturing approaches and active adoption of automation, and fewer environmental restrictions and less health care benefits cost. Hong Kong Trade Development Council (HKTDC, 2015) considers domestic trading increase is due to average income increase, real estate booming and high renovation rate.

*Table 3-1 Total Production, Export Volume and domestic trading volume of household furniture of China*

	Total Production (Million Sets)	Export Volume (Billion USD)	Trading Volume (Billion USD)
2015	N.A.	N.A.	31.63
2014	777.86	52.02	29.05
2013	651.62	51.82	26.03
2012	654.44	48.82	23.69
2011	698.96	37.94	22.34

*Source: National Bureau of Statistics of China, 2016a*

##### 3.1.2 Products Types and Output Shares

Furniture products are divided into different types according to different principles. China's National Bureau of Statistics, for statistics purpose, divides the country's furniture industry into metal furniture, wood furniture, upholstered furniture, bamboo furniture, rattan furniture, plastic furniture, glass furniture, stone/ceramics furniture and others based on raw materials composition (National Bureau of Statistics of China, 2016b).

However, according to Industrial Classification and Codes for National Economic Activities, furniture-manufacturing industry in China is classified into wooden furniture manufacturing, bamboo/rattan furniture manufacturing, metal furniture manufacturing, plastic furniture manufacturing and miscellaneous furniture manufacturing based on products types (National Bureau of Statistics of China, 2016c). On the other hand, furniture products on the market are

divided mainly into home furniture, hotel and guesthouse furniture, office furniture, and public institution furniture based on products final destinations (HKTDC, 2015).

Metal furniture, wood furniture, and upholstered furniture are the top three major furniture products by outputs. In 2014, the outputs of metal furniture, wooden furniture and upholstered furniture are 375, 264 and 53 million sets and the proportions of their output based on the total output of furniture products were 48.2, 33.9, and 6.8 percent, respectively (see Table 3-2).

However although wooden furniture is not the largest of total output, it is always the main component of the industry among all types of products, accounting for around 59% of total furniture manufacturing revenue and was expected to reach \$88.5 billion RMB in 2016, according to Hong Kong Trade Development Council (2015) and IBIS world (2015). And According to the Yang et al.'s (2012) statistics, China's major categories of exported furniture are wooden furniture, metal furniture, and bamboo rattan furniture, with a ratio of 58:23:6 by Chinese Yuan.

Table 3-2 Volume and share of Output of China's furniture industry 2009-2014

Year	Total Output (Million Sets)	Wooden Furniture		Metal Furniture		Upholstered Furniture	
		Output	Share (%)	Output	Share (%)	Output	Share (%)
2009	608	205	33.7%	334	54.9%	37	6.1%
2010	770	261	33.9%	424	55.1%	47	6.1%
2011	699	248	35.5%	365	52.2%	43	6.2%
2012	654	239	36.5%	314	48.0%	42	6.4%
2013	652	236	36.2%	323	49.5%	43	6.6%
2014	778	264	33.9%	375	48.2%	53	6.8%

Source: Data from Chyx.com, 2015

### 3.1.3 Circular versus Linear– Why Circular Economy Thinking

Revenue across the industry is relatively low. According to Smiling Curve invented by Stan Shih, the founder of Acer, the most profitable value area always focus on both ends of the value chain of the industry – Research & Development and marketing. Manufacturing industry as one low-value-added industry, in order to survive, only could maintain profits by keeping expanding production capacity in order to reduce average cost (MBA Encyclopedia, 2016; Lan & Wang, 2013). The situation in China's furniture manufacturing and processing industry is even worse. IBIS world (2015) statistics industry revenue is around 6.0% due to high raw material costs and weak pricing levels across the industry. SZFA Corporation (2015) confirms the weak pricing level of manufacturing and processing industry across the value chain. Manufacturing and processing companies dominated by small and medium sizes have less negotiation power than furniture retailers (SZFA Corporation, 2015).

Research conducted by Cao et al. (2004), Cheng et al. (2014), IBIS word (2015), Yang et al. (2012) and Wang, L., (2015) indicate main challenges China's furniture manufacturing and processing industry facing mainly exist in three areas: first, raw resource supply, to be more specific, including limited domestic supplies, highly depending on imports and high costs of raw material, second, labor related, including labor shortage, rise in cost and low labor productivity of extensive form management; third, weak design power, lack of cooperation between the links and international competition.

As mentioned in previous chapter, limited raw material is main concern for future development, especially for the manufacturing companies (Cao et al., 2004; Cheng et al., 2014; IBIS world, 2015; Yang et al., 2012; Wang, L., 2015). Chinese domestic raw materials supply for production was in short and importing became the only way to make up for lack of raw materials for furniture production. Current China's raw material supply for manufacturing is highly depending on imports (Wang, L., 2015). Take wood supply as an example, in 2013 the domestic Chinese wood consumption have reached 212 million cubic meter, 79 million cubic meter be filled by imports (Hu et al., 2015). In the country's total wood consumption, the furniture manufacturing and process sector is always accounting big proportion of (Yang et al., 2012; Hu et al., 2015). However regarding the raw material importing, Yang et al. (2012) point international protection of tropical forest resource lead to raw material shortage and then hamper the production of furniture. Meanwhile, Wang, L. (2015) identifies rapid rise in price on international furniture raw material supply market increased the pressure on Chinese furniture production. His research shows, from 1999 to 2013, cost of raw materials imports presented rapid upward trend, particularly on steel, glass and sheepskin, which increased 2.6 times, 1.4 times and 2.5 times relatively compared with the prices in 1999.

As stated above, the fast growing of China's furniture industry is mainly due to its national cheap labor resources (Cheng et al., 2014), but now the industry is facing the problems of labor shortage and cost rising. Wang, L. (2015) analyzes the reasons of labor shortage in the industry: first, suitable labor population for furniture manufacturing in China was shrinking; second, regional structure of available labor is not conducive to the needs of the furniture manufacturing and process industry. More and more suitable labor is moving to Mid-western Region from the Pearl River Delta and the Yangtze River Delta. Wang, L. (2015) also found from 2004 to 2013, labor costs in manufacturing in China were keeping increasing. China's national average wage in manufacturing kept about 14% annual growth rate. The numbers in eastern coastal provinces were even bigger.

Cheng & Tian et al. (2011) pointed that product design is the weakest link in China's furniture manufacturing industry and there is a big gap between China and developed countries. To be more specific: lack of professional designers, lack of design innovation and serious plagiarism in product design. According to their incomplete statistics, China's furniture designers are less than 3,000, for example, as an industrial cluster with more than 6,000 furniture firms, Guangdong province only has professional designers less than 600. Weak furniture design not only set serious obstacle for the development of Chinese furniture industry, but also lead to a negative impact on the reputation of China's furniture products on the international market. Cheng & Tian et al. (2011) also highlight there is lack of cooperation in the manufacturing and processing industry. The specialization is low and small and mediums firms have similar equipment and every firm works on its own through all links in the process. Challenges leading to low revenue on sales side, especially on exporting are also severe, which include rapid appreciation of Chinese currency; reduce of export rebate rate and unapproachable final consumer market (Wang, L., 2015). On the other hand, China is also facing increasing competition from other countries such as Malaysia and other emerging processing countries. Results of Yang et al. (2012) show that China's exported furniture has no price or resource advantages compared with countries with rich forest resources in the international comparison.

Furniture waste disposal is huge in China and globally. There are over 60 million tones of wooden furniture waste generated every year in China (Mao et al., 2015). In France, household furniture waste was around 1.7 million ton per year and in 2009 half of this waste went to landfill which included 100% of the mattresses. In France every year a four-person household throws away around 100kg of furniture. In UK, the furniture wastes are over 10 million pieces

every year (Zhu & Wu, 2013). Fast replacing time of these products is one of the most important reasons for such a large amount of waste furniture disposal. According to a report conducted by Hong Kong Trade Development Council Research on China's furniture industry, the interval of replacing furniture in China, the average period mentioned by all respondents is 7.6 years. And HKTDC pointed out more specifically, among all respondents, 13% chose 3-5 years, 48% chose 5-10 years, 11% chose 10-15 years, and 24% only replaced their furniture when broken. Numbers confirmed by Xie's market investigation report of 2013, which indicates majority (63%) consumers would replace their furniture in 6-10 years and the reasons are "aging" and "outdated".

Many studies suggest the adoption of circular thinking in China's furniture industry in order to solve the problem of the shortage of productive resources (Cao et al., 2004; Cheng et al., 2014; Wang & Wu, 2013; Yang et al., 2012; Zhu & Wu, 2013). On the other hand, environmental pollution prevention also requests proper dealing with household furniture waste. After reaching the end of life cycle, if furniture products are not recycled or not treated properly, they will lead to a waste of resources and serious environmental pollution (Wang & Wu, 2013). Besides supplement of the shortage of productive resources and environmental pollution prevention, the circular business model would also spur furniture-manufacturing enterprises to improve product durability and extend product lifetime, and then reduce the waste of materials in the process and achieve energy saving and emission reducing (Wang & Wu, 2013).

The adoption of circular thinking can be located on every segment of the industry chain. Wang & Wu (2013) present circular economy strategies on green furniture design and integrated recycling system in order to realize better recycling and reusing of furniture products. Strategies on green furniture design include: 1<sup>st</sup> Minimize the use of raw material and maximize the use of green materials; 2<sup>nd</sup> Simplify and wisely design process structure; 3<sup>rd</sup> Set up recycling labels and include information of materials on the label; 4<sup>th</sup> Improve renewable technology on the utilization of non-reusable products. Establishing integrated recycling system for used furniture need efforts on: Involve municipalities and industry associations, decree and clarify responsibility for recycling; Set up furniture recycling subsidy, and adopt variety of recycling financial methods; Combine different forms of furniture recycling systems; Establish visiting sites for recycling bases.

Zhu & Wu (2013) highlight that integrated and mature end of life management is the key to close the loop of material and resource. They believe that a good end of life management system for used furniture could contribute to improve the hard dealing situation of large amounts of used furniture products treatment and the waste of resources, and then to reduce pressure on environment, to close the loops and contribute to the realization of circular economy. Wang & Wu (2013) also confirm that in the furniture industry, if there are reasonable measures to improve the recycling and reusing of waste furniture products and their parts and components, it is possible that making the transaction happen from traditional linear growth economy which relying on the resource consumption into a circular business model which relying on the ecological cycle of natural resources.

Cao et al. 2004 suggests Chinese manufacturers to seek new advantages through innovations in the areas of processing, products, and business systems. However up to 2004, innovation activities within the Chinese furniture industry are mainly based on incremental improvements of existing products and technologies, rather than aggressive breakthroughs, which include the adaptation of new business models of circular economy (Cao et al., 2004).

### 3.2 Role of Stakeholders involved in the industry

The purpose of this section is to map different stakeholders in China's furniture industry and identify most relevant for the scope of this research in order to further investigate current status of implementation of circular business models in China's furniture sector.

#### 3.2.1 Overview: Operation Mechanism

The value chain of furniture industry is composed of several components (see figure 3-1). Hao, Y. (2007) identifies stakeholders involved in the value chain of China's wooden furniture industry: households, forestry industry, wood processing factories, wooden furniture manufacturing and processing companies, furniture design firms, mechanical equipment and chemicals suppliers, furniture selling at all levels including wholesale and retail and products recycling sector in general including used collection, second markets and etc. Zhao et al. (2005) divides involved stakeholders in the value chain into three sectors: upstream, midstream and downstream. Most upstream industry belongs to the first industry and mainly raw material supplier e.g. forest cultivate industry. In the middle is the secondary industry: raw material processing industry such as wood-based panels manufacturing and wood processing, and end tangible products provider: furniture manufacturing industry. Downstream provides intangible services and delivers products to the consumers, as the tertiary industry named furniture business or furniture specialized market. However Zhao et al. (2005) do not include products reuse and recycling into the system.

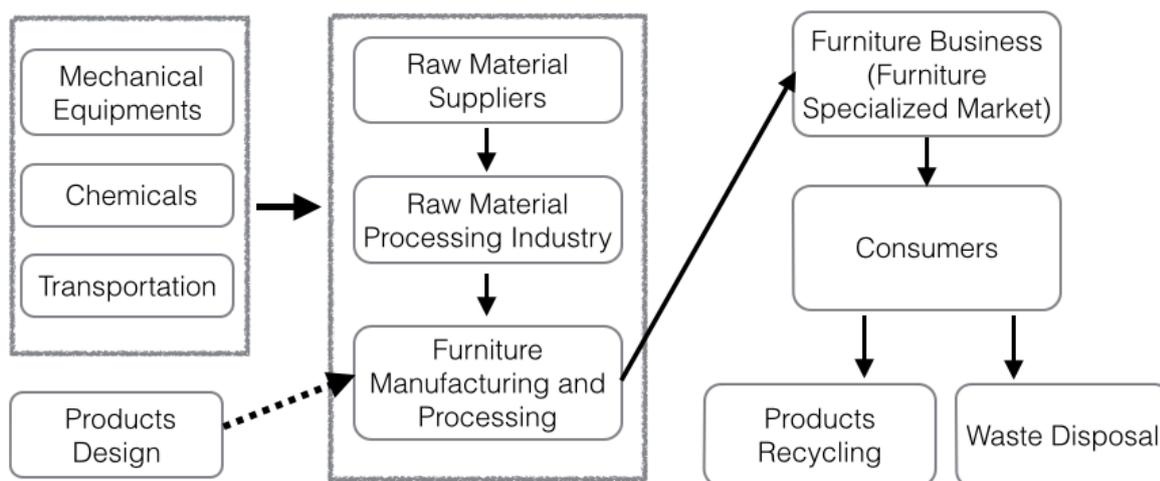


Figure 3-1 Wooden Furniture Industry Value Chain

Source: Hao, Y., 2007; Zhao et al., 2005

In this thesis, the researcher focuses on furniture products direct related links: furniture manufacturing and processing companies, furniture selling sector and products recycling sector.

#### 3.2.2 Furniture Manufacturing and Processing Companies

*What.* Furniture manufacturing and processing industry refers to furniture products' manufacturing and processing using varieties of material such as wood, metal, plastic, bamboo, rattan and etc., with single or multi functions of sitting, lying, storage, space division and so on, which can be used for any place like housing, hotels, offices, schools, restaurants, hospitals, theaters, parks, ships, aircraft, motor vehicles, and etc. (China Industry Research,

2014). In this thesis, it focuses on furniture manufacturing and processing companies in China. According to the statistics of China Industry Research revealed in “the Report on the In-depth Study of China’s Furniture Market and its Development Prospects in 2015-2020”, in 2014, there were 4,942 furniture manufacturing and processing enterprises above a certain scale<sup>1</sup> in China (China Industry Research, 2014).

*Who.* Compared with other industries, furniture manufacturing and process companies in China have a much less concentrated rate, for instance, in 2014, “it was estimated that 80% of them are small and medium-sized<sup>2</sup>” (HKTDC, 2015). In the annual report of China’s Furniture Industry Market Research Report conducted by Xie, Q. (2013), it is also emphasized that furniture manufacturing and process industry concentration is very low and enterprises with market share over 1% barely found. Majority of Chinese furniture companies are not state owned and ownership types are diversified, including foreign owned, domestic Chinese privately owned, stock-holding companies, as well as various joint ventures (Cao et al., 2004).

*Where and When.* Wu, Z. (2013) states China’s furniture manufacturing and processing industry gradually shaped industrial clusters and characteristic regions based massive economy under the export-oriented strategy of China’s reform and opened economy. Zhu, Y. (2014), Cheng et al. (2011) and Yang et al. (2012) confirm the feature of industrial clusters and identify five major clusters: the Pearl River Delta; the Yangtze River Delta; Bohai Rim Region; Northeast Region; Mid-western Region. By virtue of a prime location and open foreign trade policy, the Pearl River Delta represented by Guangdong and Fujian has a long history on furniture manufacturing and processing. Quality of products is relative high and it is export-oriented. The Yangtze River Delta represented by Zhejiang and Jiangsu is a rising star with high product quality and products are mainly sold in east China and overseas. As the national strategy shifts from an export orientation to a focus on domestic demand and cost rise of the Pearl River Delta and the Yangtze River Delta, Mid-western Region, which is lead by Chengdu has a rapid growth in the market share since 2000. Its products are mainly at middle and low level and distributed domestically. Bohai Rim Region has a sound foundation regarding furniture manufacturing and processing development and has relative high-level products. The sound development of Northeast Region mainly relies on the abundant timber resources of Daxingan and Xiaoxingan Mountains (Zhu, Y., 2014; Yang et al., 2012). Zhu, Y. (2014) highlights Except Tibet, Inner Mongolia, Qinghai, Gansu and several other provinces in the west, provinces besides the ones located in the cluster all have the relatively mature furniture manufacturing and process industry and their value chains are relatively complete also. Based on the major industrial clusters, characteristic furniture manufacturing and processing regions are formed. Sun, Y. (2014) highlights top 10 characteristic regions: Xianghe, Zhuanghe, Shengfang, Ningjin, Anji, Yuhuan, Wuhou, Lecong, Dayong, Dalingshan and Shunde.

### 3.2.3 Furniture-Selling Sector in China

*What.* In this section, the research focuses on furniture selling activities at all levels including wholesales and retails in the region of China. In 2014, the total sales of household furniture products by wholesalers and retailers above a certain scale<sup>3</sup> were 227.30 billion Chinese Yuan with an increasing rate of 13.9% than presvious year (HKTDC, 2015). Floor area of furniture-selling outlets in China reached 14 million square meters in 2014 (HKTDC, 2015).

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<sup>1</sup> Annual Income over 20 million Chinese Yuan (National Bureau of Statistics of China, 2011)

<sup>2</sup> Annual Income less than 400 million Chinese Yuan (National Bureau of Statistics of China, 2011)

<sup>3</sup> Annual Income over 20 million Chinese Yuan (National Bureau of Statistics of China, 2011)

*Who.* Furniture products are generally sold by the manufacturers or sales agents by the regions. In terms of furniture-selling business models, they can be divided into sales in large furniture shopping malls or department stores, and sales in independent stores includes furniture supermarkets, manufacturer's gallery stores, specialized furniture stores and etc. (Cao et al, 2004; Wang & Song, 2008; Xiao, 2012; Xie, 2013; Yang, 2016).

Sales in large furniture shopping malls refers to furniture manufacturers or their agents renting physical space in a furniture shopping mall for sale. It is currently used by most of furniture production companies as their sales model. Representatives of this model are Macalline China and Easyhome China. Large Chinese furniture manufacturers and several international furniture brands set up their own independent gallery stores in China as well due to their large volume of production or diversity of products. IKEA's sales model is the representative of furniture supermarket model. Wang & Song (2008) highlight furniture supermarket model is adopted by many Chinese companies and under a fast dissemination confronting with other sales models of furniture market. Other sales models include specialized furniture stores for special consumer groups, online sales, furniture exhibitions and government bidding. Xiao (2012) highlights regional trademarks, which are formed due to various types of furniture selling models concentrated in one region and these regions usually are furniture manufacturing and processing industrial clusters.

*When.* Xiao (2012) describes the development history of Chinese furniture sales. He divides the process into three stages. First stage is the transition from high street stores to shopping malls. During 1980s, furniture-purchasing activities usually happened in furniture stores in the streets. With the improvement of living standards, consumers had more and more demand on different types of furniture products. In 1990s, furniture shopping malls appeared with the size of 2000-3000 square meters on Shenzhen's furniture market. Second stage: shopping malls grade scaled up and furniture brands differentiation was becoming apparent. After 1990s, as urban expansion and urban population rapid growth, the real estate market got more active than ever. Meanwhile, there was a substantial increase in domestic demand for home products. The largest furniture shopping mall was nearly 50,000 square meters. On the other hand, furniture brands had more differentiation and stores facing middle-class and high-level consumers came out as furniture stores began to consider re-positioning. Third stage: diversified formats and personalized topics. Furniture supermarket and other new retailing formats appeared as British company B&Q opened its first store in Shanghai in 1999. More demands on diversity and personality of furniture products from consumers pushed furniture market updating. Furniture business subdivided consumer group and for different consumers in different markets, it launched personalized furniture products in order to meet changing market demands.

*Where.* In terms of targeted domestic markets, besides Guangzhou, Shanghai, and Beijing traditional top target markets, major Chinese cities where new middle-class consumers distributed like Shenzhen, Xiamen, and Ningbo were also developed very fast and all these Chinese major marketplaces are surrounded by clusters of furniture-producing industries (Cao et al., 2004).

### **3.2.4 Furniture Products Recycling Sector in China**

*What.* During the product use phase, reuse of furniture products is realized by repairing and reselling to second hand market. When used furniture products reaching end of life disposal stage, part of them go to waste management with general wastes, but what is more expected is the increasing percentage of the portion going to reverse logistics, in which recourse and material of used products could be reused, recycled and recovered. In this thesis, the researcher focus on the companies working with reverse logistics of used furniture products.

As mentioned above, furniture waste in China is huge and there are over 60 million tones of used wooden furniture generated every year (Mao et al., 2015) due to many reasons such as fast replacing rate of furniture products. However, large percent of furniture waste were not recycled, Hu & Xiang (2006) point out, and practices of furniture reverse logistics were very limited, which is confirmed by Luo & Xu (2016) as well.

Mao et al. (2015), Luo & Xu (2016), Ly & Huang (2016) and Zhu & Wu (2013) summarize current used furniture products end of life disposal methods in China, which includes: products reuse, material recycling, energy and material recovery. In order to close the loops of recourse and material and realize the reverse logistics of used furniture products, first, used products need to be collected, then either realize reuse by simply repairing and reselling to second hand market or remanufacturing for reselling, then, the rest are sent to material recycling or energy and material recovery. Mao et al. (2015) describe general process of end of life disposal after collecting: first, sort and classify the collected used products. Then, for the products like wood furniture, rattan, metal, glass furniture and etc., which still can be reused, resell them after cleaning, repairing and several maintenance processes. For non-reusable products such as sofas and mattresses, disassemble into several categories like plates, metal, glass, fabric and hazardous waste, etc., and recycle or recovery by sorting. The main source of used furniture collection is from public used furniture recycling programs, general recycling process of private sector and special designed programs such as used furniture trading-in programs (Luo & Xu, 2016).

*Who.* Who is collecting used furniture products depends on collection methods. For trading-in programs, Yue (2015) highlights public sector for instance local governments and private sector involving furniture selling sector and recourse and material recycling and recovery companies are working together on the collection, some private companies are in charge of remanufacturing such as EasyHome Limited Company, who working with Beijing local government, but most of the cases recourse and material recycling and recovery companies take care of repairing and all following processes including recycling and recovery. Local governments and recourse and material recycling and recovery companies cooperate on public used furniture recycling programs. For general recycling process, used furniture are collected by self-employed collectors and private companies including recycling companies based on smart ICT, which only focus on collection and simple repair and maintenance (Luo & Xu, 2016).

*Where and When.* Used furniture products trade in programs currently only happens in large cities such as Beijing since the year of 2012, Chongqing 2012, Tianjin 2013, and Shanghai 2013 (Luo & Xu, 2016; Yue, 2015; Mao et al., 2015). General recycling are varied depends on policies of different regions. Cities such as Shenzhen Changsha, Shangrao and Hefei has set up used furniture recycling programs (Luo & Xu, 2016; Yue, 2015). For example, by the end of 2015, Shenzhen city had set up its regular used furniture reverse logistic system and used furniture was recycling standardized (Yue, 2015). Private recycling companies working used furniture are limited, for example there were no one in Beijing ed by the year of 2015 (Lu, 2015), only a few self-employed dealers from second hand market working used furniture recycling.

### **3.2.5 State of the Art of CE Practices in Chinese Furniture Industry**

Svensson & Wagner (2011) describe a business sustainability model that consisting of the following updated structure and areas: the company's connection and re-connection to the mother of all stakeholders, namely "the planet Earth"; the company's "vision and mission" of business sustainability; the "sources" of carbon footprint and impact on the natural environment, such as: raw material and energy, transport and storage, procurement (inbound),

production and assembly (in-house), and physical distribution (outbound); and such “stakeholders” that generate a carbon footprint and have an impact on the natural environment such as: producers and suppliers, organizations and employees, wholesalers and retailers, customers and end-users, and market and society.

Research regarding China’s current circular practice in furniture manufacturing and processing industry is limited and mainly about raw material and wooden furniture focused. Wu, Z. (2013) argues, from a macro perspective, raw material supply in Chinese furniture industry has transitioned from mainly relying on natural wood to the development of comprehensive utilization of wood-based panels, metal, plastic, glass, leather, textiles and other materials.

As the pillar of China’s forestry economy, the secondary industry is mainly divided into six manufacturing categories: sawn wood and chips, panels, wood products, paper and pulp, wood furniture, and others (Yang et al., 2012). Wu, Z. (2013) s that the whole value chain of forestry industry, furniture as a final product at the downstream has of great value and plays a leading role. According to official statistics for industrial output values in 2000, the panel manufacturing industry accounted for 28.6 percent of the entire forestry secondary industry, whereas wood furniture industries accounted for about 15 percent (China State Forestry Administration 2001). Zhao et al. (2005) believe among all forestry related industries furniture industry has the deepest processing hierarchy, most links, longest chain, highest output value and maximal additional value.

Compared with industries using nonrenewable raw material, its development has more environmentally friendly features, since the wood furniture industry relies on the resource supply of renewable timber such as wood-based panel and other alternative of wooden materials: honeycomb paperboard, linen, bamboo, rattan (Yang et al., 2012; Wu, Z., 2013). Wood-based panel is one product that meets the requirements of the concept of circular economy because it is made from domestic artificial fast-growing wood, small diameter timber, recycled timber, harvesting and processing residues, and straw (Wu, Z., 2013). According to her statistics, by 2013, all types of wood-based panels China’s furniture industry consumed accounted approximately 60% of total wood-based panel production.

Meanwhile, furniture manufacturing and processing companies extend their responsibilities to remanufacturing such as EasyHome Limited Company, which builds its own furniture remanufacturing center with a nearly 10,000 square meters in Beijing and 7200 kg used furniture products are repaired and disassembled daily by 8 employees (Sun, W., 2012). The remanufacturing center is used working with local governments on used furniture products trading-in programs as well.

Circular business models implementation in China’s furniture-selling business is behind, Xiao (2012) s out marketing strategy and sales management is very behind and sales channels and models are limited. Based on the research most implementations exist in the model of product-as-service with a focus on influencing consumer’s behaviors according to Svensson & Wagner (2011)’s sustainability model. Consumers could lease or rent furniture products from the retailers instead of purchasing furniture products. For example, WeiYou furniture rental and leasing limited company located in Shanghai, which presented in case study one.

Liang (2015) s out furniture rental and leasing business has not only giving furniture resources a reasonable and effective configuration, but also reducing wasted resources which in accordance with the requirements of the development of circular economy. Lin et al. (2013) found furniture rental and leasing business in China was not integrated and very immature up to 2013, it only existed in large cities such as Beijing, Shanghai, Guangzhou, Wuhan,

Hangzhou and etc. Liang (2015) confirms the development process and highlights in 2013, there was no furniture leasing business in Beijing.

In 2013, furniture renting and leasing activities happened usually in specialized furniture rental and leasing companies and on second-hand furniture trading market (Lin et al., 2013). Furniture rental and leasing companies accounted almost 90% of the rental and leasing business' market share in 2013 (Lin et al., 2013). However products of rental and leasing companies were indigent. More types of products were available on second-hand market but with a much small quantity. Liang (2015) adds that very few individual consumers were accepted and majority of business was for commercial use, such as film and television shooting, wedding celebration and etc.

Liang (2015) identified a few high-end furniture brands started to have the furniture rental business from 2015 and furniture rental and leasing companies such as WeiYou were growing. In addition there are furniture-supporting service for low-rent housing, which is led by the government to guarantee the welfare of low-income groups (Liang, 2015).

Furniture products for leasing and renting come from purchasing or customized furniture. For a few companies, which have the ability to run their own furniture production, leasing products come directly from their own factories (Lin et al., 2013). Lin et al. (2013) divides leasing activities can be divided into: short-term, long-term and express leasing (see Table 3-3).

Table 3-3 Types of leasing activities

Types	Leasing Products	Advantages
Short-term	Products from Leasing companies	Flexibility, Fast delivery and Enable reduce the costs.
Long-term	Consumers could chose from leasing companies or any available on the market	Enable to educe the initial cost and make the payment by liquidity, Without worrying about the cost of depreciation of goods and other losses
Express	Products from Leasing companies	Courier leasing service within designated time for consumers with a urgent need for certain products

Source: Lin et al., 2013

The improve and perfect of used furniture products reverse logistics could achieve efficient resource recovery and contribute to the effective utilization of recourse, however as stated above, it is very immature of China's current end of life management system and policy for used furniture products. Lots of research focuses on technologies and process of end of life disposal after products collected and suggests a sound policy system. Practice and research regarding current circular business models implementation and effort of companies involves in the process is very limited (Hu & Xiang, 2006; Luo & Xu, 2016). Available practices include, extended responsibility of manufacturing and processing companies as mentioned above, used products trading-in programs and the application of smart information and communication technologies (ICT) on general recycling process of private sector.

What consumers know and are most familiar with is used furniture products trading-in program, which was conducted since last five years from 2011 and in very few large cities such as Beijing, Shanghai and Chongqing and etc. (Lu, 2015; Yue, 2015). As mentioned above, these programs usually were held by local governments, furniture selling sector and recourse and material recycling and recovery companies. When consumers giving away their used furniture, they could get certain benefits based on the value of returned products. Benefits could be credits, subsidy or discount for purchasing new products. In the case of Beijing, local

governments and furniture selling sector pay for the benefits together. Local government administers the returns, which would be sold to recourse and material recycling and recovery companies or remanufacturing center of cooperative furniture production companies for example the case of Easyhome in Beijing. Furniture selling sector benefited from the programs as well since sales generated from the program were much higher than sales of business as usual. On the other hand, it was found that based on Yue (2015)'s survey, consumers were not very motivated and they felt like the trade-in program was more like promotions of furniture selling sector for potential consumption and not intend for recycling.

As mentioned in the above section, used furniture reverse logistic relying on general recycling process of private sector is typical and is one of main source for used furniture collection in China. New business models in reverse logistic based on smart ICT solutions do not belong to the furniture sector directly but they contribute to the update of general recycling process, and to furniture recycling as well. The application of smart ICT based solutions on general recycling process of private sector consists in ICT companies involved in the reverse logistics process such as case study two Nine Shells App, internet of things companies and traditional recycling companies upgrade by applying smart ICT (Huang, Y., Personal Communication).

Reverse logistics and its high transactions costs is one of the main problems in the efficacy of circular business solutions. Once a product is produced and sold, the manufacturer's control level over the further fate of the product reduces dramatically and it generally rather difficult to track where the products are, at what state they reaching end-of-life and how to return them back for remanufacturing. Tracking and managing used products collection information, and organizing the return for remanufacturing, material recycling and energy recovery represents a high share of transaction costs. However, smart ICT based solutions have a potential to address this hurdle. Sun, W. (2012) and Lu (2015) both highlight the role of disruptive information and communication technologies playing in reverse logistics process. They believe online second hand products market and smartphone Apps<sup>4</sup> working on recycling would contribute to close the loop of material and resource effectively. Lu (2015) mentions the start-up American company- Move Loot as an example Chinese furniture recycling should learn from and future more, he s out in order to dealing used furniture products in an environment friendly and low carbon way, professional service and ethics of online service should improve together with the rapid development of smart ICT.

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<sup>4</sup> Smartphone Apps refers to smart mobile applications developed for small handheld devices, such as smartphones, PDAs and so on.

## 4 Case Studies of Business Models

Selected circular business models cases are presented in this chapter under the framework of Business Model Canvas, as well as selection process.

### 4.1 Selection of Circular Cases

Three companies are selected for the thesis - WeiYou Furniture Limited Company, Nine Shells APP and WJQY IT Limited Company. Apart from limitation of available cases in terms of the research scope and the accessibility of the interviewees in terms of location, time and contacts, these three companies appropriately fitted the research topic of circular business models implementation in the China's furniture industry.

In the furniture-selling business, WeiYou was identified as the representative as product-as-service business model based on desk research. It was reported in news journals most and token as a good example for circular business models implementation in China by many researches (Song, 2013; Zhao, 2013; Li, 2013).

In the furniture recycling and recovery sector, Nine Shells APP and WJQY were identified as representatives of product life extension (resell and recycle) and recourse recovery (waste as a recourse and recycle) business models. As mentioned above, information and communication technologies, especially the application of smartphone Apps in recycling business would contribute to close the loop of material and resource and the implementation of circular thinking in furniture products recycling. Lois (2015) investigates and summaries all APPs currently working with resource recovery in China (see figure 4-1). They are with different business models, for instance, in her investigation, business models are simply divided into two groups: working on one single category of products recycling such as household electrics and plastic and those working with more one categories including furniture recycling. However, under single category of products recycling, there is no one special designed for used furniture products recycling. Nine Shells and WJQY are selected from multi-categories products recycling, which also with furniture recycling segment in their business models.

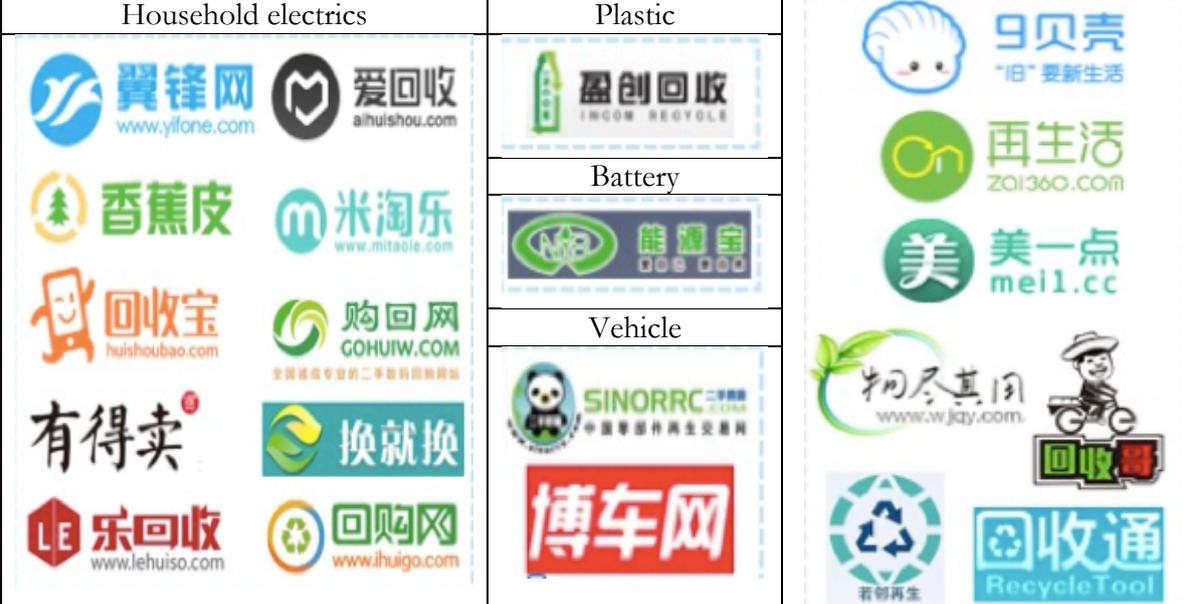
Apps for Single Category of Products Recycling		Apps for Multi-categories Recycling
Household electrics	Plastic	
	Battery	
	Vehicle	

Figure 4-1 Apps for resource recovery in China

Source: (Lois, 2015)

All three cases aim to promote recourse utilization and reducing environmental pressure of furniture products in China. It was worthy to examine sustainability performance of these three cases from a circularity perspective. And among selected cases, the two companies working with furniture recycling have several business model elements difference and are seen interesting in the view of the current recycling study as giving the potential to make a good basis for making conclusions.

## 4.2 Case One: WeiYou

### 4.2.1 Overview and Background

WeiYou Furniture is the first furniture company in China focuses and started renting and leasing service to personal households and organizational sectors. WeiYou was founded in 2006 and started its business with furniture customization in Shanghai. For furniture customization business sector, furniture product differentiation is the core company's strategy and it focus on consumers with relative high level income with a positioning to create a different home for successful people. Main consumers segments of furniture customization include individual consumers such as senior managers of international companies, showfolk, politics and real estate investors from other countries, and organizational customers for example, model rooms of real estates. After over ten years' development, WeiYou has expanded its service to many domains, which include furniture design, online furniture shopping, furniture college and furniture rental and leasing. Currently among all services, furniture customization and furniture rental and leasing are its main businesses. WeiYou came to furniture rental and leasing business in 2006, as one of the first companies came to this business domain with a concern on resource utilization and providing better service for customization consumers through offering this rental and leasing service. Besides, the company founder, Weilong Chen adds, "*in 2006, furniture rental and leasing was very mature business in the US and other western countries but limited companied involved in China*".

### 4.2.2 Description of Elements in Business Model Canvas

**Value proposition.** WeiYou offers "one-stop integrated service provider of household furniture " for its clients, including "one-stop rental and leasing service" consisting of consulting, logistics, assembling, maintenance and recycling. WeiYou believes rental and leasing business contributes to reusing, recycling and recovery of recourse, low-carbon development of China's furniture industry, environmental pollution prevention and China's furniture industry restructure as well, therefore, WeiYou have a high requirement on raw material selection for furniture products in order to extend product life and maximize reuse rate after leasing periods. Current the percentage of reusing rate is around 80% and the rest goes to material recycling and energy recover.

**Consumer segments.** Consumes of WeiYou's rental and leasing business are divided into personal consumers and organizational consumers. WeiYou started with household furniture rental and leasing for personal consumers, however current sales of organizational sector are bigger than the number of personal sector, which only accounts 20% of total. Sales of personal consumers are expected to increase fast and reach 50% in next several years according to Chen (2016). Office furniture and hotel furniture are two main components of sales of organizational sector. Others components include movies and TV show production, wedding photography, exhibitions in close area, showrooms of real estate, and restaurants.

**Channels.** One of the main channels for WeiYou to deliver its value to consumers is the physical space of the company, which situated in Shanghai. Sales offline rely on connections and networking of the sales team. Other than its settled physical stores, WeiYou has built up a well designed, and frequently managed online website allowing consumer to gain knowledge, consult and make the orders without worrying about locations. All goods available in physical sotres can be achieved online and sales through the website in 2015 have passed 50% of total. After furniture returned from the consumer, or maintenance of products was needed, used furniture would be sent to WeiYou and its partners' manufacturing factories to repair, remanufacturing and recover.

**Consumer relationship.** Customer relationship is sustained through both online channels and offline services in the physical store. Consumers appreciate the exhibition of personalized and diversity furniture products for renting and leasing in the store and the social factor that WeiYou created in the physical store, specially the café bar in the store, having the chance to chat with the owner regarding furniture design, the idea of renting and etc. The website is updated by the e-business team, informing about new products, new events such as promotion, interesting furniture using and maintenance knowledge and addressing sustainability. They also have added to another information and communication platform built in one smartphone App (Wechat) to encourage the communication between. As of late, WeiYou offers repair and maintenance services.

**Key activities.** In working hours, in the physical office, every department is there is a design team in charge of furniture production design and purchase. Operation team is to arrange products production, delivery, and door-to-door recycling and maintenance. E-business team is in charge of online platforms maintenance and sales. Key activity besides and outside of the office is to scale up its customers by marketing team. Because of the novelty of WeiYou' circular business model, social networking and media communication are also main content of the company owners' working.

**Key Recourses.** Main office of WeiYou is located in Shanghai with a team of 28 employees and divided into design, marketing, operation, finance, e-business and strategic planning departments with one self 100% owned furniture manufacturing factory in Qingpu, Shanghai. WeiYou started one pilot program in Wuxi in 2015, and expects to expand business to Beijing, Wuhan, Chengdu and Shenzhen in 2016. Intangible assets include competitive advantages on the experience running the business, leading developing strategies and mindsets of circularity thinking, and furniture design background management team. WeiYou has integrated supply chain, especially advantages on online/offline sales channels and maintenance and storage centers.

**Key business partners.** As WeiYou started with furniture customization, it has its own furniture-manufacturing factory and meanwhile has a good partnership with four others, which all located at Qingpu Shanghai. Production capacities of five factories could reach 100 million Chinese Yuan's sales. In order to expand its rental and leasing market, WeiYou has built up partnerships with pre-owned houses letting agencies, interior design firms and business-incubating parks. Cooperated with banks seeking financial support and with furniture products suppliers in order to keep more available kinds of furniture.

**Revenue stream and Cost structure:** Rental and leasing is main revenue of WeiYou. Price of rental varied with the time period of renting. Office furniture usually has 2 years leasing contract, restaurant chain 3 years and hotel furniture 5 years. In 2015, WeiYou's rental and leasing business sales was 20 million Chinese Yuan with gross profit around 35%. Additionally, WeiYou gets financial support from governments. The main costs of running the

company is furniture maintenance and fixed cost for example rent, electricity and also the personnel.

## 4.3 Case Two: Nine Shells App

### 4.3.1 Overview and Background

Nine Shells APP is a smartphone App operated by Hangzhou Daman Internet Technology Co., Ltd. It focuses on visiting recycling and used products management service, including used furniture. Through the smartphone App service, users could make an appointment with a specialist who will conduct an evaluation of products and the user would be paid back in cash or bonus points which could be used on Nine Shells' online shop for various types of selected goods. Recycled products will be sent to recycling companies to be sort and utilized into used furniture, secondary raw materials, or energy production. In this business model, Nine Shells would like to shorten reverse logistics process and transforming the recycling behavior to new consumption chance through big data analysis of consumer behaviors.

Nine Shells was established in October 2014 located at Hangzhou, China. The company has very strong online business background as most of the founders of the company had worked with Alibaba Group, a Chinese e-commerce company for long time. The founders of Nine Shells realized the gap between the amounts of purchased new products and redistributed used products as online retail market in China was huge and keeping growing rapidly, meanwhile downstream distributions channels for used products were very traditional which mainly relying on offline collection, not effective and may not meet current recycling demand. They would like to bring disrupt information and communication technology into the used products collection market and business opportunities were identified based on this assumption. On the other hand, Nine Shells takes it into its version and mansion as its corporate social responsibilities to make limited resource circulatory and reduce raw materials consumption. In last two years, Nine Shells' business was keeping healthy growth and in June 2015, it got 50 million US dollar venture capital from YI Capital, China.

### 4.3.2 Description of Elements in Business Model Canvas

**Value proposition.** Nine Shells offers, "All category of household used products door-to-door collection including paper, bottles, clothe, furniture and household electrics etc." for its clients, which is faster and more convenient, and more valuable rewards consumers would gain through online retail shops, than traditional offline collection. On the other side, Nine Shells also seeks to work with formal distribution channels for collected used products.

**Key activities.** Appointments are made by the consumers on smartphones through Nine Shells APP. Information collected from appointments includes the categories of expected collected products and their amounts. Consumer service team circulates the value and transforms the value into their own rewards system based on the received data. After confirming by consumers, certain collection staffs and vehicles are sent to home and finish one collection. Consumer service team is charge of training, management and dispatch of collection staff. Rewards consumers acquired from the transactions can be consumed in the online retail shop built in the APP. Maintenance and R&D of Nine Shells APP is done by Technology Department. Visual graphic design is done by Design Department. Collected products would be transported to warehouses and be sold to second hand market, recycling and recovery companies after primary treatment. Supply Chain Management Department researches on supply chains of related used products industries, sets up recycling standards for used product and explores downstream distribution channels. Then Operation and Business

Department would build up business cooperation with potential partners and strategy making as well.

**Key recourses.** Main office of Nine Shells is located in Hangzhou. Currently Nine Shells has 150-160 employees including 50 recycling staffs relocated in departments of Consumer Services, Technology and Development, Design, Supply Chain Management and Operation and Business. As mentioned above, core management team of Nine Shells has rich experience on online retail and promotion. Nine Shells rent eight warehouses in the rural area of Hangzhou City and the biggest one is 1000 square meter.

**Key business partners.** In order to acquire more users, Nine Shells seeks partnerships with shopping malls that locate downtown and have lots of foot traffic to hold ground promotion activities and trade-in programs. And Nine Shell cooperates with companies to conduct special custom promotion programs. For example, a trade-in program with smartphone companies Smartisan Technology Co. was conducted in 2015. Consumers mailed used smartphones to Nine Shells and would get coupon for Smartisan new phone purchasing. Nine Shells donates certain products to non-profit organizations, such as Jinlin Foundation.

**Consumer segments.** Consumes of Nine Shells are households, second hand markets, and recycling and recovery companies. In Hangzhou, Currently Nine Shells covers five largest districts: Shangcheng, Xiacheng, Xihu, Gongshu and Ganjing and also include Yuhang district. And owns 170,000 active APP users who generating over 1000 orders every weekend. Secondhand products dealers, recycling and recovery companies would come to warehouse to buy collected products from Nine Shells, for example, Shantao Charity Shop which focus on disable people and remote area donation is one of Nine Shells for second hand clothes. Most of recycling and recovery are from Jiaxing and Shanghai. Regarding used furniture that are hard to realize reassembling for assembled furniture, secondhand market and energy recovery are the two main downstream directions.

**Channels.** The main channel of Nine Shells to deliver its value to consumers is its APP where allows consumer to manage products what they want to be collected and make the appointment with collection crew without limitation of locations. Other than collection, consumers are also able to shopping in the build-in online shop using their bonus gain from selling their used products. After used furniture and other products collected from the consumers, they would be transported to physical warehouses where deals between second hand dealers, and recycling and recovery factories happen.

**Consumer relationship.** Nine Shells would like to have more users by winning word-of-mouth through convenient service. Sustaining customer relationships is done through face-to-face door-to-door collection, smartphone Apps and call center. A survey would be sent to consumers after every collection service in order to evaluate service quality. As Nine Shells also have ground and online promotion programs, information of the company, new events such as promotion, and sustainability issues are addressed on these programs as well.

**Revenue Stream and Cost Structure:** Currently Nine Shells is on break-even point (BEP). Main costs of running the company is procurement for online shopping and fixed cost including personnel, physical spaces renting and management and etc. Sales from collected products and online shop are main revenue and furniture has 600-700 pieces per month and account for 10% of total collected products amount. Nine Shells values potential consumption opportunities after products disposal very much.

## 4.4 Case Three: WJQY

### 4.4.1 Overview and Background

WJQY Information Technology Limited Company locates in Hangzhou. It has three years experience on used products collection since 2011 with the support of information and communication technology. The founder is Yi Huang, PhD of Industrial University of Zhejiang with education background in environmental engineering and computer science. He started the company with motivations of making the transition of used products collection industries from offline to online with the support of disrupt information and communication technology and making the information regarding used products collection supply and demand more transparency in order to bring convenience to the households, improve efficiency of collection process, reduce transaction costs for formal recycling and recovery factories, and in the end reduce wastes and recourses consumption for the whole communities. WJQY focuses on visiting recycling and building up connections between consumers and collection staff, and between collection staff and recycling centers through two smartphone Apps. It had tried used furniture products recycling but now suspend. They state WJQY is able to come back to the used furniture market and consider to restart this business soon once has the support from recycling centers side.

### 4.4.2 Description of Elements in Business Model Canvas

**Value proposition.** WJQY's value propositions are discovered on both sides of households' used products collection and terminal recycling and recovery companies. WJQY offers convenient and fast door-to-door collection service for household consumers, on the other hand, it also provides updated, correct and transparency information between collectors and terminal recycling and recovery companies, then shorten recycling chain trough cutting down middle segments. WJQY connects end consumers and the group of collectors and deliveries collection information between them in an efficient way. Consumers make appointments on a web page, which is built in a social network App, Wechat. The closest collector is expected to show up at the certain place and on certain time according to the appointment. Collectors come home and collect used products. Consumers would get paid trough online transaction or by cash. WJQY also builds up connection channels, a well-designed smartphone App between collectors and terminal recycling and recovery companies. Collectors and terminal recycling and recovery companies have to register their accounts in the App first. For terminal recycling and recover companies, they are also required to top-up their accounts in advance and post information such as collecting prices of different used products on the App. Recycling centers or collectors could set their own collecting prices according to the price information from terminal recycling and recover companies and they are required to update their amounts of collected materials regularly. By the App, the information communication platform, terminal companies could collect materials more efficient in a shorter time and with larger amounts. When transactions between terminal companies and collectors happening, it is required that they have to use weight scales designed by WJQY by which allows transaction data could be collected and be uploaded into WJQY's system. Payments will be transferred from terminal companies' accounts to collectors' accounts.

**Key activities.** Information and communication technology is the core competitive power of WJQY. R&D and maintenance of the App and the built in information and communication platform needs to be done daily by the technology department. The marketing and revenue department is in charge of maintenance existing partners and exploitation of potential opportunities including new cooperative partners such as collectors. The administration department evaluates and develops strategies and plans for the company.

**Key recourses.** Main office of WJQY is located in Hangzhou. Currently it has 10 employees in five departments: research and development, administration, marketing and revenue, and operation. WJQY runs its business based on the information and communication platforms including the built-in webpage and the App used on the phone. As mentioned above, core management team of WJQY is familiar with the collection industry and knows the concerns and work status of the self-employed collectors. It has built up a database of self-employed collectors. WJQY also owns the patent for the weight scale used during the transaction.

**Key business partners.** In order to extend its service area and quickly responses collection requirements, WJQY seeks partnerships with a large number of collectors and recycling centers. Currently it has built up partnership with over one hundred collectors in five largest districts in Hangzhou city.

**Consumer segments.** Consume groups of WJQY are similar with Nines Shells' which are the households, and terminal recycling and recovery companies. Not owns as many users as Nine Shells, but WJQY still covers five largest districts by the time of writing: Shangcheng, Xiacheng, Xihu, Gongshu and Ganjing of Hangzhou City. Current business of WJYQ on the recycling and recovery companies side focus on water paper and household electrics collections. Three waste paper terminal recycling and recovery companies involve cardboards, newspapers and books recycling in Jiaxing and Shanghai and over 10 middle-size household electrics recycling companies are its main consumers.

**Consumer relationship.** As mentioned, WJQY has a well-designed webpage on Wechat, which not only is one channel for consumers making collection appointments, but also for communication. It is regularly managed and subscribed newsletters are sent to communicate with its customers and potential customers in order to updates service information, and to influence the consumer lifestyle by sharing initiatives about circular economy, knowledge about enlightening people how to better recycling their wastes in an environmentally friendly way and etc. Moreover, WJQY regularly manages its App for collectors and terminal recycling and recovery companies in order to answer and response in a timely manner.

**Channels.** The main channel for customers to making door-to-door collection orders is the built-in information and communication platform in Wechat, which is one of the most popular social networking Apps in China. Besides channels between consumers and collectors, as mentioned above, WJQY's smartphone App, which allows information updates, consumer service and payments between is the other main channel.

**Revenue Stream and Cost Structure:** WJQY's business model is relative simple and does not own fixed assets which need high maintenance fee. Main component of its costs is fixed cost including personnel, physical spaces renting, information platforms maintenance and management and etc. WJQY does not charge any fees from household consumers. The main income source is from the transactions between collectors and terminal companies. 2% of total transaction is charged and as mentioned above, the application of weight scales designed by WJQY during the use phrase allows transactions and payments realizing correctly and instantly.

## 5 Analysis

### 5.1 State of the Art of CE Practices Bases on Literature Review and Case Studies

This section is to reflect on current state of circular business models practices in China's furniture industry analytically, and to present key actors and stakeholders identified for circular solutions based on previous literature review, case studies and triangulate results with primary interviews data. What is known about the state of circularity in Chinese furniture industry is that circular business models implementation in all sectors of China's furniture industry is very immature and research related is limited, as well as end-of-life management and policy of used furniture products. Circular economy initiatives and involvements are barely found in Chinese furniture industry from the bottom to up (Naustdalslid, J., 2015).

Circular business models practices of furniture manufacturing and process companies in China are product life extension, circular supplies and resource recovery related. Raw material supply has transited from mainly relying on natural recourse and material to the development of comprehensive utilization of varieties of material including renewable wood-based panels. Companies such as EasyHome Limited Company started remanufacturing by building up its own remanufacturing center to recover useful resources and energy out of disposed products. In furniture-selling sector, product-as-service business model for instance furniture rental and leasing business is the main practice. Based on literature studies and case studies of WeiYou, it is found that furniture rental and leasing companies accounted most of the rental and leasing business' market and it is adopted more among organizational consumers, however there is a great potential among personal consumers. Product life extension and recourse recovery are adopted by used products recycling sector such as used products trading-in programs and the application of smart ICT based solutions on general recycling process. Smart ICT based solutions such as smartphone Apps are able to contribute perfect reverse logistics and reduce its high transactions costs by less collection steps and time. ICT companies involved in the reverse logistics process such as Nine Shells and WJQY proved their potential to track and manage used products collection information, and organize the return for repairing, material recycling and energy recovery. Researched stakeholders in this thesis as furniture manufacturing and process companies, furniture retailers and used products recycling collector are the main objects implementing circular solutions. On the other hand, government and recovery and recycling companies are vital in the CE practice as well. In the case of used furniture products trading-in program which Beijing local government organized, remanufacturing center of furniture production companies is built as a result of the program.

In conclusion, circular business models practice such as product-as-service, product life extension, and resource recovery business modes are identified in China's furniture industry. Existing practices are facing barriers to scale up, meanwhile based on explored cases in the thesis and interviews, it shows that implementation of circular business models has potential in terms of reducing raw material consumption, increasing resource efficiency and solving problem of environment pollution. Furniture manufacturing and process companies, furniture retailers and used products recycling collector, local governments and recovery and recycling companies are the main actors and stakeholders involved in the circular business models implementation. On the other hand, there are still lots of unclear and unknown parts about the state of circularity in Chinese furniture industry, which is not covered in this thesis. The circular business models implementation in furniture producers is not well presented due to lack of available cases. Barriers for companies to implement and disseminate circular business models are identified and analyzed in the following section.

## 5.2 Barriers to the Implementation and Dissemination

This section is to identify barriers for new business models based on primary interviews data, then analysis and triangulate results of interviews with literature review in order to answer research question number two: what are the barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors. The related literature review on the barriers is within the scope of China's furniture selling and recycling sectors. Analysis is focus on products-as-service business model, online/offline furniture products recycling business model and used furniture products trade-in programs based on the framework by Bastein et al. (2014), which has already described in the methodology chapter, see Table 2-1.

### 5.2.1 Identified Barriers

Companies experience a complex mix of barriers, but it is first and foremost market based, which related to unfavorable consumer behaviors and lack of economics of scale. It is behind of consumers' attitudes towards circularity thinking which including furniture products recycling, online/offline recycling service and furniture products rental and leasing. Regarding attitudes towards furniture products recycling, Huang, Y. (2016) states role of consumers play in the recycling circle is not very appreciated. He (2016) believes a few consumers still "*hoard as a rare commodity*" and do not put their products into circular circle without very good price, however it is "*their responsibilities to take care their un-used staff*". Compared with traditional offline recycling service, "*it is relative low that level of understanding of users on the recycling through Internet*"(Yang, G. Personal Communication,). However Yang, G (2016) believes consumer's attitude towards furniture products recycling is fine, "*they would love to give away their unused products if collection service is convenient*" and he further adds that consumers' habits on handling waste materials need to follow the rapid technology development. Barrier regarding consumer behavior is also mentioned for products-as-service business model. Chen, owner of WeiYou (2016) points out consumption concepts of Chinese consumers are behind that Chinese consumers prefer to own the products compared with renting and leasing. Lack of economics of scale is one important reason keeping costs high and market demand low. There is "lack of deals from the end of life treatment factories, however used products were guaranteed to be collected if there were demand"(Huang, Y., Personal Communication). On the consumer side, Yang, G (2016) also points out that number of online service users is not growing as the same pace with investment involved and the company growth. For reasons for hindering accessing more consumers, Yang, G. believes, one of them is that "channels and means consumers could get to know Nine Shells products and service are limited".

All the interviewees in this study recognized an increasing interest on circular economy and business models related from the industry, but the market based barriers, specifically, consumer behavior, are hindering business growing, as well as the political system which did not make enabling conditions. Huang, Y. (2016) states current waste management mechanism focus on trash collection and landfill and there is a lack of policy support for used products recycling. Pointed out by Chen (2016) from the rental and leasing business was also that lack of preferential policy for renting and leasing business, especially at current early stage of development of PSS business model. One interviewee highlighted the fact that small government units such as street committees and community committee have positive effect on recycling services business and therefore it is key to maintain a good working relationship with the community.

Organizational and individual barriers are identified relatively in two directions: a lack of funds for scaling up and lack of manpower on quantity and quality. The mixed impact of financial barrier was brought up by interviewees from both used products recycling and furniture rental

and leasing companies. *“It is difficult to achieve large-scale expansion without financial cooperation with banks and other financing institutions,”* Chen states (2016). Lack of financial support on used products recycling is in line with the landfill-oriented policy. For rental and leasing business, Chen (2016) points out, *“on financial, at present, mainly private capital runs the business, for example, WeiYou has support from over-the-counter (OTC) market group of Shanghai. PSS concept needs to be identified with investors and governments and then financial support from them.”* Shanghai City conducted furniture products trade-in program in 2008 and 2009, however re-distribution of collected used furniture and financial issue restricted the expanding the program, and *“revenue on furniture reuse and recycle was low and request government subsidy”* (Ma, Y., Personal communication). Online/Offline recycling companies need to expand service area in order to cover current active users on smartphones, both interviewees encounter difficulties on collection team recruitment, *“no one wants to work as an used products collector”* (Huang, Y., Personal Communication). Individual barriers are varied with companies. To be more specific, a more diversified talent team and well educated collection staffs are needed by WJQY. Because of the high cost of training, WJQY has very simple recycling standards regarding products types and qualities. On the other hand, Nine Shells believes itself has very clear objectives among all members organizationally and act concertedly as a whole individually.

The findings further demonstrated that furniture products related barriers needed to be highlighted within the technological barriers, as specificity of recycled used furniture products was mentioned as a constraining factor for both of the interviewed online/offline recycling companies. Yang, G. (2016) states based on recycling experience of Nine Shells, used furniture products recycling cost much higher on transportation. He further highlights very small portion of recycled furniture products could be reused and realize re-commodification after disassembly. Similar problems can be observed with WJQY as well.

In conclusion, barriers for the interviewed circular business models to scale up are found to be institutional, market based, organizational, individual and technological at both the external and internal levels. However more barriers are found at the external, which market based ones dominate. Barriers identified at the external level, which institutional and market based, includes lack of back-up policy for circular business models implementation, unfavorable consumer behaviors and lack economics of scale. Internal barriers are lack of funds for scaling up and lack of manpower on quantity and quality. Used furniture products related barriers are identified under technologies barriers sector as well. Findings are put into context with literature research and discussed in the next section.

## **5.2.2 Barriers Analysis**

This section to further confirm and analysis identified barriers for new business models in above section by triangulating results of interviews with literature review with a focus on analyzing why these barrier existing.

All interviewed companies argue their business models do not only focus on the circularity of recourse but also bring convenient service to consumers. However all these business models are based on the acceptance of circularity thinking among consumers. Only the concept of circular economy accepted, consumer behaviors will follow and reflect on the concept. Specifically, the reflection of acceptance of consumers, for example, are recourses conversation, reuse and recycling products rather than throwing away, initiative to looking for recycling service and rental and leasing business instead of owning, and etc. Nine Shells expansion based on word-of-mouth proves once consumers accepted circular thinking, the current business model and service of Nine Shells could engage consumers and even let more people participate in.

The unfavorable and technology development-behind consumers' attitudes towards circular business models may due to the early stage of development of both online/offline service and PSS business models in China. The acceptance extent of circular thinking among Chinese personal consumers is not clear. There are very few consumers known and use service provide by the circular business models implementation companies. Consumers need time to know, accept and get used to the concept of these business models. The current early stage is confirmed by non-business stakeholders, and Ma Yiman, Secretary-general of Shanghai Furniture Association (2016) points out "*it is very necessary to have the circular thinking and implementation in furniture industry main due to the limited resource issue, however current trend is only staying on the thinking level, there are not much implementation going on.*" Chen (2016) compares different situation in the USA and China, "*Furniture rental business is mature and accepted among consumers in the USA, for example, 28 of 100 households rent their furniture in the USA in 2015.*" Based on Chen's analysis on consumer groups by ages, Chen (2016) states PSS concept is more accepted among young people.

In order to have more consumers and increase economics of scale, circular business models implementation companies would like to accelerate the development of circular economy in China by seeking power and support from policy and finance to promote the market, which would also contribute to reduce financial risks. Bastein et al. (2013) highlights that it has to overcome the consumers' desires of owning products and reduce high transaction costs transforming specifically to product-as-service business model. Current China's CE practice is a top-down process (CIRAIG, 2015). Naustdalslid, J. (2015) points out inadequate supporting police and little bottom-up involvement is critical challenges for implementing CE in China.

Both online/offline recycling companies argue they could contribute to a better-regulated furniture recycling market (Wang & Wu, 2013). Wang & Wu (2013) highlight recycled furniture products on unregulated market usually have lower cost due to their very few and informal treatment methods: re-sold in the flea market after simple repair or be burned as fuel. Through circular business models, formal recycling and recovery factories could reduce their transaction costs on collection through shorten recycling chain and could be competitive with inform factories. However lack of deals from these formal recycling and recovery factories currently hinder online/offline recycling companies' growth. This may due to lack of formal recycling and recovery factories (Wang & Wu, 2013). This indicates more formal recycling and recovery factories need to participate in the current circular economy movement and more channels of communication between existing formal recycling and recovery factories and recycling companies are required. The concerns and motivation of formal recycling and recovery factories need to have a further research as well. Meanwhile more companies willing to use recycled materials and renewable energy are desired in order to increase the scale.

Although online/offline recycling companies argue they could bring more benefits for used products collectors, they are still facing the problem of lacking of manpower on quantity. As a recycling company for all kinds of goods, there is a higher requirement on working experience background for collectors. Wang, Q. (2011) points out that lacking knowledge and understanding across the industry is the primary factor restricting the development of used furniture market. And in China, job positions such as used products collector usually have a relative low social statues (Li et al., 2016).

Manpower quality as a barrier is varied with companies may due to the difference between business models. As Bastein et al. (2014) state type of firm, sector or business model will all influence how the company is affected by barriers. For example, the relationship with collectors is based on partnership for WJQY. They may have more limitation on management

and training for collection crew. For Nine Shells taking collectors as key recourse of its business model has no such a problem.

Furniture products recycling have more barriers than other types of used products due to the specificity of used furniture products based on the interview results. And one reason leads to this situation is that lack of special consideration regarding spare parts of furniture products recycling during product design process (Zhu & Wu, 2013). Zhu & Wu (2013) further add that due to lack of mature and practical recycling processing technology for used furniture products, it is very hard to re-enter the market for majority of discarded used furniture. This confirms the low re-commodification rate of recycled used products mentioned by Yang, which stated above. Zhu & Wu (2013) further highlight that “low profit rate, difficulties on sales, and narrow selling channels” are the three main barriers existing after used furniture products recycled and treated.

The fact of barriers identified both at external and internal levels restricts the development of online/offline furniture recycling business model, including weak manpower in terms of quantity and quality and business partners dealing with recycled used furniture products. Business model such as PPS is relative mutual especially internally as no individually and technological barriers are identified. Barriers are varied with business models. Furniture products recycling have more barriers than other types of used products. Current China’s circular business models implementation is still at its early stage. More external changes are desired from all circular business models implementing companies, especially on policy related and on consumers’ behaviors.

## **6 Discussion**

### **6.1 Legitimacy of Research Questions**

The starting point of this thesis is that Chinese industry development faces challenges on raw material supply and environmental pollution, and implementation of circular business models enables to solve the problems at some point. However current implementation is limited and little initiatives and involvement showed from the bottom companies level. This conclusion was drawn from the author's literature analysis. It should be noticed that the literature analysis were performed from an over industrial perspective. But the scope of this thesis is China's furniture industry, which is a smaller scale than the literature analysis. This means the conclusion drawn from literature may not be applied to China's furniture industry. The research confirms practice of circular thinking in China's furniture industry is also limited. But it is still questionable how much circular business models could contribute to solving problems of China's furniture industry and whether furniture industry sectors in China encounter barriers to implement circular business models. The author conducted a future literature analysis and interviews. The views from the interviewees are univocal. All interviewees agree that their business models contribute to resource efficiency and releasing pressure on environment and they facing challenges to disseminate. However due to the novelty of the circular business models in China's furniture industry concept, the researcher could not evaluate the potential and compare it with the others analytically. Therefore, in this research, the author only presents barriers to implement and disseminate circular business models in China's furniture industry. For future studies, it might be interesting to identify and quantify potential of the implementation of circular business models. On the other hand, the research's intention was to conduct an overall barrier analysis on the China's furniture industry including manufacturing and processing companies, furniture-selling sector and products recycling sector together, however due to various reasons, for instance, the limitation of available cases, the accessibility of the interviewees in terms of location, time and contacts, and etc., there were no cases from manufacturing and processing sector identified. Therefore, the researcher only analyzed barriers from furniture-selling sector and products recycling sector.

### **6.2 Legitimacy of Scope**

This thesis examines the barriers for to the implementation and dissemination of circular business models in China's furniture sector, but in some circumstances, the author expanded or narrowed down the scope. This is because furniture industry has a wide range of sectors and includes a variety of products. For example, furniture selling sector is generally classified into two categories: selling by furniture manufacturing and processing companies selves or their agents because they have different features and market. This means they could face different barrier for adoption circular business models such product-as-service. This point of view has been mentioned in the literature. Lin et al. (2013) state furniture products for leasing and renting usually come from purchasing or customized furniture. Due to lack of funding or production ability, products types for renting and leasing usually are limited. For a few companies, which have the ability to run their own furniture production has no such problem. But this thesis did not pick one over another due to limited cases to presents the differences. In addition, as stated in the section of products types, furniture products could be categorized into many kinds of types. Some interviewees mentioned barriers for these different types of products are also different. But due to same reason as above, the author did not make a choice from the whole. Generally speaking, the author adapted the scope of this thesis on the basis of the knowledge and experience of the interviewees of available cases. In the future, it might be interesting to look into one of these fields.

### **6.3 Generalizability of Results**

Initially, this thesis first aimed to explore the current state of circular business models practice and with a strong focus on China's furniture industry. This means the conclusion of the thesis may not be applied to other nations, regions or any other industry either, as there are context differences. Second aim of the thesis was to find out barriers hindering the implementation and dissemination of circular business models with a focus on China's furniture selling and recycling sectors, which means the conclusion of research question two is not be applied to the whole China's furniture industry as barriers for furniture manufacturing and processing industry were not taken into analysis. Furniture producers may not identify or confirm with the same barriers as selling and recycling sectors identified and confirmed, results would change. Nevertheless, based on the data collected, the author reckons the results of thesis could be applied to a broad scope, to general used products recycling, especially for the application of ICT based solutions on general recycling process. First, desktop research of ICT based solutions application on reverse logistics was performed at the level on general recycling process which includes other kinds used products as well, as there is little research specifically about ICT based solutions application in used furniture reverse logistics. Secondly, the author conducted a limited number of interviews, and the majority (4 out of 7) of the interviewees are from ICT based solutions application in general recycling process. This is due to various reasons stated previously. So the information collected from the interviewees might be insufficient for analyzing used furniture products. Last not the least, ICT companies involved in the reverse logistics do not only work on used furniture product recycling but also a variety of used products. This means it is possible apply this study's results to other used products reverse logistics as well. Also caution would be raised regarding limited samples of the research. Findings indicate that barriers are varied with business models and types of company, however, in this thesis research, the number of companies interviewed does not allow for further indication.

## **7 Conclusion and Recommendation**

This chapter summarizes the main findings and lessons learned in the course of this research, primarily by answering the stated research questions in section 1.2, and provides suggestions for further research.

### **7.1 Research Questions Addressed**

Current Chinese furniture industry is under high-speed development; overall low profit rate and limited raw resource supply are its main concerns for continuous growth, as well as environmental pollution. To tackle the problem of limited raw resource supply and environmental issues, China's furniture industry needs to close the loop of material and resource and seek innovations in the areas of processing, developing circular products, and circular business systems. Implementing the circular economy in the industry is necessary and will contribute to its economically sustainable growth. Therefore, it is in a great need for new business models based on circular economy thinking, such as reusing, remanufacturing, recycling and sharing. However current real world examples of circular business models implementation in China's furniture industry and research related with it is very limited. And there are very little circular economy initiatives showed in Chinese furniture industry from the bottom to up.

So exploring and understanding these limited business models and conditions under which resource efficiency can be enabled and secured, especially the interrelations between barriers hindering the implementation and dissemination of circular business models, is therefore needed. The research on the exploration and understanding of the implementation in reality could serve as a foundation to develop and refine the applied circular business models and then pave the way for a further and sound development of circular economy in China's furniture industry, and as well as its theory generation.

Recapping aims of the research, they were to explore the current state of circular business models practice in China's furniture industry and to identify key actors in and key stakeholders for circular solutions; to provide a better insight into the implementation of the circular economy concept and find out the barriers hindering the implementation and dissemination of circular business models in China's furniture sector. Therefore research questions were developed to fulfill the two aims:

- What is the current status of implementation of circular business models in China's furniture sector?
- What are the barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors?

It was possible to gain an overview of current status of implementation of circular business models in China's furniture sector and barriers to its implementation and dissemination in China's furniture selling and recycling sectors Via a process consisting of literature research, qualitative data collection through interviews, and case studies.

RQ I: What is the current status of implementation of circular business models in China's furniture sector?

Circular business models practice such as circular supply, product-as-service, product life extension, and resource recovery business modes are identified in China's furniture industry. Existing practices are facing barriers to scale up, meanwhile based on explored cases in the

thesis and interviews, it shows that implementation of circular business models has potential in terms of reducing raw material consumption, increasing resource efficiency and solving problem of environment pollution. Furniture manufacturing and process companies, furniture retailers and used products recycling collector, local governments and recovery and recycling companies are the main actors and stakeholders involved in the circular business models implementation.

RQ II: What are the barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors?

The main barriers to the implementation and dissemination of circular business models in China's furniture selling and recycling sectors on a wider scale were identified to be institutional, market based, organizational, individual and technological at both the external and internal levels. More barriers found at the external level, which market based ones dominate, including lack of back-up policy for circular business models implementation, unfavorable consumer behaviors and lack economics of scale. Internal barriers are lack of funds for scaling up and lack of manpower on quantity and quality. Used furniture products related barriers are identified under technologies barriers sector as well. Barriers are varied with business models. Current China's circular business models implementation is still at its early stage. More external changes are desired from all circular business models implementing companies, especially on policy related and on consumers' behaviors.

## 7.2 Suggestions for Future Researches

Limitations of the study that can be filled in the future research, the following five areas are interesting to explore in order to fill the gap.

Firstly, more real world examples of circular business models implementation in China's furniture industry, especially in manufacturing and processing sector and more circular business models such as sharing platforms and circular supply are desired. This exploration could serve as a foundation to develop and refine the applied circular business models and as well as its theory generation, as mentioned in the introduction, and also contribute to integrity barriers analysis for implementation and dissemination of circular business models in China's furniture industry.

Second, all interviewees argued that circular business models contribute to resource efficiency and releasing pressure on environment. It is valuable to evaluate the potential of implementing circular business models in China's furniture industry.

Third, research regarding consumer behaviors, and recourse and material recycling and recovery companies. The acceptance extent of circular thinking among Chinese personal consumers is not clear. Some interviewees mentioned lack of deals from formal recycling and recovery factories currently hinders online/offline recycling companies' growth. Reasons for the lacking could be lack of recycling and recovery factories or inefficient communication between each other. Therefore, future researches could have an exploration on current state of recycling and recovery factories in China, including their concerns and motivation.

In thesis, the author also explored regulation provision for furniture products recycling in general. But as this is not the focus of this thesis, the author did not investigate in-depth. In the future, future researches could have an exploration on regulation provision nationally and regionally.

Lastly, barriers analysis could be more specific according to furniture products types and type of firms. Recycling process and markets are varied due to furniture products types and types of firms, so it is possible that they would face different challenges. This thesis do not choose one over another, future studies could focus one field and investigate the barriers.

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## Appendix A – List of interviewees

	Business Representatives from Circular Business Models Implementation Companies
	Non-Business Representatives from Other Stakeholders

Organisation/Company	Name & Affiliation	Date	Type of interview
WeiYou Furniture	Chen Weilong, Founder and Owner	March 1, 2016	Face-to-face, Personal Communication
WJQY IT	Huang Yi, CEO & Founders	March 2, 2016	Face-to-face, Personal Communication
WJQY IT	Xu, Chief Marketing Officer	March 2, 2016	Face-to-face, Personal Communication
Nine Shells App	Yang Gaoxiao, Chief Marketing Officer	March 3, 2016	Face-to-face, Personal Communication
Maiji Regeneration	Li Bowen, Entrepreneur	February 25, 2016	Face-to-face, Personal Communication
MEDL Furniture Retail	Liu Wei, Owner	March 7, 2016	Face-to-face, Personal Communication
Shanghai Furniture Association	Ma Yiman, Secretary-general of the Association	March 11, 2016	Face-to-face, Personal Communication

## **Appendix B – Interview questionnaires for business representatives**

Q1: Basic information: name, working position, working location, details regarding the company in terms of size, history and etc.

Q2: Explain your business model briefly: including important features of the services in the model and the market landscape for the business.

Q3: Drivers and barriers for the company to work with circular business model. How to overcome those barriers? What is the potential working with circular business model?

Q4: In the context of China, what need to be considered additionally when applying circular economy principles to furniture products?