



## FLOATING CHAPEL—

A Redesign of Chinese Weddings towards Sustainability

Name: Ying Lin

Supervisor & Advisor: Mikko Jalas

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**Author** Ying Lin

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### Abstract

Weddings have significant impacts on the environment and society, especially in China, where a complicated set of cultural and social factors have resulted in a unique wedding consumption culture. The two distinctive features of Chinese weddings, 1) the prevalent overconsumption behaviour and 2) the focus on the temporary ritual space, intertwine to pose great challenges to sustainability, including large amounts of waste production, resource consumption, and economic cost. Thus, the thesis "Floating Chapel—A Redesign of Chinese Weddings towards Sustainability" is explorative design research that proposes an alternative design strategy to ease the burden of Chinese weddings. The main objective is to design a participatory wedding planning product-service system concept, which involves consumers in the design and production process and consequently eliminates unnecessary consumption.

This thesis investigates the overconsumption in Chinese weddings, and the research process is divided into two parts: a theoretical study and design exploration. The theoretical study uncovers the reasons behind the distinctive Chinese wedding culture, focusing on the wedding planning sector, and gains knowledge from Design for Sustainability (DfS) and sustainable movements in relevant fields. This portion selected four DfS approaches (design for sustainable behaviour (DfSB), product-service system design (PSSD), participatory design, and transformable design) for the next part. The design exploration was conducted in three steps with multi-method research in the Chinese wedding industry. The first step is a workshop with consumers to investigate demands and generate the initial concept. The second step illustrates the system map and service blueprint of the existing Chinese wedding planning system to locate the problems and opportunities from the perspective of the wedding industry insiders. Lastly, the concept development builds upon previous findings with the selected DfS tools and inspiration from existing case studies. At the end of concept development, the feedback from the focus group interview serves as the final refining section. Thereafter, the thesis concludes by conceptualising a participatory wedding planning product-service system strategy, which consists of a transformable structure and a product-oriented product-service system.

The study fills the research gap between Chinese weddings and Design for Sustainability (DfS) areas and questions the production and consumption system in the Chinese wedding planning industry from the perspective of designers. The outcome of the study is an alternative design strategy that enables consumers to adopt sustainable weddings by changing their role from the observer to the co-designer.

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**Keywords** Chinese weddings, Design for Sustainability (DfS), design for sustainable behaviour (DfSB), product-service system design (PSSD), participatory design, transformable design

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## **Preface**

I would like to express my sincere gratitude to all people who helped me during the long journey of writing the thesis. Firstly, I want to thank my supervisor Professor Mikko J alas for his guidance. Secondly, I want to acknowledge the help I received from my friends at Aalto University and Tongji University. I also want to thank my parents for their unconditional support.

## **Abbreviations**

DfS	Design for Sustainability
DfSB	Design for sustainable behaviour
PSSD	Product-service system design
PSS	Product-service system

# 1 Introduction

## 1.1 Personal Motivation

Three years ago, an invitation aroused my initial concept of redesigning Chinese weddings. A Chinese wedding planning company purchased a small island and invited me to design a wedding chapel on it to provide memorable wedding experiences for customers. As a design student working in the field of sustainability, I started to pay attention to the relationship between Chinese weddings and sustainability.

Since I had a memory of attending weddings, I noticed that Chinese society provides so much emphasis on ceremony planning. It is a common phenomenon that Chinese people spend a significant amount of time and money on the design and decoration of the ritual space. As the carrier of a particular ceremony, the ritual space pattern varies depending on the ever-changing components, such as participants, activities, information, and emotions. In recent years, the constant demand for perfect weddings and increasing purchasing power in China provide a massive marketplace for the wedding planning industry to flourish. With a focus on temporary ritual spaces, the industry offers customised products and services for couples to exchange vows in chosen venues. However, the intensifying overconsumption in the Chinese wedding industry poses great challenges to our ecology, economy, and society. On this point, plenty of people have recognised the excessive consumption phenomenon and attempted to think creatively; however, limited studies and practices have been conducted on the impacts of Chinese weddings and the potentials for sustainability. Clearly, designers need to bridge the gap between Sustainability and Chinese weddings and explore potential sustainable solutions for these challenges.

Thus, this thesis aims to develop an alternative design strategy with three milestones. The first milestone is gaining a comprehensive understanding of Chinese weddings—not limited to investigating the current status and the factors behind the distinctive features, but also uncovering the current production-consumption system as well as potentials. The second milestone is acquiring

knowledge from DfS approaches and relevant practices as well as applying suitable approaches to the problems of Chinese weddings. The last milestone is taking this thesis as an opportunity to conceptualise a sustainable design strategy based on the findings from the theoretical study and empirical research

## 1.2 Research Background

Over the past few decades, increasing global challenges such as climate change and growing population have brought sustainability to the top priority of human beings. In 2015, the United Nations proposed 17 Sustainable Development Goals as "the blueprint to achieve a better and more sustainable future for all", and the 12th goal is "Responsible Consumption and Production" for the global community (United Nations, 2015). As the awareness and demands towards sustainability has kept rising in recent years, the definition of sustainable development has evolved from a static goal on environmental balance into a dynamic system emphasised on both ecological and social prosperity (Ceschin & Gaziulusoy, 2016). To achieve sustainability, the designer and educator Papanek (1995) stated that designers and architects should play a crucial role in linking humankind and nature, which requires them to manage both sociologist and ecologist roles to provide more ethical solutions based on social responsibility for production and consumption. On this point, as worldwide social events that happen every day, weddings have been attracting ever more attention recently due to its huge environmental influence as well as the significant impacts on the economy and society.

### 1.2.1 Global Weddings

People attach great value and significance to a memorable wedding in their life, no matter what nationality and religion they belong to (Breg, 2013). As the dream maker for ideal weddings, the wedding industry has become one of the most fast-developing sectors globally, especially in America, Western Europe, India, and China (Perry, 2006). Although the wedding culture varies from country to country,

almost every single wedding in the world brings considerable impacts on our environment and society.

As a significant social event supported by a set of commercialised goods and services, a wedding has a noticeable environmental influence. Numerous researches on Western weddings indicated that the average Western wedding would produce a large amount of pollution due to unconscious consumption behaviour and material utilisation, especially in the U.S. (e.g., Edmunds, 2008). Take the most typical representative of Western weddings as an example: the average American wedding produces 63 tons of CO<sub>2</sub> emissions and 400 LBS of waste in one single day; the number of carbon footprint equals the equivalent emissions four to five people would produce in an entire year; moreover, based on an estimated two million weddings per year in the country, the American wedding industry produces more than one billion LBS in one year (Harrison, 2008) (see Figure 1). According to the SAGE (Sound Advice for a Green Earth) project, transportation is the largest source of the total carbon footprint of an American wedding, while the venue and floral decoration take second place (see Figure 2) (Riya, 2017).

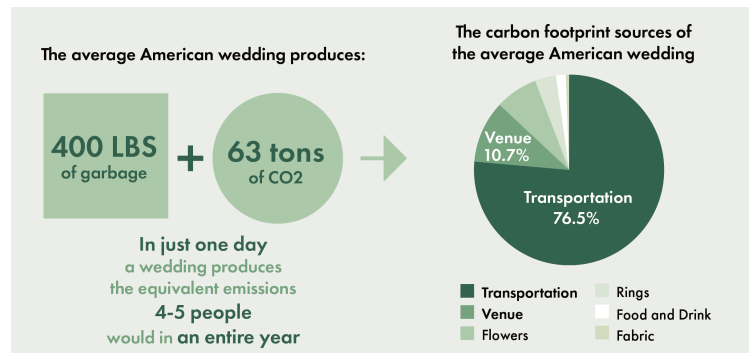


Figure 1 (left): The waste and CO<sub>2</sub> emissions of the average American Wedding (adapted from Harrison, 2008).

Figure 2 (right): The carbon footprint sources of the average American Wedding (adapted from Riya, 2017).

The main reason behind the structure is that traditional Western weddings usually be held in the local churches due to the religious tradition—the validity of marriage is officially approved by the priest at the wedding ritual. In this case, only intimate family members and close friends of the couple will be invited to witness the wedding and join an after-wedding reception (Guo & Wang, 2016). Therefore, Western people who pursue a sustainable wedding have an optimal solution—choosing an appropriate venue that minimises the total amount of transportation of all guests. Besides, plenty of guidebooks and online toolkits have emerged to help Western couples plan sustainable weddings as plenty of Western people prefer preparing weddings by themselves. However, the same approaches cannot be applied to Chinese weddings mechanically due to the distinctive Chinese wedding context.

### 1.2.2 Chinese Weddings

Transportation cannot be considered a breakthrough in the Chinese wedding context due to several differences between Chinese weddings and Western weddings. Firstly, the choice of Chinese wedding venues are tied to traditional banquets, which are commonly held at hotels or restaurants in the city centre. Unlike the Western tradition of tying the knot in the church with an afterparty on the same day, Chinese people register marriages at the local offices of Civil Affairs Bureau while holding the actual ceremony with a quite sizable banquet at another chosen time and venue. Secondly, based on the large banquet tradition, the number of guests in a Chinese wedding can often be hundreds, which is different from the typical short guest list of a Western wedding. In the 2010s, the average number of banquet tables at a Chinese wedding is 38, which means more than 400 guests (Fu et al., 2019). Lastly, Chinese society has a unique phenomenon that people usually hold the wedding twice, even three times in separate locations (Wang, 2010). In this case, the guests do not need to fly over as the couple flies to them. Obviously, the Western solution does not work for Chinese weddings; therefore, the first step for designers to connect Chinese weddings with sustainability is investigating the distinctive Chinese wedding consumption culture in depth.

China has a mix of factors, including its economy, population size, long history, rich cultures, and distinctive development path, that results in a distinctive wedding consumption culture. Two main features of Chinese weddings are indicated in this thesis: 1) the prevalent overconsumption behaviour and 2) the focus on the temporary ritual space.

### 1.2.2.1 Overconsumption in Chinese Weddings

Spending up to several years of income on a high-quality wedding has become the norm in Chinese society for decades, and this overconsumption phenomenon is intensifying in recent years. Although the data from the government shows that the number of marriage registrations in China has been decreasing in the past five years, the wedding market in China has been continuously flourishing; in 2020, the industry became a significant business worth nearly 3 trillion RMB (0.39 trillion EUR) (see Figure 3 & 4). According to the industry report released by Wedding Industry Observation<sup>1</sup> and Marrymemo<sup>2</sup> (2020a), the average expenditure of a Chinese wedding in 2019 has reached 223,000 RMB (28,700 EUR), which is 3.5 times as much as 2015. Accounting for about 30% of the total budget, the average expenditure for wedding planning, which is displayed within only one day, equals more than three times the average living costs of one Chinese person in the entire year. This phenomenon is definitely not a fad in recent years. Earlier, in 1998, the Watabe Wedding Corporation of Japan analysed the characteristics and dynamics of Chinese wedding market: the budget of a short-lived ceremony is twice or three times the annual income of the average Chinese person (Kanabayashi, 1998).

<sup>1</sup> Wedding Industry Observation: the largest Chinese wedding industry media that responsible for annual industry reports.

<sup>2</sup> Marrymemo: the largest Chinese wedding service platform that has more than 80 million registered users.

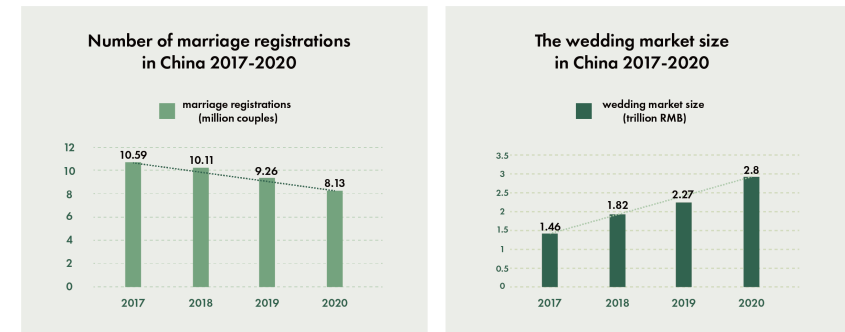


Figure 3 (left): Number of marriage registrations in China 2017-2020 (statistics source: China Industry Information Network, 2020).

Figure 4 (right): The size of wedding market in China 2017-2020 (statistics source: China Industry Information Network, 2020).

### 1.2.2.2 the Focus on the Ritual Space

While the large banquet retains a dispensable role in the entire wedding process (Wang, 2010), it is common for Chinese couples to spend half of the expenditure on the banquet in the past 30 years (Fu et al., 2019). As the banquet has served as an unshakable tradition almost controlled by parents, another significant sector in Chinese weddings—the ritual space design has become the primary focus within the control of young Chinese couples. Because most Chinese people are irreligious, they have more freedom in the wedding space design instead of choosing a built church. The constant demands for the perfect wedding spaces combined with overconsumption behaviour have provided a large marketplace for the wedding planning sector to flourish. Chinese couples are willing to spend a considerable amount of money on hiring professional wedding planning teams to design their ritual spaces. The data collected in the Guangzhou Winter Exhibition of China Wedding Expo (2018) showed that the average couple spent 30,000 RMB (3,862 EUR) on wedding planning service in 2018 (Figure 5), which is the second-highest expenditure below the banquet and venue sector (Zheng, 2018). According

to the data released by Wedding Industry Observation and Marrymemo (2020b), the wedding planning sector has become increasingly significant in the past decade, and it overtook the banquet sector as the primary spending due to the influence of the COVID-19 pandemic in 2020 (Figure 6).

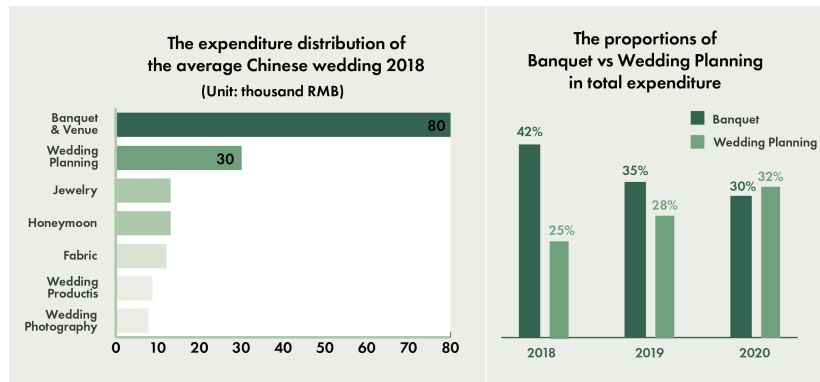


Figure 5 (left): The expenditure distribution of the average Chinese wedding 2018 (statistics source: Guangzhou Winter Exhibition of China Wedding Expo, 2018).

Figure 6 (right): The proportions of banquet and wedding planning in total expenditure in the Chinese wedding industry 2018-2020 (statistics source: Marrymemo Data Center, 2020).

### 1.2.2.3 Sustainability Challenges

The constant desire for perfect wedding spaces of Chinese people and the intensifying overconsumption behaviour in the wedding planning market intertwined together to pose great challenges to sustainability. Firstly, constructing temporary structures at vacant sites requires massive interventions with consequent resource consumption and waste production. Meanwhile, the overconsumption behaviour increases the environmental impact of the entire production-disposal process of the short-lived wedding space. Besides, the total

influence added up by a large number of Chinese weddings is remarkable. As shown in Figure 3, although the number of marriage registration has been decreasing in recent years, the authority still issued 8.131 million marriage licenses in 2020, representing nearly four times as much as in America. Moreover, the impacts of Chinese weddings are not limited to the environmental dimension; the high price and cumbersome procedure also place pressures on the couples and their families. In this case, the modern Chinese generation, who are busy working and with low- and middle-income, are seeking an alternative solution—a wedding planning package that can not only satisfy their requirements but also save time and money. To fulfil the emerging consumer demand as well as reduce the total impacts of Chinese weddings, designers should bridge Design for Sustainability (DfS) approaches and Chinese weddings based on a comprehensive understanding of both fields.

### 1.2.3 Contribution of the Thesis

There has been abundant research on Chinese weddings from the sociological and anthropological perspectives; however, there are limited studies in the design field. Most of the research topics focused on a single product or service, such as wedding dresses and wedding photography, not to mention sustainability-related issues. Meanwhile, there has a growing amount of research on Design for Sustainability (DfS) approaches, which has evolved from material and product innovation to design for systemic transitions. However, there is a research gap regarding sustainable weddings. Only a few researchers abroad have worked on green innovation in the wedding industry, and most of these studies are limited to the environmental impact without system thinking. Therefore, the thesis structures the current Chinese wedding production-consumption system based on empirical materials and explores the potential of applying DfS approaches to this field.

The research objective is not to criticise the consumption norms of Chinese weddings or condemn issues that present themselves within the supply chain, nor is it to offer a complete solution for the overarching problem in the entire Chinese

wedding consumption phenomena. Instead, it is about uncovering the cultural and social factors that comprise the distinctive features of wedding culture in China and identifying the gaps with sustainable thinking in the world today. This thesis examines thoroughly the existing Chinese wedding planning product-service system based on first-hand data collected through multi-method research with involved stakeholders—target customers, professional wedding planners, and suppliers. The design exploration part of the thesis synthesises a design proposition on the potential for the industry towards sustainability—a participatory product-service system strategy. In this way, the contribution of this thesis is to fill the gap between Chinese weddings and sustainability with an alternative design strategy.

### 1.3 Objectives & Research Questions

#### 1.3.1 Scope of Research

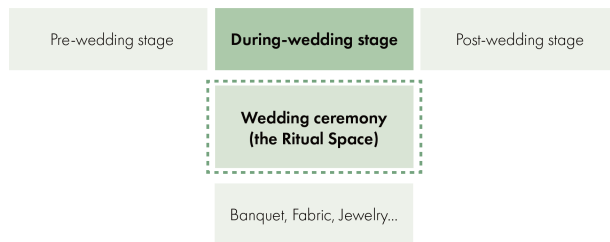


Figure 7: Scope of research.

The thesis covers the issues of Chinese weddings and Design for Sustainability (DfS) approaches, which are both broad fields. Generally speaking, all the products and services of weddings can be divided into three segments based on the wedding process structure: 1) pre-wedding stage, 2) during-wedding stage, and 3) post-wedding stage (Han & Yang, 2013). Wedding issues in the pre-wedding

stage, the post-wedding stage, or the systemic problem regarding weddings are not the primary focus of the thesis. The thesis only concentrates on the during-wedding stage of Chinese weddings in a narrower sense: the temporary ceremony that was planned before and executed on-site during the wedding day. From the perspective of the wedding planning service sector, the main objective of the during-wedding stage is providing the ritual space with an appropriate atmosphere for the couple to perform the significant rites. Other products and services outside the scope of wedding planning, such as wedding dresses, banquets, and jewellery, which belong to other fields, will not be discussed in this thesis. As shown in Figure 7, the study will focus on the creation of the main ritual space at the wedding ceremony—the temporary structure designed for the couple to stand under the spotlight and perform the wedding rite. This setting is easier to research without discussing the guest reception area and decoration for furniture, which are impacted heavily by numerous changeable factors such as the number of audiences and the size of the venue. Based on an understanding of Chinese weddings and the DfS framework, this research focuses on four appropriate DfS approaches, including design for sustainable behaviour (DfSB), product-service system design (PSSD), participatory design, and transformable design.

#### 1.3.2 Research Questions and Objectives

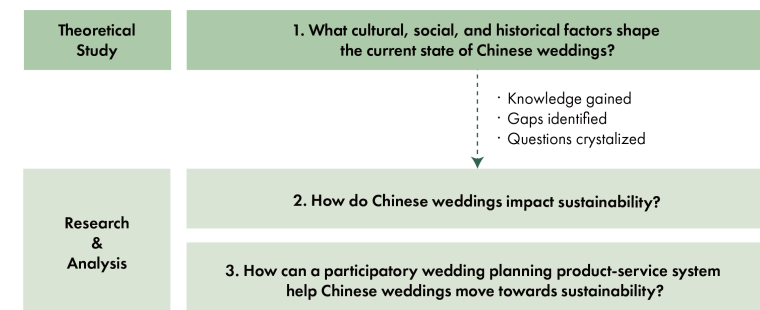


Figure 8: Research questions.



This thesis aims to answer one explanatory question and two exploratory questions:

1. **What cultural, social, and historical factors shape the current state of Chinese weddings?**
2. **How do Chinese weddings impact sustainability?**
3. **How can a participatory wedding planning product-service system help Chinese weddings move towards sustainability?**

Figure 8 visualises the formation of these three research questions. The Research methods and process chapter will provide a full explanation of the methodology, details of each research method, the reason for selection, and the execution process.

With a focus on the existing problems of Chinese weddings, the main objective of the research is to design a participatory wedding planning PSS concept that allows consumers to adopt sustainable wedding options and consequently eliminates unnecessary consumption of resources. Firstly, the participatory design service enables the end users to take actual control of the concept development process, rather than only being outside observers. In this case, they can adapt the composition of the final result according to the transparent information and achieve personalisation. Secondly, the transformable structure with a simple actuation system alleviate the impacts of the supply chain and increase the self-fulfilment of consumers by involving them in finishing or making parts of products.

### 1.3.3 Structure of the Thesis

This thesis is a combination of theoretical and applied research, where the findings of theoretical and empirical research support the design development in chronological order. A comprehensive review of existing literature provides a base of knowledge on Chinese weddings and Design for Sustainability. The empirical research follows through multi-method interactions with stakeholders and cases studies surrounding wedding planning. In general, this research aims to bridge the gap between Chinese weddings and sustainability by proposing a sustainable

design strategy. The text below is a brief explanation of the structure.

- **Chapter 1** is this chapter, declaring personal motivation, background information and research objectives.
- **Chapter 2** is the theoretical study, focusing on three topics – Chinese weddings, Design for Sustainability (DfS), and sustainable weddings.
- **Chapter 3** explains the methodology and methods of design exploration portion.
- **Chapter 4** analyses the current system of the Chinese wedding planning industry with the System Map and Service Blueprint tools based on the knowledge gained from the theoretical study and data collected through empirical research. The empirical research was conducted in three main steps:
  1. The first step is a workshop, where the problems and initial concepts are presented;
  2. The second step including 1) a content analysis of collected expenditure details of 36 typical Chinese wedding projects to identify the existing references system; 2) an interview with a professional wedding planning company to map the current production-consumption system; 3) an action-based observation to experience the wedding planning process and gain the first-hand data for the service blueprint;
  3. The last step including 1) case studies of one PSS design case and one transformable design case. Combining with the theories of Sustainable weddings analysed in chapter 2 to develop the design concept by using the selected DfS approaches; 2) a focus group interview to examine and evaluate the feasibility of the redesign concept.
- **Chapter 5 & 6** summarises the findings from the theoretical study and the design exploration and answers the research questions. In addition, the last chapter discusses the limitations of the research and suggestions for future research.

## 2 Theoretical Study

### The structure of theoretical study

The theoretical study focuses on the fundamental background knowledge of this research project and consists of three major parts and a synthesis:

The first part examines Chinese weddings—the background information about wedding ceremonies as a significant role in Chinese society, which clarifies the reasons behind the distinctive features of Chinese weddings (Creswell et al., 2016). One distinctive feature of Chinese weddings is the overconsumption behaviour to which people usually spend the equivalent of several years of income on a result-oriented wedding service with minimal participation. Another feature is the focus on temporary ritual spaces, which results in massive amounts of waste production, resource consumption, and economic cost. According to the Social Psychology field, consumer behaviour must be influenced by a combination of factors under a socio-cultural context (Baron & Byrne, 1987). Therefore, an understanding of Chinese weddings requires a comprehensive cognition of the cultural and social contexts. Moreover, the grandeur of ceremony patterns provided by the fast-growing wedding planning market also shapes the overconsumption behaviour as it exists today. In general, I summarise the influencing factors of Chinese weddings into three main categories: 1) the cultural context: familial significance, social identity, and relations construction; 2) the social context: economic development, the one-child generation, and Western influences; and 3) the market dynamics: complexity versus simplicity, current status, and challenges & opportunities.

The second part of the research focuses on Design for Sustainability (DfS) and has three sections: 1) an overview of the DfS field; 2) the identification of the relationship between Chinese weddings and sustainability; and 3) an introduction to the applicable DfS approaches selected based on the previous two sections. The approaches chosen for this research include design for sustainable behaviour (DfSB), product-service system design (PSSD), participatory design, and transformable design.

The third part of reviews Sustainable weddings to learn from sustainable

movements in relevant fields: sustainable events, green weddings, and sustainable installation art.

This chapter concludes with the synthesis based on the overview of the three major parts. Literature reviews at Chinese weddings and Design for Sustainability (DfS) fields provide the necessary information and ample space for synthesising and further processing.

### 2.1 Chinese Weddings

#### 2.1.1 Cultural Context

Weddings have long been an integral part of most societies more than an isolated affair, while culture plays an influential role in these tradition-based events (Deshpande & Webster, 1989; Rook, 1985). From a practical perspective, wedding patterns usually vary across regions due to diverse cultural backgrounds, community values, and geographic locations. However, although China is a multi-ethnic country covering a vast territory and has the largest irreligious population in the world (Yang & Huang, 2018), wedding traditions from different dialect groups still show similar features due to the same cultural roots. On this point, this section identifies three significant cultural factors that defined the traditional Chinese wedding culture; they are familial significance, social identity, and relation construction, which are interrelated with each other over the long history of Chinese weddings (Figure 9).

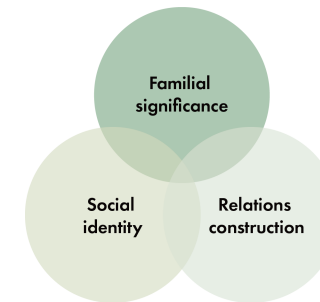


Figure 9: Three interconnected cultural factors of Chinese weddings.

The particular concern of familial significance and social identity turns a Chinese wedding ceremony into a site for relation construction. Meanwhile, social identity is emphasised in a Chinese wedding to support familial values building and personal relation construction. Obviously, no matter which factor came first or took the lead, these three components developed into a crucial force that shaped the distinctive features of Chinese weddings almost simultaneously.

### **2.1.1.1 Familial Significance**

Chinese people tend towards collectivism and live a family-oriented lifestyle influenced by traditional culture like Confucianism, which shapes their attitudes towards marriages and weddings (Brislin, 1993; Hu, 2017). In traditional Chinese culture, the value of marriage for the community is one of the forms of "Xiao"—Filial piety, which signifies the young generation should be respectful and obedient to parents and the ancestors by carrying on the family name (Cheung, 1972). An epitome of the mainstream value is the traditional wedding rite "Bai Tang"—the newlywed couple should take three bows in the wedding altar: the first bow for the ancestors to pray for the blessings, second bow for the parents to express gratitude, and last one for each other to show love (Xue & Feng, 2007). In this way, marriage is validated after receiving recognition and blessings from both families. Therefore, the wedding offers a platform not only for the couple to obtain social recognition from their families but also for the families to reconfigure the family bond; it is a significant event for Chinese people to display respect and devotion within the ongoing family dynamic (Fog, 2002; Sniezek, 2005).

In Chinese feudal society, a wedding is more about two families united in the marriage than the bride and groom due to the norm of arranged marriages. The old Chinese saying "Men Dang Hu Dui", which means roughly "doors of two families in equal size", demonstrates the marriage is an alliance of two families with matching backgrounds and mutually benefits under parental consideration (Larmer, 2013). In this case, the wedding is also a parental decision based on the honour and social status of both families (Cheung, 1972). The ancient phrase "a

parent's command and a matchmaker's word" from the statement of Mencius, the famous Confucian, also underlies the tradition of parental control rights in Chinese marriages and weddings (Sheng, 2004). For Chinese parents, offering supports to the wedding of their children is a moral imperative; even grandparents might play a significant role in this collective affair. In this way, the tremendous capital from the parental generation leads to lavish wedding consumption. In other words, parents were actual decision-makers behind extravagant traditional Chinese weddings as they had complete authority over this issue in the past.

Although the modern Chinese generation takes more control of their weddings based on the freedom in love matches instead of arranged marriages, the parental authority still has significant influences on Chinese weddings. According to recent researches, filial piety still maintains a significant role in modern Chinese family systems (Fu et al., 2019). The young generation values parental involvement and ensures the happiness of the eldership in the wedding by following their opinions (Ghee, 2016; Nguyen & Belk, 2013). During the consumption decision-making process on wedding products and services, Chinese couples tend to inherit the family traditions passed down by ancestors (Boden, 2003). Traditionally, Chinese people consider the wedding a public display of the wealth and social status of both families. A formal grand wedding presentation followed by a sizeable Chinese-style feast with numerous guests has become a tradition for the sake of family face. The face is influential in Chinese consumer culture, especially in wedding consumption; ensuring proper family interactions and following traditions are significant to avoid losing face (Nguyen & Belk, 2013). Moreover, the older generation believes that the newlyweds can receive more blessings, fortune, and happiness by holding a larger wedding. In the large gathering, the long guest list includes most relatives and friends of two families; besides, the banquet is as lavish as possible with a plethora of traditional Chinese dishes (Shine, 2019). All these parent-dominated traditions shaped the traditional Chinese wedding as a significant public spectacle under the support of both families.

### 2.1.1.2 Social Identity

As a reflection of Chinese collective value, which focuses on community interaction and the psychological intimacy between group members (Brislin,1993), traditional Chinese weddings have two significant functions for establishing the social identity of the new couple.

Firstly, the wedding offers a site for families and communities to validate the marriage relationship and identity transition of the new couple (Chesser, 1980; Fog, 2002). For Chinese people, the wedding symbolises one of the most significant milestones in life and formally redefines personal and social identity. From singlehood to marriage, the newlyweds will involve in new families and communities in new social identities provided by the wedding. In Chinese traditional culture, the marriage is genuinely validated after performing the ritual, as all guests have perceived the relationship of the newlyweds after the wedding. Due to the collectivist nature of Chinese society, the desire to gain validation from their social circles at large continues to the present day. In other words, the couple considers the wedding ceremony as the climax to complete the union with public recognition (Costa, 1997).

Secondly, the wedding is fundamentally a rite of passage for the newlyweds to regularise and institutionalise their transition to the next new life phase. For Chinese young adults, getting married means leaving parental housing and moving in their own place, which marks the start of a new family and financial independence. Traditionally, the new married couple should take responsibility for themselves and each other, such as raising children, supporting the elderly, and earning their own living without the dependence on parents. During the traditional wedding process, two immediate families are willing to offer adequate funding and human resources to support the couple to prepare for the new life (Brown et al., 2011; Nguyen & Belk, 2013). All guests, including direct relatives and non-relatives, also send a red packet of money as a gift (Brown et al., 2011; Guo & Wang, 2016). Therefore, the couple and families carefully chose all the ceremony components as the wedding has become a significant avenue to express their brand-new status in public.

### 2.1.1.3 Relations Construction

The main distinguishing feature of Chinese consumers is their shared purpose in the development and construction of interpersonal relations (Eckhardt & Houston, 2008; Joy, 2001; Tse, 1996); the network is recognised to smooth business, contribute information and resources in Chinese society (Davies et al.,1995). On this point, as a large gathering of the entire social network of two families, a traditional Chinese wedding provides both the couple and community with an opportunity to strengthen social ties.

The Confucian culture encourages people to be involved in social networking to perceive themselves as concrete roles in communities (Nguyen & Belk, 2013) and view themselves as the heart of the social network (Tu, 1994). Chinese anthropologist and sociologist Fei Hsiao-Tung states the importance of the individual initiative in relations construction and figuratively described Chinese social structure as "similar to the concentric circles formed when a stone is thrown into a lake" (Fei, 1992: 63). The wedding offers a meeting place for young adults to construct valuable relationship networks as beneficial resources, contributing to their future professional and personal development (Davies et al.,1995; Yuan, 2020).

Moreover, the wedding is beneficial to the community by serving as a public event to enhance collective sense and strengthen group bonds (Leeds-Hurwitz, 2002). At a traditional Chinese wedding, the guests will send the couple a red packet of gift money to show blessings and write down names in a red book to keep track of reciprocity. According to the record, the couple and their parents will return the gift money back while the guest turns to a host of the ceremony later. The absent guests will also ask another guest to deliver the gift money to maintain the relationship (Long, 2019). Therefore, the wedding has a social function to show appreciation to the mutual relations and organise the web of relationships, and people are willing to spend considerable time and money on the reunion (Yuan, 2020). In a word, Chinese weddings play a significant role in initiating, establishing, enhancing, and extending social relations for all participants, whether the newlyweds or their guests.

## 2.1.2 Social Context

The previous section investigates the cultural factors that shape the significance of weddings in China. Despite the dramatic changes in Chinese society in recent decades, Chinese weddings still emphasise familial significance, social identity, and relation construction, which should be mainly responsible for the overconsumption phenomenon. In this way, the concept of Chinese weddings goes beyond the legalisation of marriage—weddings are collective events with several significant social functions. Therefore, any social change can make a great difference in the pattern of weddings. This section investigates the changes of Chinese weddings under influences of social developments that mainly caused by two policies: the one-child policy and the reform and opening-up policy.

### 2.1.2.1 Economic Development

Since the late 1970s, the economic reform and opening-up policy in China has brought remarkable economic development that impacted the wedding consumption of Chinese people (Larmer, 2013). The policy changed the social system from a highly centralised planned economy to a free-market-oriented system, which boosted increases in productivity, employment, and the number of people in the wealthy middle class (Ma & Rizzi, 2017). The rapid economic growth brought a dramatic shift in wealth accumulation for the 1980s generation, whose children reached marriageable age at present. Simultaneously, the one-child policy since 1980 turned the pattern of wedding consumption into a "4 support 2" structure (Figure 10)—two pairs of grandparents and two pairs of parents support the high budget of wedding revolving around the bride and groom (Zhuang & Everett, 2018). The rising personal income and the sufficient budget collection from the wealthy parental generation combined to result in remarkable growth in purchase power and demands, stimulating the wedding market to flourish (Zhuang & Everett, 2018).

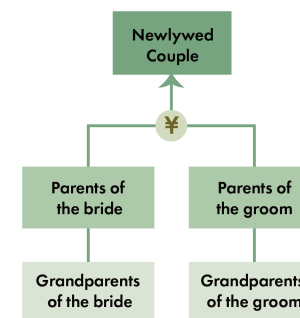


Figure 10: The "4 support 2" consumption structure of Chinese weddings.

The per capita disposable income and consumption of Chinese residents have been growing continuously for years and reached 30,730 RMB (3930 EUR) and 21,600 RMB (2760 EUR), respectively, in 2019 (National Bureau of Statistics of China, 2020). Simultaneously, according to the industry report released by Wedding Industry Observation & Marrymemo (2020a), the expenditure Chinese people spent on weddings has kept increasing rapidly. In 2019, the average wedding in China cost 223,000 RMB (28,502 EUR), and the number is 3.5 times as much as that of 2015. Accounting for about 30% of the total budget, the average expenditure of one wedding planning project equals more than three times the average living consumption of one Chinese people in the entire year. Furthermore, a recent survey shows that over 60% of the budget is covered by parental generation in the 2010s, which is higher than at any time in the last few decades (Fu et al., 2019). In conclusion, although the budget is far beyond the affordability of young couples, Chinese people still pursue a higher quality of weddings due to the improvement of living standards and traditional values.

### 2.1.2.2 The One-Child Generation

In recent years, the prime consumers in the Chinese wedding market are the post-1980s, and post-1990s generations, who are born right after China launched the one-child policy (1979) and the reform and opening-up policy (1978). The shrinking family structure and socioeconomic development offer the young generation opportunities to learn from the world and built values that differ from their parental generations. While this modern generation has a higher level of individualism perception and stronger self-expression values (Shan & Chen, 2020), they gain considerable freedom over their marriage and weddings and prefer romantic consumption based on liberated individual desires and pleasures (Zhu, 2018). Nevertheless, there are still traditionally active groups that are family-oriented to follow the requests of parents (Fu et al., 2019). Therefore, Chinese weddings have evolved into a complicated site for the young generation to work on self-expression and family face simultaneously.

Similar to the social identity, which is discussed in the previous section of Cultural traditions, self-expression is presented as that the individual requires public recognition from their social networks. However, self-expression emphasises achieving self-realisation and personal independence through meaningful experience and creativity (Campbell, 1990). The last thing the young generation would do during wedding consumption is to settle for mediocrity by accepting dominant values and regular products. According to recent surveys, more than 90% of young people indicate personalisation the most significant in weddings (Cui & Wang, 2016). While their first concern of the wedding is "unique highlight" and "creativity," a wedding process is exactly the same as a performance (Li, 2014). Boden (2003) stated that the symbolic essence of wedding consumption is presenting a particular identity or atmosphere instead of the financial sense or material quality of products. While romanticism and individual story can be visualised as commodities, the young generation is willing to spend more budget on individualised products and services for self-expression. According to *the Insight Report on Chinese Wedding Consumption Trends of 2020*, the mainstream demand in the current wedding planning market is "reflecting our story." (Wedding Industry Observation & Marrymemo, 2020a).

However, the awareness of individualism does not mean the generation is selfish, and the wedding is often a result under the balance of Western individualism and traditional Chinese collectivism. The "4 support 2" structure of wedding consumption brings two impacts to the decision-making process of the one-child generation. Firstly, ample financial support provides more opportunities to choose unique weddings. Secondly, the couple has to consider the opinions from these sponsors, who attach great importance to traditions and family face. Due to the respect for the older generation and family traditions, the traditional banquet is still a dispensable part binding to modern weddings (Wang, 2010; Fu et al., 2019). According to industry reports, this unique "1+1" pattern explains the recent market trend of one-stop wedding halls, which provide wedding planning and banquet services in one package (Wedding Industry Observation & Marrymemo, 2020a). Simultaneously, another growing trend is to separate the two goals: one light and intimate wedding in a distinctive venue for self-expression, one large traditional banquet in a high-end hotel for the family face. In order to satisfy the diverse demands of the young generation with strong personalities, companies continuously develop various options with novel themes. The interactive effects boost the overconsumption of Chinese weddings.

Moreover, the urbanisation wave through China that results in a rural-to-urban migration of the young generation brings another distinctive challenge. Since more and more young people left home for bigger cities, it is much common than before that the bride and groom come from different districts far away from each other. Considering the impossibility for numerous guests to fly over for reunion, according to the traditions, the family of the bride and the family of the groom will host a single ceremony at the local venue, respectively (Costa, 1997; Fu et al., 2019; Yuan, 2020). Moreover, according to Marrymemo (2018), there might be another one in the working and living city of the couple for their expanded social network. While some people consider the one hosted by the family of the groom as the actual ceremony, it is common to see Chinese young couples take the chance to fulfil the dream of holding weddings in both personalised and traditional ways. The unique phenomenon of having weddings twice or thrice, to some extent, brings rapid development in the wedding planning industry in both urban and rural areas, simultaneously, more burdens on society and the environment.

### 2.1.2.3 Western Influences

Except for the economic development, the implementation of the reform and opening-up policy has brought Western culture into the life of Chinese people. Opening up to the West provides Chinese people with another style of options that differs from traditional weddings. For the young generation, wedding products with Western characteristics have symbolic meanings of status and emotions, helping them achieve self-expression (Ma, 2006). For example, young people consider exchanging vows and rings during the wedding as a solemn and sacred symbol (Yuan, 2020). For the wedding industry, adapting modern and romantic forms from the West helps to meet the multiple demands of the market (Luo, 2012). Lastly, the fast development of technologies, especially the popularisation of the Internet and computer science, provides more channels towards the latest trend and toolkits for wedding planning and supports the realisation of creative concepts. For example, online exposure of the grand destination weddings of celebrities resulted in a boom in the destination weddings market since 2007 (Zhuang & Everet, 2018).

### 2.1.3 Market Dynamics

This chapter begins with an overview of the wedding planning industry in China and looks at its current status and future potential.

#### 2.1.3.1 Complexity versus Simplicity

Since history and culture are woven together, Chinese wedding culture has a dramatic development process with social transitions after the reform and opening up. Traditionally, immediate family members would serve as the wedding planning team to deal with the complicated procedure, and the choices of wedding venues were limited due to the traditions and undeveloped economy. Having witnessed the simplicity of Western weddings, some Chinese people desired a civilised and affordable new-style wedding instead of the cumbersome and lavish traditional one. In 1982, the first Chinese wedding planning company, the Purple House Wedding Planning Company, was established in Beijing, which is considered the start of the 30-years history of the Chinese wedding industry (Zhuang & Everett, 2018). In 1990, the Purple House Wedding Planning Company defined a hybrid wedding pattern that combined Western nuptial culture and Chinese banquet tradition. For example, exchanging vows in meaningful venues took the place of "three bows" in ancestral halls as the new ritual (Wang, 2014). From then on, Chinese weddings started to diversify, while people can realise individual desires with the help of wedding planning companies. For example, the Purple House Company planned the first weddings in the Great Hall of the People and the Great Wall in history; people never thought those venues could be wedding spaces before (Wang, 2014). At first, the wedding planning companies served as the pioneer of breaking traditional imprisonment by promoting simplified weddings in China. However, after years of evolution under the influences of cultural traditions and social transitions, the wedding planning sector has turned into an expensive and complicated norm that brings new challenges to Chinese society and the environment.

### 2.1.3.2 Current Status

The magnitude of weddings in traditions and the increasing budget in recent decades have established the wedding planning sector as a significant role in the modern Chinese mainstream. Since weddings are presenting as events or spectacles (Boden, 2003), people are coming to take lavish weddings as a standard rather than a luxury (Otnes & Peck, 2003). Therefore, a professional wedding planning service is becoming increasingly significant. Especially in modern China, people are willing to spend on services instead of products, while consumption has taken the place of savings (Zhu, 2018). Besides serving as a dream maker, the wedding planning industry is also a time-saver for young Chinese couples who are busy with work. Moreover, out of filial piety, the young generation prefers hiring a third party instead of troubling the older generation for their wedding preparation. The wedding planning service has touched the pain points of Chinese consumers who desire memorable weddings but have no time or experience in wedding preparation.

According to the first textbook on wedding consulting, *Wedding Planning and Management* (2013), the content of wedding planning service can be diverse, while a comprehensive package is the most popular by taking charge of every step of the wedding process (Daniels & Wosicki, 2013). In the Chinese context, a standard wedding planning package consists of the following services: 1) identify the demands of the couple and parents; 2) manage the schedule, budget, and checklists; 3) research, select and book the venue; 4) design vision and theme of the wedding space; 5) select vendors, negotiate contracts, and coordinate the logistics; 6) manage the rehearsal and adjust the plan; 7) direct the execution of the vision on-site on the wedding day; and 8) manage final payment and wrap-up with vendors. Moreover, the entire planning process is conducted under continuous negotiation with the clients.

Obviously, the existing Chinese wedding planning sector is a complex system containing diverse products and services that require months of preparation and one day of execution. Serving as the creative director and an industry insider who owns an established resource network from vendors to venues (Blakely, 2008), a

professional wedding planning team should take care of the aesthetics and logistics of every detail.

Unlike most Western weddings, whose venues are existing architectural ritual spaces such as churches and chapels, the venues of Chinese weddings are usually the same location for the large banquet. The data released by China Wedding Expo in 2019 shows approximately 50% of urban couples choose brand hotels or restaurants as their wedding venues, 30% choose one-stop wedding halls, while 20% desire distinctive venues (China Wedding Expo, 2019). The number of consultations on the banquet venue with an outdoor ritual space increased nearly 80% over last year, demonstrating the significance of wedding rituals to the young generation. More and more venue options are proposed by the wedding market, not limited to indoor ballrooms or outdoor lawns provided by hotels, even deserts, beaches, campuses, museums, and novel venues related to individual love stories. Wherever a wedding is going to occur, a specific ritual space for the couple to exchange vows in front of guests is necessary, especially for outdoor nature venues. Therefore, the main product of the Chinese wedding planning service is the creation of the temporary ritual space. A successful ritual space provides physical and psychological comfort to make the individuals and social groups feel pleased with attending the activity and a possibility for self-expression and social interactions (Alem et al., 2014). The overall operating process of the Chinese wedding planning service revolves around the design, materials, installation, and disassembling of the ritual space, bringing huge impacts in various aspects without system thinking.



### 2.1.3.3 Challenges & Opportunities

Cultural traditions, social changes, and industry development intertwined together to create the current wedding culture in China. The coexistence of the decline in the number of marriages and the rise in wedding consumption indicates the significant impact of the Chinese wedding industry. While the mainstream choice is still the grand "ritual + banquet" package in commercial venues, there is a new trend among the distinctive young generation to isolate an intimate wedding from the traditional way. Contrary to cumbersome traditions, this growing group emphasises the individual wedding experience with a limited number of intimate relatives and friends. In this respect, they prefer novel venues for self-expression; for example, plenty of couples proposed "the place where we first met" during wedding planning (Wedding Industry Observation & Marrymemo, 2020a). However, this distinctive choice is accompanied with several challenges.

Firstly, the environmental impact is unprecedented due to flexibility of wedding venues, especially when people chose more outdoor venues that closed to nature. Looking into the life cycle of the one-day-use temporary ritual space, the source of materials, transportation, construction, and recycling mode, every stage of the progress can produce waste and damage to the environment. For example, the total carbon footprint might increase while the offsite wedding planning company is unfamiliar with local materials and transportation. Moreover, unconscious behaviours during the use phase can also destroy the balance of our nature.

Secondly, the increasing prices of customised wedding planning services bring burdens to consumers. Although the expenditure varies according to the professional planner and service package that the couple picked, a wedding in a novel venue certainly requires more design intervention, which must increase the economic cost. According to the data released by China Wedding Expo (2019), in terms of wedding planning services, 50% of new couples chose semi-customised weddings of 30,000 to 50,000 RMB (3835 to 6390 EUR), while 20% chose complete customised packages that cost 80,000 to 100,000 RMB (10,225 to 12,781 EUR). Young people have to spend more than they could afford for a value-added

experience. There is a paradox for the distinctive group—the cost is expensive for escaping from the extravagant tradition.

Although these couples pay a considerable amount of money on hiring a professional team to take charge of everything, they still have to spend plenty of time on negotiation. The more customised results they want, the more time they need to spend on participating in the planning progress. Moreover, customers need to reserve the ideal company in advance and pay more money due to the extra workload brought by creative demands. However, according to the industry report, 34.5% of young couples chose the shortest wedding planning time (1-3 months), with the most common reason—busy work (Wedding Industry Observation & Marrymemo, 2020a). In other words, these "yuppie" consumers not only desire products and services that are tailored to their needs but also look for more accessible, effortless, and affordable ways of wedding planning. Although most of their starting points are not related to sustainability, the solution for their problem is undoubtedly an opportunity for Chinese weddings to associate with sustainability.

## 2.2 Design for Sustainability (DfS)

### 2.2.1 Definition of DfS

Climate change is a global emergency. In 2015, 197 countries came together to adopt the famous Paris Agreement, which aims to reduce global green gas emissions to control the increase in global average temperature within 2°C and look for solutions to hold the temperature rise within 1.5°C further. In 2018, the special report released by the Intergovernmental Panel on Climate Change (IPCC) showed the grim impacts of 1.5°C on the environment and society (IPCC, 2018). People started to realise that solving the global issue needs effective coordination and cooperation in all fields, especially applied disciplines should take sustainability as a core concern. Design discipline, serving as the leading force for innovation in business and society, has integrated with environmental considerations since the mid-20th century. Pioneered by Buckminster Fuller and Victor Papanek, designers started to focus on the life cycle management of products to reduce the environmental impact on a broader approach (Vila et al., 2015); this eco-design concept has evolved into Design for Sustainability due to more social-driven considerations.

Vezzoli et al. (2018) simply defined Design for Sustainability (DfS) as "a design practice, education, and research that, in one way or another, contributes to sustainable development." In recent decades, numerous approaches have emerged to enlarge the DfS field, with the scope evolved "from the selection of materials and energies to the design of the product life cycle, to the design of eco-efficient system innovation, to the inclusion of socio-ethical aspects" (Vezzoli & Ceschin, 2011, p.23), which can be categorised into five innovation levels: (1) the material component innovation level; (2) the product innovation level; (3) the product-service system innovation level; (4) the spatio-social innovation level; (5) the socio-technical system innovation level (Ceschin & Gaziulusoy, 2019). With more radical innovations in the product, DfS is expected to influence the consumption patterns by questioning the function of the product (Tukker & Tischner, 2006). This trend means the respective supply chains with change actors took a progressive involvement in the product design process (Van Der Heijden et al., 2010). An overview of the evolution presents DfS as a comprehensive method to combine and

evaluate the sustainability dimensions during the product and service system development process for incremental and more radical innovations.

### 2.2.2 the DfS Innovation Framework

The DfS field has been through a revolution characterised by two significant dimensions: a shift from an insular design focus towards a broader scale systemic innovation level; an increased emphasis on socio-technical innovation due to higher consideration on the social aspects of sustainability (Ceschin & Gaziulusoy, 2019). Based on their findings and the analysis model of sustainability-oriented proposed by Adams et al. (2016), Ceschin and Gaziulusoy (2019) developed a DfS framework to map the evolution of DfS (Figure 11), which serves as a helpful tool for research, education and practice in the design field.

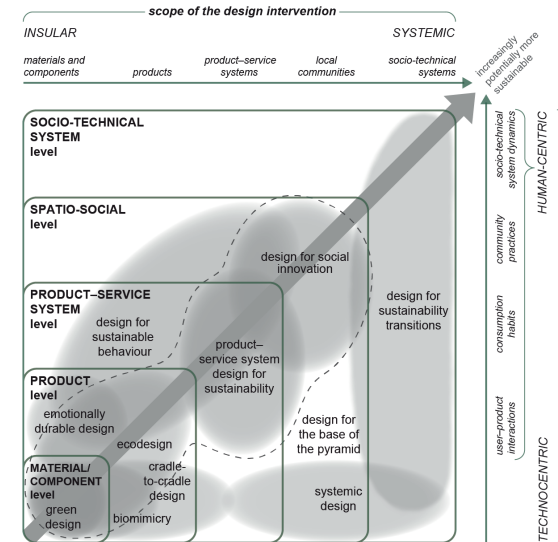


Figure 11: The DfS innovation framework (adapted from Ceschin & Gaziulusoy, 2019)

According to Ceschin and Gaziulusoy (2019), the most significant advantage of the framework is to simplify the complex by synthesising DfS in one single diagram. The DfS innovation framework not only provides a comprehensive picture of the evolution of the DfS field but also reflects the relationships between overall DfS approaches (Ceschin & Gaziulusoy, 2019). With a focus on the design practice of the wedding industry, this study utilised the framework to gain a better handle on the complexity of the DfS landscape and define appropriate DfS methods.

The framework shows the relationships between various DfS approaches are not mutually exclusive; they are complementary and overlapping. Ceschin and Gaziulusoy (2019) state that the evolution of the DfS field towards the socio-technical system level does not mean Design for Sustainable Transitions becomes the exclusive concern. Although the DfS approaches at the lower innovation levels are less systemic by only targeting the symptoms of sustainability challenges (Ehrenfeld, 2008), these approaches are as useful as the DfS approaches placed at the higher levels. Since the DfS approaches at the lower innovation levels are the foundation of those at the higher levels, only considering one specific approach in isolation is inefficient. Therefore, tackling different system levels of sustainability problems requires flexible synergies between various innovation levels of DfS approaches based on a better understanding of each approach and in-depth analysis of projects (Ceschin & Gaziulusoy, 2019).

### 2.2.3 Chinese Weddings in the Context of Sustainability

According to the DfS framework, the scope of design intervention reflects an enlargement from insular design to systemic innovations directly linked to the broadening of the sustainability focus. Therefore, the first step of exploring DfS solutions for Chinese weddings is defining the values of the complex object in the context of sustainability. To measure sustainability, John Elkington (1998) introduced the "triple bottom line (TBL)" framework focusing on the three pillars of environment, society and economy. With an expanded human-centric focus, Walker (2014) coined the Quadruple Bottom Line (QBL) of Design for Sustainability to value the addition of spirituality, which addresses the

transcendental personal value of sustainability. As the previous section shows, Chinese weddings have a characteristic in terms of self-expression that echoes the personal purpose. Based on the TBL framework and the understanding of Chinese weddings, this section defines the values of Chinese weddings in relation to sustainability into four elements within extrinsic and intrinsic dimensions (Table 1).

Extrinsic	Environmental value	Eco-friendly materials, production processes, renewable resources and labor, reuse
	Economic value	financial viability, enhancing local economy
Intrinsic	Social and Cultural value	social equity, humanistic design, community building, cultural tradition, social norms
	Personal value	Self-expression, self-fulfillment, spiritual development

Table 1: Values of Chinese weddings in relation to sustainability.

The environmental and economic values of Chinese weddings in relation to sustainability are more physical and practical, which can be measured by objective data and money. Unlike the extrinsic dimension, the intrinsic values of sustainable Chinese weddings can only be evaluated and defined rather than measured because they are transcendental and initially based on the wedding itself. The cultural and social impacts embedded in Chinese weddings are the other two significant values of the intrinsic dimension. Moreover, as sites for people to work on self-expression and family reputation, Chinese weddings have inherent personal values to newlywed couples, their families, and the community. Figure 12 represents the relationship of these values based on Maslow's Hierarchy of Needs (McLeod, 2007).

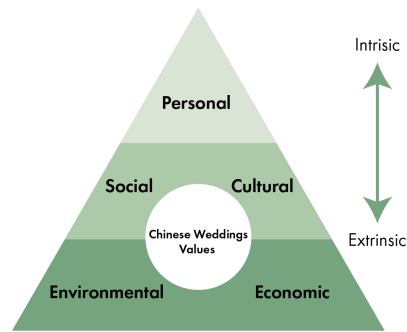


Figure 12: Values of Chinese weddings in relation to sustainability.

Corresponding to the DfS framework, the environmental and economic values are the crucial basis that requires the DfS approaches at the product level. In the context of Chinese weddings, although the use phase of end products is only limited to one short-lived ceremony, in the long run, promoting longevity of products, reducing materials consumption, and optimising the production-disposal process are necessary. While at the second level, achieving social and cultural goals should consider services design, stakeholder value chains or business models, which indicates the importance of product-service system design principles from the product-service level. Moreover, considering that wedding events are linked to strong personal purpose, design strategies for involving the end users in the design process have great potential. Therefore, this research applied an integrated set of DfS methods that includes design for sustainable behaviour (DfSB) and product-service system design (PSSD) approaches that cover various innovation levels.

## 2.2.4 DfS Approaches for Chinese Weddings

### 2.2.4.1 Design for Sustainable Behaviour (DfSB)

At the material/component and product levels, the earlier DfS approaches aim to reduce the environmental impact throughout the whole life cycle of products. Various approaches have been developed in this respect, for example, green design,

eco-design, biomimicry, and emotionally durable design. However, these approaches are limited to technical, functional, or user-product relationship development for the extension of product lifespan while lacking consideration for the impacts of consumer behaviour. According to Tang and Bhamra (2009), unconscious consumer behaviour could cause substantial effects that far outweigh the efficiency achieved by the product innovation level approaches, especially in some user-oriented contexts. A Chinese wedding is a typical case: the lifespan of the wedding products is only half a day as it ends with the completion of the ceremony; therefore, lengthening the product lifespan may be counterproductive. On the contrary, consumer behaviour becomes the primary factor behind the total environmental impact of Chinese weddings due to the feature of customisation. To be more specific, the desired result, which consumers decided at the beginning, determines the utilisation of resources in the production process. In this case, besides conventional techniques for product improvement, designers should apply design strategies for sustainable behaviour to reduce the decisive impact that was within the control of consumers.

Design for Sustainable Behaviour (DfSB) aims to provide artefacts that influence customers to utilise products or services in a way that produce less environmental influence. To create behavioural changes, various DfSB methods and tools have been developed based on three groups of behavioural change models: 1) individualistic rational choice models, 2) context-driven models, and 3) middle-ground models (Niedderer et al., 2014). Therefore, some researchers categorised existing DfSB practices into three main groups: 1) individual-cognitive strategies to change individual behaviour by promoting individual cognition; 2) context-driven strategies that aim at influencing the behaviour of users by transforming their operating environment; and 3) middle-ground strategies that integrate both internal and external factors (Niedderer et al., 2016). Combining these existing DfSB strategies into a unified system, De Medeiros et al. (2018) proposed a decision support framework for designing products (goods or services) aimed at promoting sustainable behaviour (see Figure 13), which consists of four phases: 1) analyse the cultural context, 2) decide the control level, 3) define the generic strategy, and 4) combine specific strategies into the design.

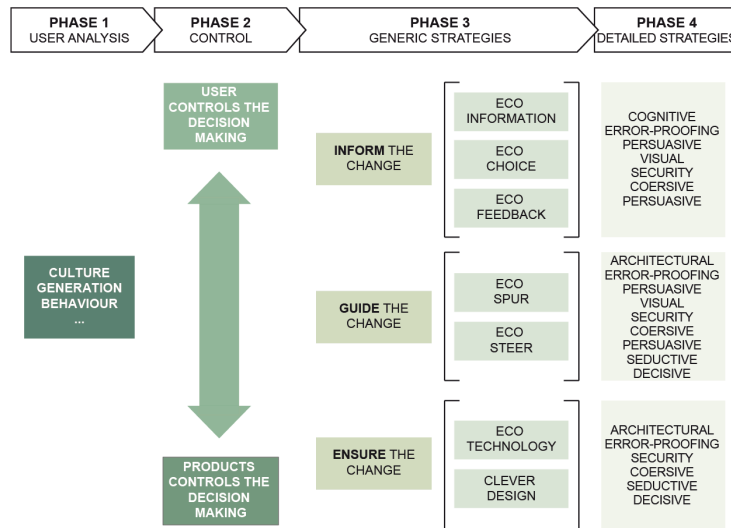


Figure 13: the decision support framework for DfSB (adapted from De Medeiros et al., 2018).

From the perspective of detailed strategies, those within "inform the change" generic strategy focus on individual sense-making and reasoning by providing information to users, while those within "guide the change" and "ensure the change" generic strategies rely on alterations in product features to induce or limit the behaviour change of users (De Medeiros et al., 2018). Obviously, the scope of DfSB intervention can span from a single product or service to product-service systems and even social context; in other words, DfSB requires synergies with specific DfS methods that span various innovation levels. This thesis proposed a new PSS to motivate sustainable consumption behaviour in the context of Chinese weddings; thus, the design solution is an integrated set of strategies that cover the product innovation level and the PSS innovation level. To be specific, besides the primary DfSB and PSSD approaches, participatory design and transformable design methods were applied to guide and ensure the change.

### 2.2.4.2 Product-Service System Design for Sustainability (PSSD)

As mentioned above, the adoption of product innovation approaches is crucial to managing the environmental influence of products and production procedure, but only focusing on product improvements cannot achieve the sustainable goals of Chinese weddings. It is significant to consider a broader design approach that concentrated on reducing the impacts of the production and consumption systems through structural changes. On this point, the most promising alternative strategy is the product-service system design (PSSD)—a DfS approach for developing models that offer integrations of products and services to satisfy particular customer needs. This approach focused on innovative interactions between all actors of the value creation system, where the providers have to keep seeking sustainable solutions because they take the responsibilities of the product and its life cycle from beginning to end (Vezzoli et al., 2014).

Researchers who studied the product-service system (PSS) considered it as a win-win model that achieves the three fundamental dimensions of sustainability: environmental protection, financial viability, and social equity. For example, Vezzoli et al. (2018) stated that PSS offers sustainability potentials based on three levels of innovation: 1) it transferred business focus from the sale of a single product to providing a "unit of satisfaction", which means a combination of intangible services and tangible products that can satisfy the customer demands; 2) it promoted the core of innovation from technological development to innovative stakeholder interactions, and this structural change is based on three types of innovative interaction relationship among actors, which will be discussed in detail later; and 3) it changed the value perception way of users from personal ownership of goods to access and sharing of products and services (see Figure 14). Through these innovations, PSS can create new values while achieving eco-efficiency by improving resource utilisation and enhancing the socio-ethical impact by extending access to products and services for more low- and middle-income people. On this point, PSS innovation has the potential to strengthen society and the economy by moving from the stage of consumerism towards an innovative service economy based on personal satisfaction and low consumption of resources

(UNEP, 2002).



Figure 14: Three levels of innovation in PSS (adapted from Vezzoli C. et al., 2018).

Based on the consideration of revenue models and the interactions among stakeholders (Geum & Park, 2011), Tukker (2004) classified PSS types into three major categories (product-oriented PSSs, use-oriented PSSs, and result-oriented PSSs) and eight subtypes. Figure 15 presents these categories of PSSs and their shift in the focus from tangible products to intangible services (Tukker, 2004).

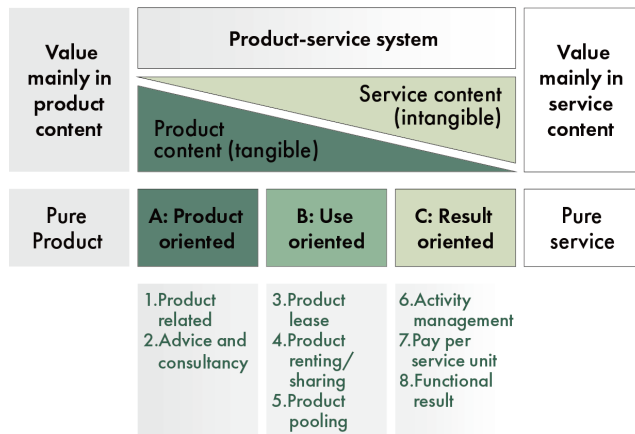


Figure 15: The classification of PSS type (adapted from Tukker, 2004).

- The product-oriented PSS is a service offering a product combined with additional services that extend the value of the product life cycle (Ceschin & Gaziulusoy, 2019). These supplemental services include product-related services such as maintenance, repair, upgrading, substitution, and take-back service of the product, moreover, advice and consultancy services for the usage of the product (Tukker, 2004). This category of PSSs reduces the burden of the use phase and disposal phase of the product placed on customers; moreover, the innovative interaction relationship with customers drives the company to continuously enhance the durability and recyclability of products for economic and competitive benefits (Vezzoli et al., 2018).
- The use-oriented PSS is when a company (or a business alliance) provides customers access to a product (or a suite of commodities) that enables them to fulfil their particular demands (Ceschin & Gaziulusoy, 2019). This type of PSSs consists of three subcategories: product leasing, product renting or sharing, and product pooling. In these cases, customers can operate the products during an agreed period of time to meet their satisfaction, and they only need to pay for the time they used the utility rather than purchasing full ownership of the product (Tukker, 2004). Again, similar to the product-oriented PSS, the innovative operational structure of the use-oriented PSS motivates the company to seek cost-effective and environmentally friendly solutions (Vezzoli et al., 2018).
- The result-oriented PSS is when a company (or a business alliance) offers integration of goods and services to achieve a certain result based on specific demands of customers (Ceschin & Gaziulusoy, 2019). There are three types of result-oriented service systems: pay per service unit, activity management, and functional result; these services enable customers to be outsiders of the entire life cycle and operating process of the products by only paying for the "final result", while the providers maintain the ownership of the products and offer performance (Tukker, 2004). Therefore, the company is economically incentivised to be eco-efficient by producing fewer products and improving resource utilisation (Vezzoli et al., 2018).

However, not all PSSs lead to the goal of sustainability, which can be achieved based on a balance against the additional cost and the rebound effects case by case (Ceschin & Gaziulusoy, 2019). According to the eight archetypical models, the current Chinese wedding planning service corresponds with the activity management/outsourcing type within the result-oriented services category. There are two features that turn this distinctive PSS into the opposition to sustainability: 1) for users, the outsourcing way makes them focus on the performance criteria and the prediction of weddings, which combine with intrinsic factors to cause an increase in the costs of resources; and 2) for companies, because they are free to decide how to deliver the final results that vary from case to case, unconscious resource utilisation can occur in order to fulfil the diverse requirements of users.

### **2.2.4.3 Participatory Design**

According to the key feature of Chinese weddings that customers place a great emphasis on self-expression, designers need to ensure that the design strategy can satisfy the consumer demands for personalisation. Mugge (2007) suggested two ways associated with self-expression: involving users in the innovation process and offering personalised and customised products.

The participatory design approach allows the users to shift the role from invisible decision-makers to actual co-designers by involving them throughout the product development process. The involvement of users in the designing phase not only contributes to problem definition, concept generation, and solution evaluation but also encourages user self-expression for product personalisation and customisation (Mugge, 2007). Moreover, the users can achieve personal accomplishment and fulfilment through the participatory experience (Salvia, 2016). Mugge (2007) also indicated that the users could engage in finishing or making (parts of) the product to increase self-expression by adding personal symbols to products, which contributes to the development of personalised and customised outcomes. Again, the making experience generates personal achievement and satisfaction for users (Salvia, 2016).

Involving in the design process as co-designers, the users require appropriate approaches to express their perspectives and opinions (Sanders, 2006). On this point, the most notable feature of participatory design methods is utilising concrete artefacts as thinking and communication tools. A scenario is the most commonly used tool to bridge designers and users by illustrating the new design in different operating environments, which allows the users to evaluate the project and discuss it with designers. While mock-ups and prototypes are more physical tools for users to experience the design and iteratively amend it to ensure the result meets their demands. The other two common methods, user personas and product-related utilisation cases, simulate the interaction between users and the design based on a background description. Moreover, various cooperative design interventions have been developed to provide platforms for all stakeholders to co-design.

#### 2.2.4.4 Transformable Design

As mentioned above, product personalisation and customisation are closely connected to self-expression; however, the diverse demands could cause an increase in economic cost, waste production, and material consumption. To improve resource utilisation efficiency, companies require adaptable solutions to respond to the changing consumer demands rapidly. This research combined participatory design practice with adaptable products as a strategy, enabling the users to transform the products according to their visions. In this way, the personal experience of involving in the production process changes the role of the user from a passive observer to an active co-producer (Chapman, 2005). In this case, the most significant component is a transformable product that allows these non-professional co-producers to easily erect, demount, and reconfigure in different contexts. The goal of the product aligns with the premise of transformable design, which aims at developing simple systems to offer the users the control of product transformation with minimal intervention (Brancart et al., 2017). According to Bishop and Williams (2012), transformable design is useful for temporary activities, especially supporting people to hold "pop up" events in empty sites. On this point, the transformable design method is well suited for Chinese weddings.

Generally, transformable design practices are based on two principles: 1) design for disassembly and 2) deployability. The transformable structures built upon the principle of design for disassembly consists of a group of (usually standardised) components, which can be combined into diverse configurations with reversible connections. With the reversibility of the connections, the structure elements are reusable, and the storage volumes gain the potential to become more compact (Debacker et al., 2007). Moreover, the easy-to-operate connections and assembly modes save plenty of time on assembly and encourage the participation of users. On the contrary, deployable structures replace the manual assembly and disassembly parts with an instantaneous opening and closing mechanism, enabling a rapid transformation from a compact package to an expanded configuration (Hanaor & Levy, 2001). With the complex nodes designed and fabricated by professionals, deployable systems have several advantages, for example, the rapid and straightforward assembly process and compact volume.

## 2.3 Sustainable Weddings

### 2.3.1 Sustainable Events

Since the wedding is one type of personal events in the event industry (Shone & Parry, 2004), the sustainable practices in the field of event management have reference significance to the wedding planning industry. Dickson and Arcodia (2009) stated that events could minimise the environmental impact by proper management and recycling excess supplies and materials in meaningful approaches. In the last two decades, the emerging field of green event planning has attracted plenty of attention due to increasing awareness of environmental sustainability; meanwhile, all sectors of society are seeking methods to encourage the event industry towards sustainability transition (Dickson & Arcodia, 2009).

Numerous organisations have developed green guidelines and regulations for event planners to create environmental-friendly events while maintaining design effects. For example, in 1996, the United States Environmental Protection Agency (1996) approved a green planning guide that presents the key steps for green events; the green meeting policy released by the National Recycling Coalition (2001) is focused on event recycling; in 2007, the American Institute of Architects (2007) provided green planning guidelines for meeting events. Most of these green guidelines concentrate on similar environmentally-friendly strategies, for example, the basis 3R principles—reducing waste, reusing materials, recycling, facility management, and green venue selection.

Meanwhile, most researches and practices in the field are focusing on the venue. Koukiasa (2011) stated the venue is the most influential factor for sustainable goals of an event and outlined several benefits of the sustainable venue design approach, for example, developing stakeholder relations, enhancing reputation, supporting the local economy, providing regeneration potentials, and improving legacy value. Taks et al. (2009) suggested event planners combine event experience with the venue, which signifies adding sustainable aspects into event venue can form a win-win situation for customers and the business. According to Draper et al. (2011), site selection is one of the five significant themes in an event and based on in-depth studies with surveys, reviews, and experiential evidence.



Koukiasa (2011) also outlined the significant steps of environmental-friendly and affordable venue design: "metering, monitoring, and targeting, reporting and evaluation, and benefits" (p. 222). Moreover, the LEED certification is becoming more appealing for the green business to establish a reputation.

Although there already have an abundance of research and ideas to support the sustainable movement in an event, some barriers still hold event planners and companies back from sustainable practices (Dickson & Arcodia, 2009). The first reason is that these guidelines are not completely available and reasonable for all practitioners (Dickson & Arcodia, 2009). For example, some venues forbid any modification to the basic facilities, which results in difficulty for event planners to follow the green guidelines. Secondly, since planners need to overwhelmingly take care of various aspects due to the dynamics of event design (Adema & Roehl, 2010; Lawton, 2011), not all of them are willing to pursue sustainability. Merrilees and Marles (2011) stated that there are two motivations for businesses to adopt environmental practices: ethical consideration and commercial consideration. In some situations, being more sustainable requires higher levels of effort, responsibility, and cost, which may outweigh the benefits it brought (Dickson & Arcodia, 2009). Therefore, some planners and companies will not consider establishing a reputation or pursuing the trend at the risk of primary effects, especially for significant events with large numbers of participants. While more and more customers consider sustainability as one significant component during the events planning process (Benjamin, 2011), it is time to increase education on sustainable event planning for all sectors and set flexible guidelines for as many specific situations as possible.

### 2.3.2 Green Weddings

Although there is a lack of research on sustainable weddings, the concept of "green weddings" has become one of the popular trends in Western countries over the last decade. After realising the enormous impacts of traditional weddings, environmentally aware couples are seeking appropriate alternatives to avoid lavish consumption (Navarro, 2009); therefore, some professional guidebooks and

websites have emerged to provide guidance for organising green weddings. In *the Green Bride Guide*, Harrison (2008) described the green wedding as one wedding type that focuses on the environmental impact with natural resources preservation and ecological system protection. At the same time, Edmunds (2008) stated in *The Green Wedding Guide* that planning a green wedding denotes reducing the social and environmental impacts of wedding products and services as much as possible. Despite the common starting point of nature conservation, a green wedding also benefits the couple by reducing the costs (Harrison, 2008; Breg, 2013). Harrison (2008) outlines three main reasons for choosing green weddings: the first one is to sidestep the wedding market that brings financial and psychological burdens; the second reason is to support green business and stimulate the transition in the wedding industry; the last one is about education, which suggests a green wedding can be an inspiring example for all guests to raise the environmental awareness. In addition, Edmunds (2008) mentioned that a green wedding offers people a site for self-expression; not only eco-conscious couples can share their personal values, but also people new to sustainability issues have the opportunity to explore sustainable lifestyle through a memorable event.

Generally speaking, green wedding guidance provided by these books and websites are mainly focusing on six categories: locations, invitations, dresses, flowers and gifts, food and drink, and decoration, which are appropriate for standard Western wedding procedure. Among these categories, venues and decoration are related to ritual space. As previously discussed, venue selection is the priority for most Western weddings; choosing one venue fits all can cut down the largest carbon emission of transportation. An outdoor location become a better choice due to the advantages of energy conservation and natural backdrop; venues with LEED certification are recommended for indoor weddings. While church buildings are still mainstream because of religious belief, these green guidelines encourage couples to decorate the ritual space with local materials or rent living plants; donating the decoration or turning it into gifts for guests can also reduce waste. These guidelines cover all aspects of a green wedding, which not only support passionate couples to plan green weddings by themselves but also help the wedding planning business establish a reputation of being environmentally responsible.

### 2.3.3 Sustainable Installation Art

According to the most distinctive feature of Chinese weddings that the main product presents as a type of installation art, it is necessary to learn from the sustainable practices in the public art field. The definition of "a public art of sustainability" is an art practice where artists involve divergent sustainability concepts and bridge art and the environment (Phillips, 2009). With intelligent use of materials, conservation approaches and sympathetic linkage between art and the environment, the sustainability of public art provides a dynamic, critical and dialectical environment for the field to develop and involve in a creative future (Phillips, 2009). An overview of typical works shows that the emphasis and design approach of sustainable practices vary from artist to artist, also the way they influence the public awareness of sustainability. American sculptor Tara Donovan is known for using massive waste as raw materials for her large-scale artwork, which represented the 'cradle-to-cradle approach' (Dick, 2009). With a similar concern of recycling waste, a team of London artists from the Free Form Arts Trust produced an entirely new material - Eluna. This product used recycling glass from the industrial and domestic waste stream and a sustainable manufacturing process, which has attracted plenty of designers to use it in various projects (Cummings, 2006). On the other hand, Australian artist Warren Langley concentrated on the integration of low-energy technologies and built environment, especially for the day to night transformations of public light installation (Langley, 2010). With more concern on the social aspect, American artist-in-residence Mierle Ukeles focuses on responsible connections between the public and environmental issues, with artwork redefined controversial sites to involve communities and raise public attention and response to sustainability (Phillips 2009). Similarly, the director of Austin Green Art (AGA), Randy Jewart, emphasised the role of the community-involved public art in enhancing public sustainability awareness, which demonstrated the social innovation philosophy (Calder, 2007). Compared to the conservative approaches of corporations that under economic concern, artists usually took more radical actions with system thinking.

### 2.4 Synthesising

The theoretical study reviews these three significant sections of information—Chinese weddings, Design for Sustainability (DfS), and Sustainable weddings. A comprehensive investigation of Chinese weddings confirms the significant position of weddings in Chinese society and culture as well as unveils how the distinctive features evolved under the influence of a complex set of factors. The essential factors that shaped the current status of Chinese weddings are categorised into three dimensions: the cultural context, the social context, and the market dynamics of the wedding planning industry. They are not mutually exclusive but interact and influence each other. An understanding of the cultural context indicates that the importance of weddings is deeply rooted in the collective values of traditional Chinese culture. A peek into the social context reveals the influences of two important policies, the reform and opening-up policy and the one-child policy, which shaped the consumption structure and self-awareness in the wedding consumption of modern Chinese people. In terms of the market dynamics, the mutual promotion relationship between the market trend of novelty and the consumer demands for customisation continuously enhance the distinctive features of Chinese weddings. Meanwhile, the emerging demand that calls for alternative solutions to ease the burden has turned into a design opportunity for Chinese weddings to move towards sustainability.

Simultaneously, a new design field for sustainability is emerging by integrating sustainability transition theories and design practices. While global movements keep advocating for socially responsible business and consumption, designers in the wedding industry should bridge the gap between wedding practices and sustainability theories. According to the related literature, Chinese weddings consist of various products and services accompanied by massive impacts covering environmental, economic, social, and personal aspects. Meanwhile, the evolution of DfS has shown an expansion of the sustainability focus, so a synthesis of suitable DfS approaches can address the challenges of Chinese weddings in a holistic way. Based on the understanding of Chinese weddings and DfS, four design approaches were selected for the design exploration—design for sustainable behaviour (DfSB), product-service system design (PSSD),

participatory design, and transformable design. Moreover, emerging practices in the fields of sustainable events and green weddings have paved the way for the wedding industry to move towards sustainability. Sustainable movements in the installation arts field also offer some references and directions that are suitable for the distinctive feature of Chinese weddings that focus on temporary ritual spaces.

By synthesising these three major parts from the theoretical study, it is conclusive that the concept of redesigning Chinese weddings towards sustainability is compelling enough for the environment, economy, and society. Although the distinctive features of Chinese weddings seem to run in the opposite direction of sustainability, the instructive DfS strategies and the emerging demands for customisation show a great potential to introduce sustainable solutions. In conclusion, Chinese weddings and sustainability issues are seemingly mutually exclusive because the distinctive features of Chinese weddings are deeply rooted in a complicated context; in fact, there are feasible design opportunities for Chinese weddings to align with sustainability.

## 3 Research Methods and Process

### 3.1 Research Design

This thesis is explorative design research that proposed a design strategy in order to ease the burden of Chinese weddings. The work is based on multi-method research, including a literature review, a workshop, a content analysis, interviews, observation, and case studies. The literature review aims at three goals: 1) uncover the significant social and cultural factors that shaped the wedding culture in China; 2) present the theoretical background of Design for Sustainability approaches; and 3) identify the gap between Chinese weddings and sustainability. Followed by this theoretical investigation, the empirical material collection was conducted chronologically in three sections:

Firstly, a workshop with 35 participants, which aims at improving the wedding planning experience, was organised to identify customer pain points and the criteria for an ideal design concept. The workshop as a qualitative research method supports researchers in collecting valid and reliable data about specific elements in the topic regarding design innovation, and the outcomes flow back into the methodology and future practices (Ørngreen, 2017). According to Darsø (2001), workshops have the advantages of interaction, prospects, concentration, and "real-timeness", which is especially useful for emerging and unforeseeable studies. As the starting point of the research study, the online workshop conducted in September 2020 constructed a platform for 35 young Chinese of marriageable age to discuss the optimisation of the wedding planning experience. Invitations for participation in the workshop were sent through social media two weeks before the workshop; moreover, the basic personal backgrounds of participants were collected at the registration stage. Due to the coronavirus (COVID-19) pandemic, the facilitator conducted the activity on the online collaboration platform Flow. During the one-hour workshop, 35 creative-oriented participants discovered and described their pain points and ideal scenarios in a simulated environment created by the facilitator. They proposed twenty concepts, which developed into three directions focused on 1) a simplified and flexible process, 2) the involvement of participants, and 3) co-creation. These three points offered the basis for the concept generation of the design exploration—a PSS involved the couple and

wedding participants to co-create the wedding space. This finding also feeds back into the selection of the DfS approaches in the theoretical study.

The second section integrated a content analysis, a semi-structured interview, and participant observation to comprehensively understand the current production and consumption system structure of Chinese weddings. These three steps unveiled all the involved stakeholders and interaction flows and identified the barriers and limitations to locate potential design opportunities. Content analysis is a systematic technique for researchers to filter large amounts of data (U.S.GAO, 1996), which helps discover and describe the importance of specific issues (Weber, 1990). This research utilised the content analysis method to process the expenditure statements of 36 recent weddings. After converting the large volumes of qualitative data into quantitative information, the essential components of the system map and tangible impacts of Chinese weddings came to the surface. This was followed by a semi-structured interview with one professional wedding planning company to confirm the findings and explore the underlying causes. The semi-structured interview is a combination of a prepared interview framework and an unstructured open conversation, which allows researchers to obtain not only the answers to questions but the in-depth reasons behind the answers (Keller & Conradin, 2020). The face-to-face interview with professional wedding planners was held in December 2020 in Shanghai. All interviewees are members of one independent wedding planning studio, which is famous for its green wedding concept. The four professionals expressed open opinions on wedding planning topics, followed by the loosely structured interview guide. This research also includes participant observation of one entire wedding planning process to understand the internal interactions of the system and consider time as a metric. The participant observation allows researchers to build rapport within a community and integrate into the community as a participant to ensure every member act naturally; therefore, researchers can remove themselves from the environment to analyse the data and describe the findings (Bernard, 1994). In this research, the researcher participated in a wedding project held in winter 2020 and took the role of design assistant in the planning team. The observation took three weeks, and the location was in Fujian, China.

Lastly, two case studies of relevant designs and a focus group interview with three couples of potential customers were conducted to support the generation, development, and evaluation of the design concept. Case studies are a suitable method in design research for phenomena analysis, hypothesis generation, and methods validation (Teegavarapu et al., 2008). In this regard, this research chose a PSSD case and a deployable structure design case to inspire the concept development and validate the practicality of DfS approaches in the wedding issue. To test and evaluate the developed design concept, the author organised a focus group interview in Spring 2021. A focus group interview usually consists of 6–9 chosen participants with certain characteristics to express feelings, perceptions, and attitudes towards a given issue (Denscombe, 2007). The interview included three couples who are ready to hold weddings this year and who desire to optimise the wedding planning experience, and they were invited to the interview through WeChat. During the interview, these potential users were required to provide evaluation and personal feedback after the presentation of the design prototype. The outcomes fed back into the refining of the final concept.

The design exploration part utilised the System Map tool and Service Blueprint tool at both the analysis and design stages. In the analysis process, the tools supported the visualisation of the current system structure, indicating the interactions among all the actors. Based on the analysis outcome, the tools helped structure initial design ideas, formalise the conceptual system, and served as communication tools with stakeholders.

### 3.2 Process Map

The process map below (Figure 16) visualises the relationship between multi-method research and design exploration. The dash lines in Figure 1 illustrate the information flows from theories to practice and the feedback from concept development to the theoretical source selection. The concept generation starts with the online workshop conducted in September 2020 and an understanding of background information gained from the literature review. Based on the initial ideas, this research selected theories on design for sustainable behaviour (DfSB)

and product-service systems design (PSSD) as primary design strategies. Through the step-by-step research process, the in-depth understanding of the current system and the theory of feasible DfS approaches combined to finalise the design concept. The last focus group interview served as the promotion and evaluation phase to refine the final design outcome.

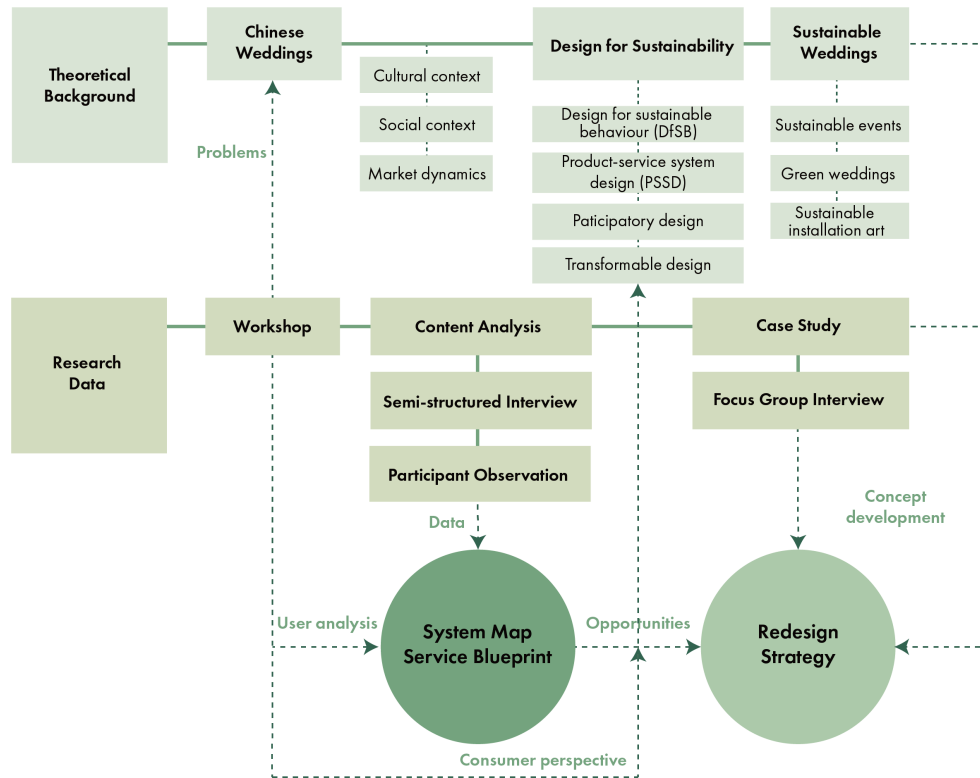


Figure 16: Process map of the research.

## 4 Design Exploration

This chapter presents the concept development process of the new wedding planning PSSD strategy. To design a system that induces and supports people to plan their weddings in a way that reduces negative ecological and social impacts, this thesis developed the design concept with the decision support framework for promoting sustainable behaviour (see Figure 13) (De Medeiros et al., 2018). The first phase is a user analysis to gain a thorough understanding of the intended users to generate the initial concept. In the second phase, a mixed level of user and product control was decided on based on an exploration of design opportunities with the help of PSSD tools. The last phase is strategy definition and application—defining the redesign strategy and applying suitable design approaches into the final concept. At the end of the chapter, the outcome was refined based on the feedback from the intended users.

### 4.1 Consumer Perspective

The design exploration started with the identification of the perception, demands, and visions of the intended users for optimising the wedding planning experience by conducting a requirement workshop. On September 20, 2020, the workshop "wedding service experience optimization" was conducted with 35 Chinese youth of marriageable age. Due to the COVID-19 pandemic, this workshop was held online, utilising the digital collaboration platform Flow and the voice communication software WeChat. In this way, the facilitator prepared the introduction, guidance, and relevant information in a digital form and facilitated discussion and provided suggestions during the process. Meanwhile, all the participants interacted with each other through real-time voice communications and documentation of their statements on the platform. This multimodal data were collected through digital workshop artefacts and audio recordings, which was transcribed for further analysis. The workshop followed a prepared structure and was combined with brainstorming, evaluation, and supporting materials; the one-hour process consisted of a brief ice-breaking activity and three major modules.

### 4.1.1 Module 1—Identify Demands

This module asked participants to brainstorm their demands for “the ideal wedding” by offering them a scenario to achieve. Thirty-three active participants posed their statements on the digital platform, followed by a ten-minute discussion. Figure 17 indicates that three significant themes kept repeating through data analysis:

- 1) Emphasizing the experience of participants;
- 2) A simplified and adaptable process;
- 3) Involving participants in the design process.



Figure 17: The result of module 1 of the requirement workshop.

The most-mentioned requirement is that the ideal wedding needs to pay more attention to the experience of wedding participants. Up to 42% of statements expressed a desire to make the wedding more engaging for the guests. This finding verified the collectivism in Chinese wedding culture. Another hot issue is about optimizing the process. 30% of statements complained about the cumbersome preparation and called for a simplified and adaptable solution to address the changing contexts and ease the psychological and financial burden on consumers. This requirement corresponded to the emerging trend in the Chinese wedding

market. The third discussion point is a combination of the previous two topics. 18% of statements showed the wish to involve their families and intimate friends in the design or production process. This way can not only enhance the experience of wedding participants but also fulfil the personalization demand of the couple.

### 4.1.2 Module 2—Propose Concepts

This module organized participants to propose and discuss design concepts based on their own visions or inspirations from others. Participants actively proposed nineteen initial ideas, which can be categorized into three themes associated with the finding of Module 1:

- 1) Activities for participants experience;
- 2) Products and services for an adaptable process;
- 3) Products and services for co-creation.

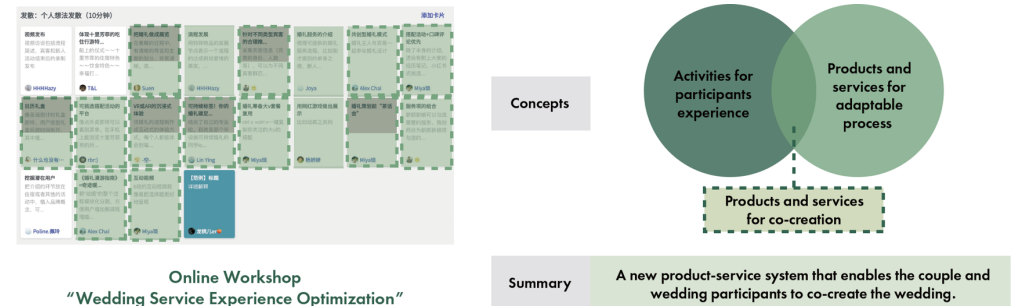


Figure 18: The result of module 2 of the requirement workshop.

As shown in figure 18, most of these design concepts addressed two or three demands at the same time. Six statements mentioned creating activities for guests to gain participatory experience, for example, turning the wedding into a unique exhibition form or applying VR or AR technology for an immersive experience. Up

to fifteen concepts concentrated on the optimization of the process, including products and services surrounding “modularity”, “visual flow”, “interaction”, and “self-service”. Thirteen participants focused on the co-creation process and proposed diverse wedding planning products and services that enable the involvement of the couple and wedding guests, for example, online co-design platforms and assistive artefacts similar to Advent Calendar.

### **4.1.3 Module 3—Evaluate Concepts**

At the end of the workshop, participants were asked to review all concepts and vote for their favourites. According to the result, the five most popular concepts cover three demands from Module 1: providing simple interactive products or/and services for the couple or/and guests to get involved in the wedding planning process.

The findings of the workshop helped generate the initial concept of this research—a new wedding planning PSS that enables the couple and wedding participants to co-create the wedding.

## **4.2 Design Opportunities**

This section starts the exploration of design opportunities based on the user analysis in the previous phase. According to the decision support diagram, designers in this phase need to decide on the level of user or product control—whether users, products or a mixture of both are given the ability to control the decision making (De Medeiros et al., 2018); on this point, it is essential to explore the design opportunities holistically. Based on the initial design concept of a participatory wedding planning PSS, this research utilises the PSS-related methods and tools to examine the existing Chinese wedding planning PSS and develop the new PSS design concept. The system map tool and the service blueprinting tool are applied to visualise the existing Chinese wedding planning reference system. The reference system map provides a clear and complete overview of the existing system that indicates the interaction flows between various actors involved in the system, which is helpful to investigate the potential failure points as well as the level and role of consumer participation (Tischner & Vezzoli, 2009). In this thesis, the existing reference system map of the Chinese wedding planning sector helps identify what problems to focus on when aiming to induce sustainable consumption behaviour during the wedding planning process and identify design opportunities for future system changes.

### **4.2.1 Mapping the System**

#### **4.2.1.1 Content Analysis**

According to Tischner and Vezzoli (2009), drawing a system map requires three aspects of information: 1) identified satisfaction unit, list of elements of the reference system, description of the boundaries of the reference system; 2) list of actors with one line about their interest in the system; and 3) list of (material) products and (immaterial) services that are necessary for the system. In this section, a content analysis of collected expenditure statements of 36 typical Chinese wedding projects converts the large volumes of qualitative data into quantitative information as needed.

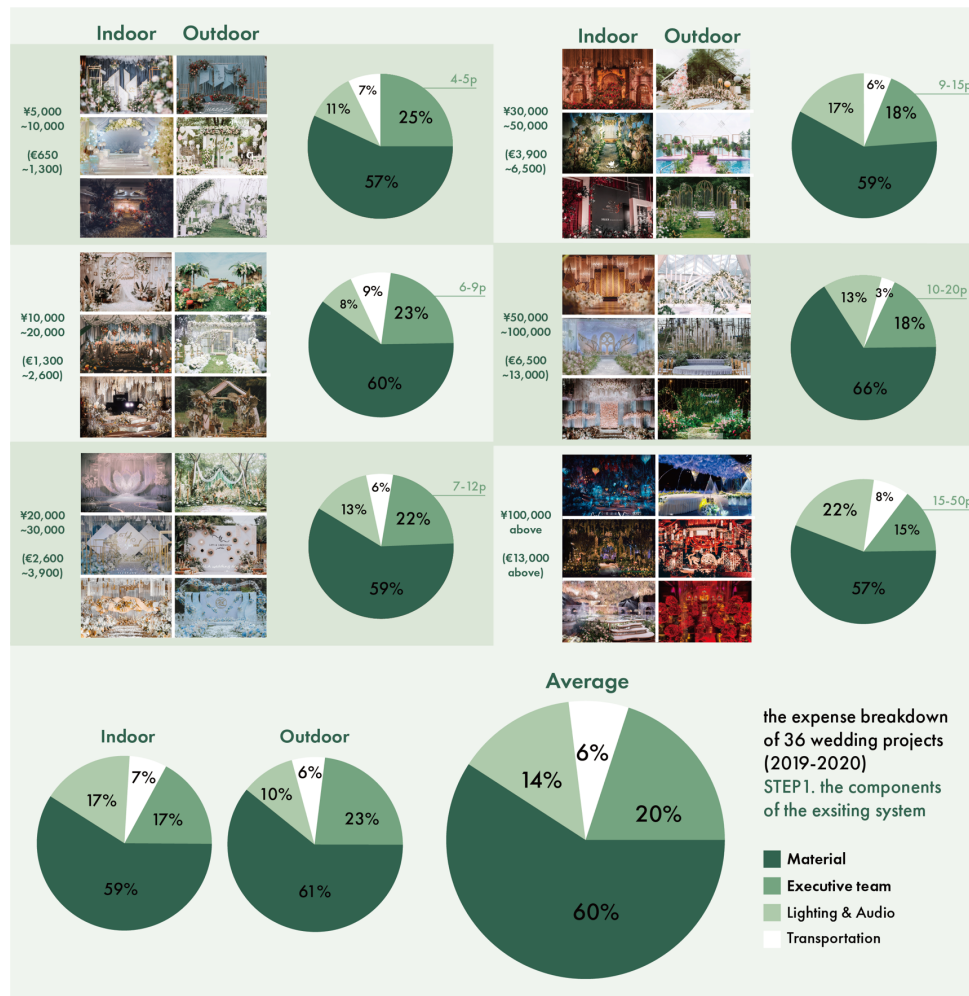


Figure 19: Findings of content analysis of 36 typical Chinese wedding planning projects.

Generally, the wedding projects in the Chinese wedding market are classified by the venue and price—indoor weddings and outdoor weddings with six price levels. This research selected 36 Chinese wedding projects, three typical projects from each of the twelve categories held in recent two years, to identify the essential components of the existing system by analysing the expenditure details of these weddings. Figure 19 summarises the results of the analysis. As seen in the figure, the material sector holds the most significant proportion of the total spending in average Chinese wedding, which is about 60%, followed by human resources, holding around 20% of the expenditure. The equipment, serving as another source of material, accounts for 14%, while the transportation represents approximately six percentages. From the perspective of classifications, outdoor venues require more human resources to construct the temporary structure, while indoor venues require more equipment to create the atmosphere. The finding also shows that proportions of human resources and transportation increase as the budget downgrades. At the lower price level, around 30% of spending is on invisible products. However, the size of the executive team is larger as the budget grows, while materials and equipment still occupy a more crucial position.

According to the collected content, the satisfaction unit delivered by a Chinese wedding planning company can be defined as “providing a customised ritual space in the wedding ceremony”. This process fulfils the fundamental demands associated with the functional aspect—providing a physical space and necessary equipment for the couple to exchange the vows. Normally, these basic demands are related to construction quality, adaptability, and ease of assembly and disassembly. On the contrary, the term “customisation” has a higher emotional attachment. As mentioned in the theoretical study, customisation supports the couple and their families to express self-identity and social status. In this way, the demands for customisation require more novel patterns of wedding spaces with personal elements. Based on the functional and satisfaction units, the boundaries of the current Chinese wedding planning system can be defined, which consist of 1) designing the ritual space; 2) arranging the material suppliers, the venue supplier, logistics, and executive team; 3) constructing the ritual space; and 4) the final disposal of materials.



STEP2. the relevant actors and their interests

	Actor	Main interest	
<div style="border: 1px dashed black; padding: 5px; width: fit-content;">           visualiser            constructor            florist            manager         </div>	<b>Wedding planning company</b>	Sell and create appealing projects to satisfy consumers' demands for wedding spaces	→ financial benefits
	<b>Executive team</b>	Sell skills and labor force to the wedding planning company	→ financial benefits
	<b>Logistics</b>	Sell logistic services to the wedding planning company	→ financial benefits
	<b>Material suppliers</b>	Rent or sell materials and equipment to the wedding planning company	→ financial benefits
<div style="border: 1px dashed black; padding: 5px; width: fit-content;">           decoration            printing            plants            lighting &amp; audio         </div>	<b>Venue supplier</b>	Rent venues to the wedding planning company or straight to consumers	→ financial benefits
	<b>Consumers</b>	Require a wedding space to fulfil functional and emotional demands	
	<b>Guests</b>	The secondary users of the wedding space	

Table 2: Relevant actors and their interests in the existing system.

Table 2 lists the most relevant actors and their interests in the existing Chinese wedding planning system. According to the table, the wedding planning system involves numerous stakeholders that aim to achieve financial benefit through supporting the wedding planning company. All these relevant actors and their interaction enable the Chinese wedding planning system to satisfy the diverse demands of customers as well as benefit financially. In this system, the essential services offered by the wedding planning company include 1) designing and improving the wedding space project based on the discussion with the customers; and 2) taking charge of the entire process from production to disposal. Meanwhile, the necessary product can be simply defined as a temporary ritual space for the wedding, which consists of various materials, as shown in Table 3. Due to various

wedding patterns related to diverse demographic and lifestyle classes, it is difficult to calculate the average environmental impact of Chinese weddings. However, as can be seen in the result of the content analysis, wedding planning products and services pose great challenges to the balance of nature in obvious ways. For example, single-use tailored construction consumes massive volumes of resources and produces immense waste; also, the transportation sector produces a considerable amount of carbon emissions that are harmful to the environment.

	Function	Material	Reusable (general)	Disposable (customised)
<b>Main stage</b>	Structural support	Iron/ wood struss	✓	✓ Customised structure
	Decoration	PVC/ KT/ Acrylic material	✓	✓ With customised information
		Floral material	✓ Artificial flower	✓ Fresh flower
		Fabric material	✓ e.g. carpet, curtains	✓ Customised fabrics
		Other props	✓ e.g. chandelier, furniture	✓ e.g. candle, ribbon, balloon
<b>Equipment</b>	Lighting	Plug-in light	✓	
		Portable light	✓	✓
	Audio	Speaker	✓	
		Sounder	✓	

Table 3: The material components of a typical Chinese wedding space.

#### 4.2.1.2 Semi-Structured Interview

This section summarises and presents the existing Chinese wedding planning reference system with all the above information by utilising the system map tool. The system organisation map tool supports the visualisation of the significant interactions that enable the system to deliver satisfaction or functional unit (Tischner & Vezzoli, 2009). Morelli and Tollestrup (2006) also state the system presentation could explain the operational logic and two major aspects of the system. The functional aspects focus on the consumer touchpoints and information exchange methods within the system. In contrast, the constructional aspects clarify the organisation of material and money flows as well as the logical grouping of service providers.

<b>Interview Structure</b>	Topic 1. The functional aspects - interactions with customers
	Topic 2. The constructional aspects - interactions with other stakeholders
	Topic 3. Wedding planning experience optimization - participatory design

Table 4: The interview structure of the semi-structured interview.

To accurately describe the interactions within the current system, this research conducted a semi-structured interview with a professional Chinese wedding planning team to gain more information from the perspective of the industry insiders. The face-to-face interview was conducted in Shanghai on December 18th, 2020. With the help of the pre-planned interview structure (see Table 4), the semi-structured interview provided reliable first-hand information on the existing Chinese wedding planning system. The interview audio recorded with the permission of interviewees was translated into text format in Chinese, then significant information was sifted and translated into English. The collected data was analysed and finally summarised in the system map.

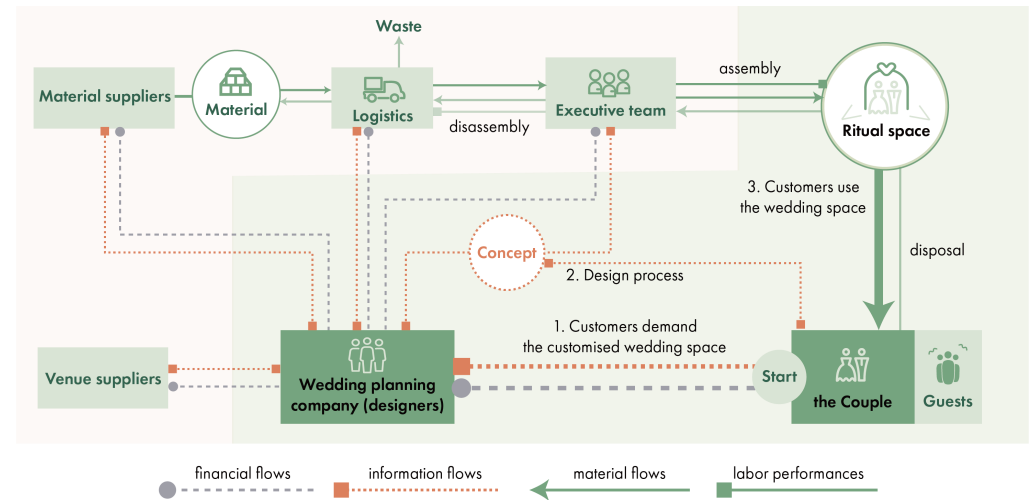


Figure 20: The system map of the existing Chinese wedding planning system.

Figure 20 illustrates the existing Chinese wedding planning PSS, which includes all the information listed above. The system map is built upon two basic needs: one is that the consumers require customised ritual space on the wedding day, another is that the service providers aim at the financial benefit. As primary actors performing the system, the customers and wedding planning companies are positioned in the green area. In contrast, the orange area shows the outside system of secondary actors that support the system to deliver the required function or satisfaction. The interaction flows between the various stakeholders are marked by different types of arrows: the solid green arrow indicates material flows, and the solid green line with a square at its tip represents labour performance flows, while the dotted orange arrow represents information flows and the dashed grey arrow indicates financial flows. In addition, the thickness of the lines shows whether the flow is primary (thick) or secondary (fine).

In terms of the functional aspects of the reference system, the primary information flows that consumers interact with designers at the starting point help

generate the initial concept of the ritual space. While the information flows on the production side, which refers to material demands and technical instructions shared between the wedding planning company and various suppliers, have significant influences over the final result—the ritual space presented on the wedding day. However, the system map does not show how these interactions and consumer touchpoints present in chronological order. Therefore, the following section applies the blueprinting tool to describe the system on a time scale.

### 4.2.1.3 Participant Observation

With a focus on the interaction with the customer, a blueprint of the system represents all activities that support the service delivery from the perspective of consumers in chronological order (Tischner & Vezzoli, 2009). The application of a blueprint brings similar benefits as a system map, but it is more helpful to identify what customers could see and how they could participate in the process. In other words, a system map indicates the core of the service delivery process of the system, while a blueprint offers a supplementary description of the interaction flows from the time dimension, which helps to identify the failure points and design opportunities. In this section, the first-hand data collected from the participant observation of a wedding planning project supports making the blueprint.

In this participant observation, the researcher joined a wedding planning team as a design assistant and participated in a wedding project in winter 2020 to learn about the detail of customer action, onstage and backstage activities, and support processes. In a service blueprint, these activities are separated into four principal levels by three horizontal lines: 1) the line of interaction between the onstage contact employee and the consumer; 2) the line of visibility that separates the actions into the visible part and invisible part for consumers; and 3) the line of internal interaction between the backstage actions and supporting actions (Tischner & Vezzoli, 2009). Figure 20 illustrates the logical flow of a Chinese wedding planning service offering in a blueprint diagram with the blueprinting tool and all the information mentioned above.

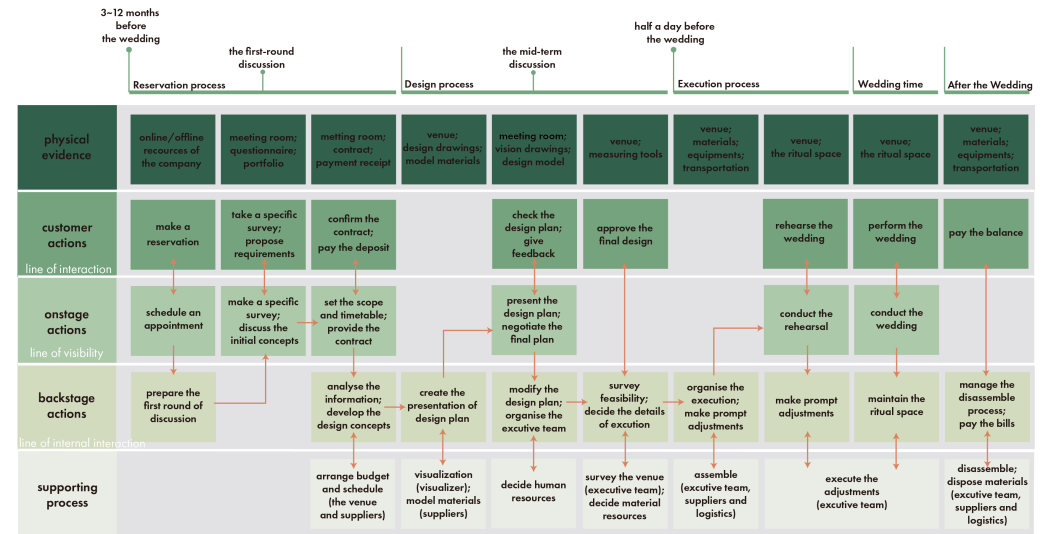


Figure 21: Service Blueprint of current Chinese wedding planning procedure.

As shown in Figure 21, the wedding planning service process has five phases:

- 1) Reservation process. A Chinese couple usually makes the reservation of a wedding planning service three to twelve months in advance. The starting point is when the customers contact the company and make a reservation for a wedding planning service after receiving the information from online or offline channels. Then, the customers take a specific survey and propose requirements in the first-round discussion with the designers. The customers can then select the type of product-service package and confirm the contract with the company. Details of the order, including the requirements of the customers, are recorded by the designers who attended the meeting.
- 2) Design process. Based on the analysis of the personal information, the wedding planning team develops the design concepts with supports from suppliers.

In the mid-term meeting, the designers present the design proposal with a model and scenario drawings, then the customers check the design proposal and give feedback for improvement. When the customers approve the modified design as the final proposal, the team starts to survey the venue as well as organises the material supplying and executive team for the final execution.

3) Execution process. Because most wedding venues are hotels or restaurants, the execution usually begins half a day before the wedding. The wedding planning team, material suppliers, logistics, and executive team cooperate on the assembly of the ritual space. Then, the users rehearse the wedding in the constructed ritual space, while the team makes prompt adjustments according to the actual situation.

4) Wedding time. When the couple performs the wedding rite in the ritual space, the required function and satisfaction are delivered. The short hours of wedding time are the usage phase of the end products (the customised ritual space).

5) After the wedding. When the users complete the ceremony, the team starts to manage the disassembly of the temporary structure. After the customers paid the balance, the wedding planning company pays the bills to all the involved supporters.

#### 4.2.2 Problems & Opportunities

The system map and service blueprint above provide a clear and complete overview of the existing Chinese wedding planning reference system. With an understanding of the logical flow of the current product-service delivery process, the next task is to identify the potential failure points and future opportunities of the system according to the anticipant development. Figure 22 indicates the points of existing problems (red) and future opportunities (blue).

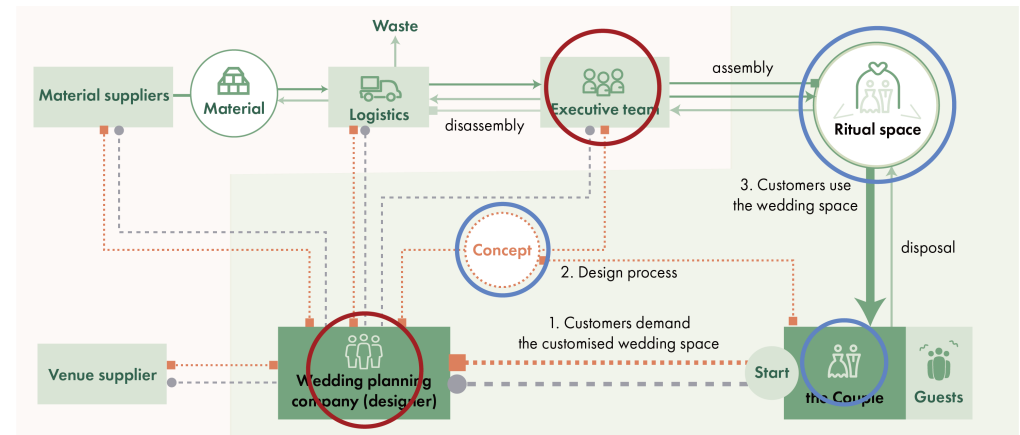


Figure 22: The failure points and design opportunities of the existing system.

Based on the analysis of the two diagrams above, the most obvious feature of the existing system is the dissociation between the functional aspects (interactions within the consumer side) and the constructional aspects (workflows on the production side). On this point, the end users stay in a passive position as inert observers of the product and have limited opportunities to become active participants. The existing system has several barriers for the consumers to involve in the process and influence the final result.

The first failure point (red) is the wedding planning company. The company plays a dominant role in the design-production process due to the nature of the Chinese wedding planning service. However, the increasing consumer demands for customisation and personalisation in recent years require more involvement of consumers. For these wedding planning companies, more services for customisation mean more material and human resource, which causes an increase in financial cost. Although the designers will develop the concept based upon the requirements that consumers proposed at the beginning, the outcome is mainly determined by companies since the budget has decided the limited level of participation of consumers in the design process. Therefore, the end products usually satisfy the functional and aesthetic requirements but miss the personal ideas and views from customers.

Another failure point of the system is the execution process. As shown in figure 23, this complicated process is strongly linked to the final performance of the wedding space and total expenditure, but it is hidden from the sight of the users. This situation is an inherent characteristic of wedding planning service: consumers only need to pay for the result and get free from the intricate details while the company takes full responsibility for the allocation of the agreed budget. However, a paradox exists in the current system: the desire for lower price and customisation require a higher level of participation of consumers, but they are usually averse to the cumbersome process. Moreover, consumers typically spend a significant amount of money for an ideal result unconsciously because the details of material and financial flows are invisible to these actual purchasers. In this way, the invisible execution process increases the cost of resources and money.

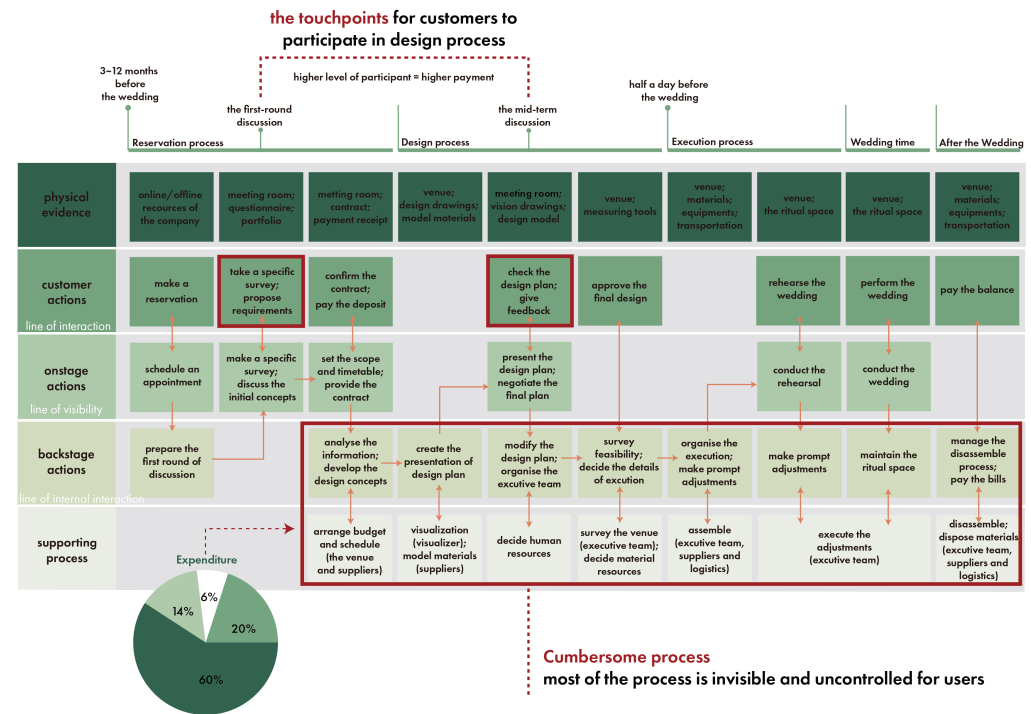


Figure 23: The failure point in the design-production process.

The last failure point is the weakness in consumer touchpoints. A touchpoint is defined as a point or stage where the consumers and service providers have a communication, or physical, or human contact, or sensory interaction (Brigman, 2013). Figure 23 indicates the lack of touchpoints in the existing system. The first touchpoint is the first-round discussion. It supports designers to collect the necessary information from consumers to generate initial concepts, but consumers only receive limited information about products from reference cases. Another touchpoint is the mid-term discussion, when consumers gain the first chance to check and give opinions on the design after the designers presented the design in some tangible forms (e.g. models, drawings). As discussed above, the budget has

decided the frequency of mid-term discussion, which limits the opportunities for users to receive information about products. Moreover, the lengthy negotiation and the heavy workload for the design proposal presentation also reduce the interaction between consumers and designers.

The first identified possibility in the system is the end product, the ritual space presented on the wedding day, which integrates the functional unit and satisfaction unit. In the existing system, behind the short-lived products is a complexity of workflows and resources utilisation. It is crucial to rethink the current design practices and develop alternative solutions that are able to satisfy the diverse consumer demands and reduce the cost of resources and money at the same time.

The second possibility focuses on the users, which includes the couple and wedding participants. As mentioned above, the overconsumption behaviour and individual requirements of consumers have the greatest influence on the total environmental impacts of the system. Besides, the focus on the involvement of guests provides a great potential for participatory design. Therefore, it is significant to consider how to induce consumers to make reasonable decisions and motivate both primary and secondary users to participate in a co-creation process.

Another possibility, consumer touchpoints, was emphasised because of its significant impact on the outcome and experience of consumers. According to the existing problems mentioned above, advanced management of consumer touchpoints can enhance the interactions between various actors within the system. It is necessary to consider what kind of touchpoints can optimise the experience of consumers and motivate them to adopt sustainable options while ensuring the financial benefits of all actors at the same time. For example, the physical touchpoints in the mid-term design process can turn into digital form, which is more simple and powerful for information sharing; more importantly, it is time-saving and cost-effective for all actors within the system.

In conclusion, the redesign of the existing system covers the product innovation and system innovation levels; in other words, both the users and products will control the decision-making process in the new PSS.

### 4.3 Design Strategy

Based on the analysis of consumer demands and the existing system, this chapter elaborates on the new wedding planning PSS design strategy. The redesign strategy aims to solve the current problems, expand the design opportunities, fulfil the identified consumer requirements, and finally achieve sustainability. To achieve these goals, the new PSS should identify the basic consumer demands and the new requirements that are not yet satisfied in the current system. According to the findings of the previous chapter, the existing system is able to meet the fundamental requirements related to tangible materials. However, it cannot completely fulfil the emotional demands for intangible personal satisfaction. Moreover, the existing system has a mutually exclusive relationship between the demand for participatory design and the desire to save money and time. Therefore, the new PSS, which addresses these promising demands, should be defined as a system that not only delivers customised products with functional and aesthetic values but also provides services that improve the level of participation of users in the entire design-production process in a cost-efficient and time-saving way.

Returning to the DfSB approach, the new strategy can induce consumer behaviour change in three ways: inform the change (i.e., information, choice, and feedback), guide the change (i.e., spur and steer), or ensure the change (i.e., technology and design); specific strategies related to “inform the change” rely on the cognition and reasoning of the consumers, while the “guide and ensure the change” strategies focus on changes in product features (De Medeiros et al., 2018). In this thesis, the new PSS concept aims to inform the change through system innovation as well as guide and ensure the change through product innovation. Two relevant case are studied for reference in the beginning of this section, and then the redesign strategy was elaborated in detail; the last part is an evaluation through a focus group interview.

### 4.3.1 Case Studies

#### 4.3.1.1 System Innovation Case: The Pop-Up Chapel

The Pop-Up Chapel, as the Uber or Airbnb of weddings in Canada, is a wedding planning PSS that rents all-inclusive wedding packages to newlyweds on a per-hour basis. According to the website of the company (see Figure 24), a full wedding package consists of a styled wedding space (venue & décor), a planned ceremony, a light reception for 20 guests, personal florals, photography, and music. Besides, the system offers add-ons selections for couples to customise a particular wedding experience. Ten couples can host their weddings at separate times in one day by sharing a pre-arranged wedding package, and each wedding has a one-hour time slot that includes 15 minutes of ceremony and 45 minutes of reception.

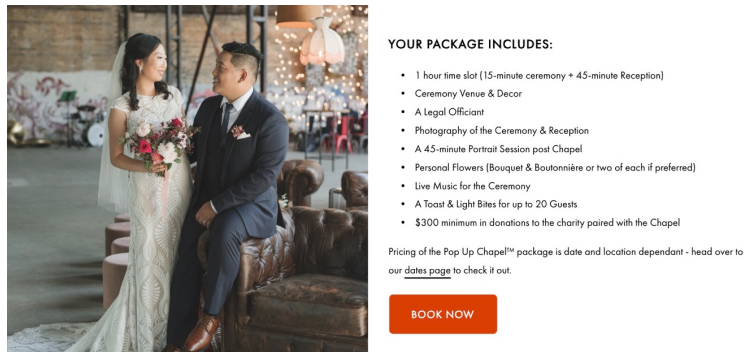


Figure 24. A screenshot of the Pop-Up Chapel website (<https://www.popupchapel.ca/how-it-works>).

#### Main environmental benefits:

- This use-oriented PSS rents a shared wedding package to couples instead of offering single-use wedding products. A designed wedding spot allows ten couples to host weddings in one day. This way can decrease the environmental impact by maximising the utilisation of resources and reducing the total waste production.

#### Other benefits (social, economic):

- The company takes full responsibility for the wedding in creating the ritual space, arranging the logistics, and organising necessary vendors, which offers a simple and efficient solution for those who do not want to spend too much time and efforts on wedding planning.
- For the couples who desire an affordable option or a light, intimate wedding instead of a larger traditional one, the releasing system offers convenient access to an all-inclusive package at a lower expenditure than a traditional event planning service.
- It is worth mentioning that one of the add-ons choices during the COVID-19 pandemic is live streaming, enabling the couple to invite more friends and relatives to witness the wedding.
- The company donates \$300 from the revenue of each chapel spot to a paired charity.
- With all the above advantages, the system brings competitive and economic benefits for the company.

#### Limitations:

- Although every pop-up wedding spot is uniquely designed based on the venue, season, and market trend, the spot-sharing scheme has an inherent weakness in customisation. The only opportunity for couples to customise their wedding experience is when they add additional products and services to the basic package.

#### 4.3.1.2 Product Innovation Case: Pure Tension–Volvo Pavilion

The “Pure Tension”, designed by Synthesis Design + Architecture, is a deployable structure that served as a mobile charging station for hybrid electric cars. This design integrates dynamic forms, striking visual effects, excellent functionality, and high efficiency. In general, the portable pavilion has three components—a perimeter frame made of bent carbon fibre rods, a pre-fabricated HDPE mesh membrane with integrated PV panels, and several anchor plates.

These lightweight, high-tech materials can be stored into a small-scale bag that fits in the trunk of a car; thus, the users can easily transport and rapidly deploy the structure without a large executive and logistic team. Figure 25 illustrates the simple installation process of the pavilion. The critical steps of assembly include 1) feeding the rods into the pre-fabricated sleeves of mesh membrane and 2) bending the rods through the mesh skin to achieve an organic tensioned form. This efficient and effective transformable way enables the free-standing structure to be flexible and adaptable to changing environment; also, the dynamic forms satisfy the diverse demands for visual impact and functionality. Moreover, the photovoltaic panels embedded in the membrane collect light from the environment to generate power, which turns the potable shelter into a charging station for electric cars, with the cable inserted within the rods.

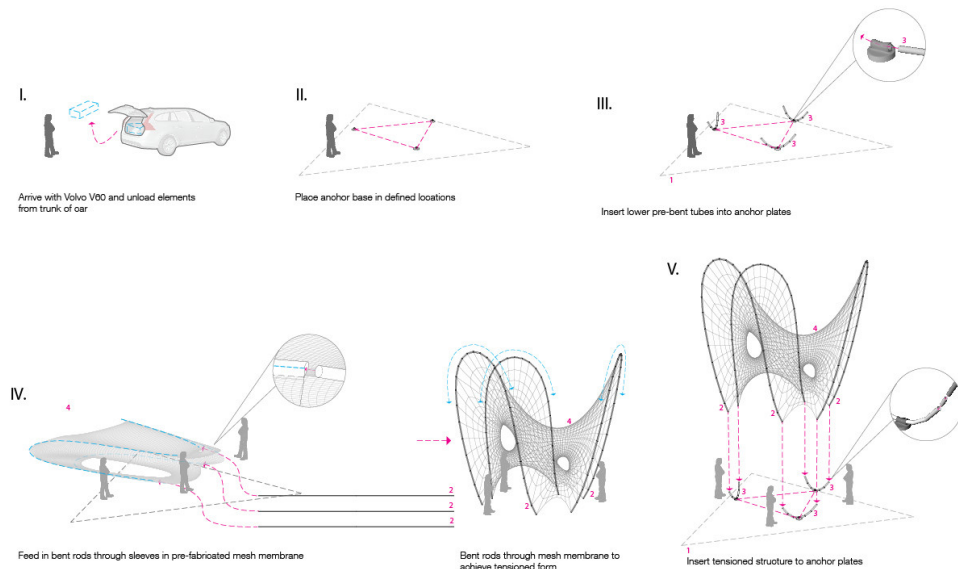


Figure 25: The assembly process of the Pure Tension pavilion (<http://synthesis-dna.com/projects/pure-tension-volvo-v60-pavilion>).

### 4.3.2 Redesigning the System

This section details the design strategy in the following considerations: relation of material product and immaterial service; co-operation and partnership; organisation; customer/ consumer relation; user interface; and financial structure (Tischner & Vezzoli, 2009). The system map tool is applied to elaborate the new PSS concept. Finally, two specific strategies are described in detail: 1) the transformable structure design for guiding and ensuring sustainable behaviour; and 2) the digital touchpoint design for guiding the change.

#### 4.3.2.1 Sustainable Wedding Planning Product-Service System Concept

The Floating Chapel wedding planning PSS offers a platform for the couple and wedding participants to co-create the temporary wedding space and provides rental service of the material boxes to the consumers according to their customised orders. The core product of the new system is the Floating Chapel—a transformable installation that served as the wedding space, which consists of two elements: a basic structure and additional customised segments. When designing the Chapel on the online platform, the users can simulate various scenarios of the structure by changing its frame, materials, and add-ons. Moreover, the platform allows consumers to invite wedding participants to select the exclusive elements together.

During the customisation process, the consumers can witness the details of materials, the number of material boxes, the time for manufacturing and shipping, and the estimated cost according to the changing content in real-time. More materials and customised effects require a larger number of boxes and a longer prefabrication process, which increases the cost of money and time. The real-time feedback informs the consumers to make the decision based on the expected venue, budget, and schedule. The outcome, the material boxes of the customised Chapel, is quickly produced by the manufacturers once the consumers decided the content and placed the order. After the manufacturers finishing the prefabrication and



packaging work, the materials are packaged into modular boxes that are suitable for the common logistic system. In this way, the company can easily transport the material boxes to the chosen venues or send the boxes straight to the consumers if they have not chosen the wedding venue yet. The prefabricated materials enable the consumers to quickly and easily assemble the structure in any venue right before the wedding. After the wedding, consumers disassemble the structure, keep the personalised parts as souvenirs, and then return the reusable materials back to the service provider.

In the new wedding planning system, the decision-making is within the control of consumers instead of the company, while the company is responsible for the underlying organisation. Compared to the existing system, the new one emphasises the role of consumers by turning it from passive receivers to active participants in the design-production process of the wedding space. The participatory design approach not only increases product satisfaction but also brings the users memorable experience and the feeling of achievement. Moreover, the total transparency of the simplified material and financial flows induces the consumers to control the utilisation of materials under the consideration of financial cost. The send-back step also motivates them to apply fewer resources and prioritise reusable materials. Besides, the digital presentation form of the design proposal cuts out the consumption of materials during the concept development, and the intensive package of materials requires less transportation. In this way, the system is environmentally sustainable by reducing the total impacts of resource and transportation. From a financial perspective, the company also gains economic benefits due to the efficient and effective workflows. The increased level of participation of consumers eases the most time-consuming process of concept development and interaction with various stakeholders. Besides, the creative PSS can increase the competitiveness of the company and has great potential to turn the invited participants into new consumers.

At the final disposal stage, the consumers reserve the personalised components and package the reusable materials into the boxes. Then they can choose to send the boxes back to the service providers or leave the boxes in the venue if the supplier has a cooperative partnership with the company. After taking

back the boxes, the company can reuse the materials to remake new boxes. Another possibility is that the company cooperates with the venue suppliers and leaves several basic boxes with regular materials in the venue only to deliver the additional materials there if the consumers chose the partner venue.

### 4.3.2.2 New System Map

The existing Chinese wedding planning system map illustrated in the previous chapter indicates the current cumbersome design-production process and its weak relationship with the consumers. On the contrary, the new PSS concept (see Figure 26) describes an efficient and effective organisation as well as an active role of consumers within the system.

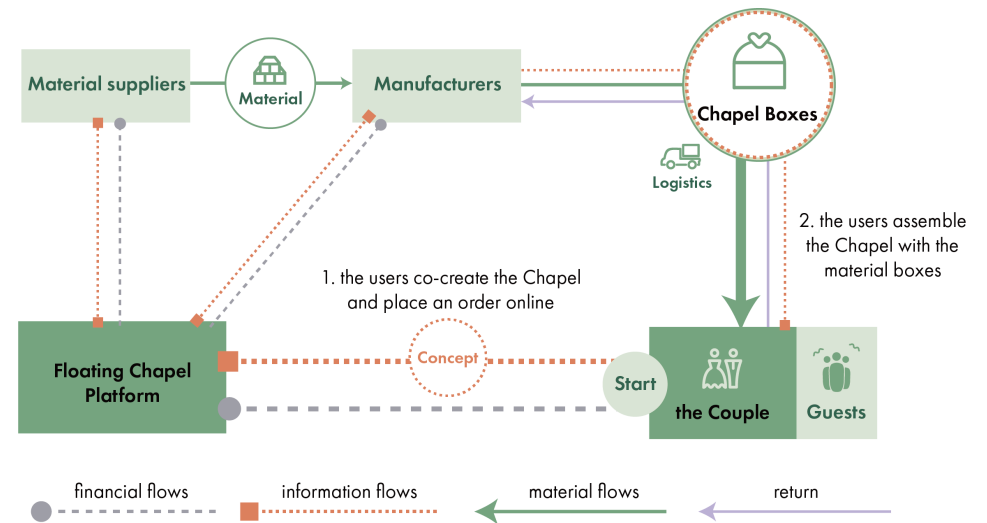


Figure 26: The system map of the proposed wedding planning PSS.

	Actor	Role		
<div style="border: 1px dashed grey; padding: 5px;"> <div style="border: 1px solid grey; padding: 2px; margin-bottom: 2px;">fabric</div> <div style="border: 1px solid grey; padding: 2px; margin-bottom: 2px;">metal</div> <div style="border: 1px solid grey; padding: 2px; margin-bottom: 2px;">lighting &amp; audio</div> <div style="border: 1px solid grey; padding: 2px; margin-bottom: 2px;">others</div> </div>	<b>Floating Chapel (company)</b>	Sell services and rent products to satisfy consumers' demands for customised wedding spaces	→ financial benefits	
	<b>Material suppliers</b>	Rent or sell materials and equipment to the company	→ financial benefits	
	<div style="border: 1px dashed grey; padding: 5px;"> <div style="border: 1px solid grey; padding: 2px; margin-bottom: 2px;">prefabrication</div> <div style="border: 1px solid grey; padding: 2px; margin-bottom: 2px;">package &amp; storage</div> </div>	<b>Manufacturers</b>	Sell manufacturing services to the company	→ financial benefits
		<b>Logistics</b>	Sell logistic services to the company and consumers	→ financial benefits
	<b>Consumers</b>	Require a customised wedding space to fulfil functional and emotional needs		
	<b>Guests</b>	Participate in the co-creation process of the wedding space		

Table 5: Relevant actors and their interests in the new system.

Compared the proposed system map with the existing one, the users replace the wedding company as the dominant role in the design and production process, while the company plays the role of facilitator to support the interactions within the reorganised actor group. In the new system map, the flows of money, information, and material are marked with grey dashed lines, orange dashed lines, and green solid lines, respectively. The simplified map shows that the new PSS system has changed the actors and interaction flows to improve efficiency and reduce unnecessary consumption. Firstly, the simplicity of operating the Floating Chapel and the involvement of the users in the process eliminate the need for the executive team. Unlike the traditional temporary construction for wedding spaces, the Floating Chapel is a simple transformable structure that is prefabricated elsewhere, transported to the venue, and quickly assembled on-site without much manual handlings and expertise. In this case, the flexibility and adaptability of the structure also allow the users to set up the chapel in random venues and diminish the significance of the venue suppliers. Lastly, from the perspective of transportation, the modular packaging pattern only requires regular delivery instead of large shipment on a contract basis. The new actor added to the system is

the manufacturers, who take charge of prefabrication and packaging of the materials. Table 5 shows the actors involved in the new system.

Not only the actors of the system have changed, but the role of each actor and the relations within the organisation are also completely different from the existing one. As the consumers control the design and material utilisation in the proposed system, the interaction between the consumers and the wedding planning company is essential. In this case, the most significant consumer touchpoint is the digital platform, where consumers receive information from other actors and make decisions. While the platform provides the basic structure template, the consumers are responsible for customising the design, which is considered the primary flow. Another significant flow is when the users participate in the assembly process after receiving the material boxes. In addition, the new-added return phase of the material boxes also intensifies the significant role of the consumers. The purple lines in the map illustrate the new return flows that the consumers send the reusable material boxes back to the service provider. Obviously, the reduced amount of material, information, and financial flows increases the efficiency of the system and reduces the total consumption of resources; moreover, the higher level of participation of the consumers and the simplification of the organisation have great potentials to influence the users to make decisions from reasoning and sense-making, which turns to affect other actors to achieve sustainability at the same time.

### 4.3.2.3 Detailed Strategies

The functional unit of the new PSS, a transformable structure that served as the wedding space, is an alternative design that aims to guide and ensure the users perform particular behaviours for sustainable goals. As discussed above, a simple operating approach and lightweight materials of the structure are essential factors of its flexibility and adaptability, which motivate people to adopt the alternative solution.

According to the service blueprint of the existing system (Figure 20), normally, the design of a Chinese wedding space starts with investigating consumer demands

and then considers the functionality and feasibility at the execution stage. This way usually results in a gap between what the consumers expected and what they experienced because of practical limitations. On the contrary, the new PSS develops the design of a wedding space in reverse order—the company provides a basic structure that ensures the functionality and feasibility first, and then the customers control the inspirational segment according to their wishes. Because the starting point for each wedding space is the potential customers with diverse demands for customisation, it is significant to focus on the basic structure and its materials that enable the transformable structure to be reused multiple times, and which allows the consumers to add personalised elements for a customised outcome.

In a word, the transformable structure has to meet four requirements: 1) the operating approach is simple and efficient; 2) the weight and volume of materials are minimal for mobility; 3) the structural form is dynamic and adaptable for diverse contexts; and 4) the basic structure allows additional elements to attach and detach easily. With these goals and knowledge learnt from the case studies, the transformable design starts with defining the material components. The components of the basic structure are simplified into three essential pieces: “skin” (fabrics), “bones” (rods), and “footings” (anchor plates). From the perspective of customisation and personalisation, the basic structure can add diverse customised elements, for example, lighting, audio system, and detachable decorations. The integrated set of material components will be packaged into modular boxes—each compact box is the same standard as the checked baggage on domestic flights in China, which is restricted to a size of 100cm x 60cm x 40cm and a weight of 20 kg. Table 6 lists the material components of a transformable chapel in detail.

	Function	Material	Reusable	Customised
Main components	fabrics (“skin”)	knitted fabric, mesh membrane	√	√ customised fabrics
	rods (“bone”)	carbon fibre, metal	√	
	anchor plates (“footing”)	concrete, carbon fibre, metal	√	
Add-ons	Lighting & Audio	LED lighting	√	
		audio system	√	
	detachable decorations	fabric, plastic ...	√	√

Table 6: Material components of the new PSS.

The next step is to discuss how these materials could form a wedding space. As shown in Figure 27, the concept generation of the structure is inspired by a simple twist that turns a flat two-dimensional surface into a three-dimensional space. In this way, the basic structure only requires one piece of fabric, two rods, and four anchor plates (see Figure 28). Based on the simple principle, consumers can quickly assemble and adjust these prefabricated materials to achieve functional and aesthetic configurations in diverse contexts without a large executive team. A series of drawings below visualise the assembly process (see Figure 29).

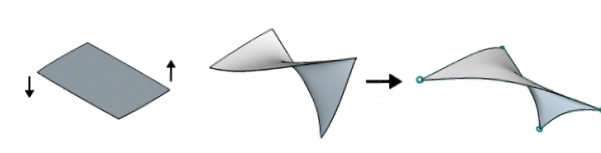


Figure 27: Idea generation of the transformable structure.

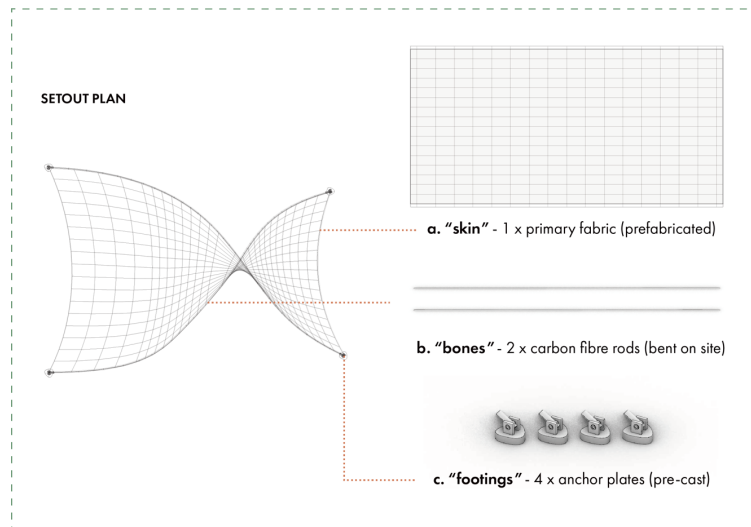


Figure 28: Material components of the basic structure.

While the operability and mobility of the basic structure ensure the functionality delivery, the dynamic forms and additional elements are responsible for the satisfaction unit of the new system. As shown in figure 29, users can transform the distance among four footings and the shape of two rods to achieve diverse configurations during the assembly process. Besides the transformability of the basic structure, various add-on selections are another effective approach for customisation and personalisation. Figure 30 shows the scenarios that adding colour-changing lights, customised printing, and detachable decorations to the basic structure.

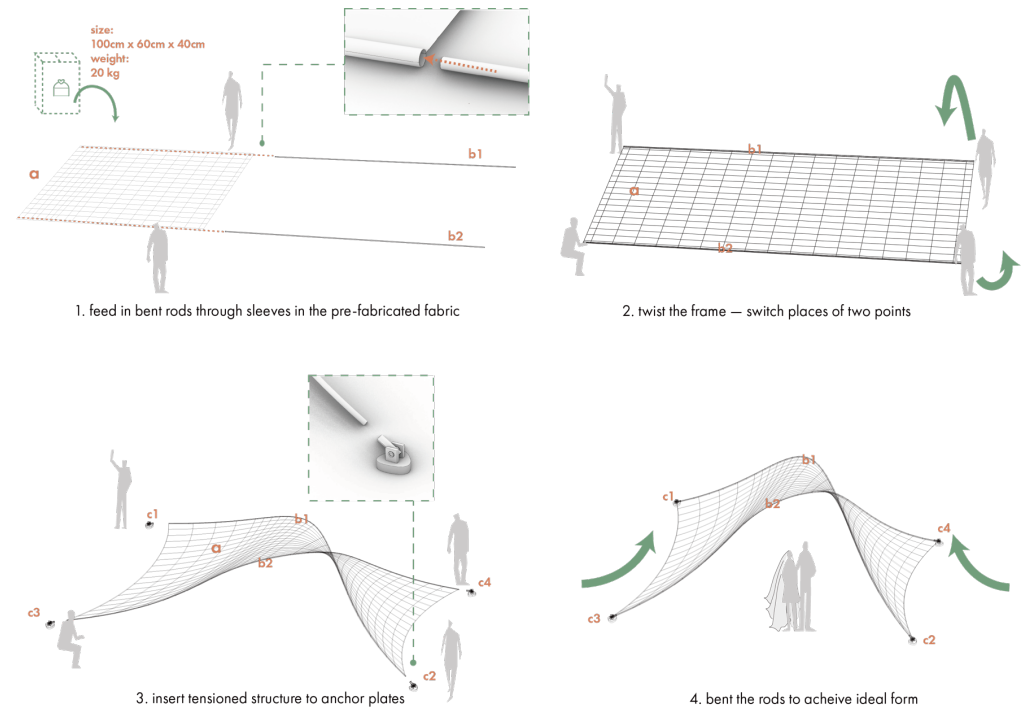
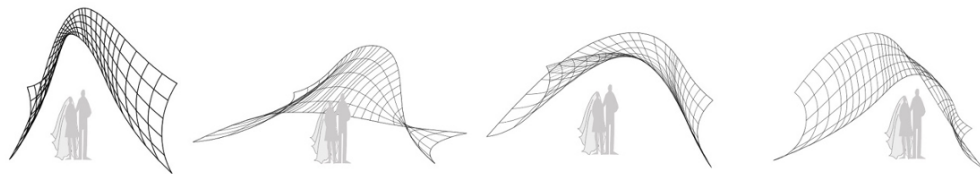
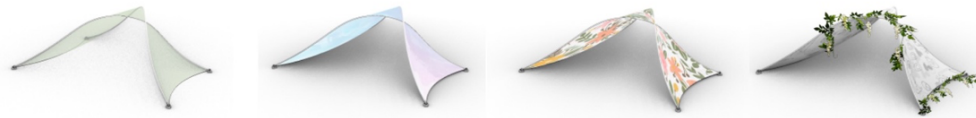


Figure 29: Assembly process of the new structure.



dynamic forms — changing with the frame and footing



add-on elements

Figure 30: Dynamic forms of the structure.

As discussed in the previous chapter, the sustainable behaviour in the Floating Chapel product-service system is controlled by a combination of products and users. Through the level of product control, the features of the transformable design guide and ensure the consumers save materials, labour work, and time during the production process; while the service touchpoint in the design process aims to encourage consumers to adopt a more sustainable package through the level of user control. In this case, the core service touchpoint of the new system is a mobile application, where the users interact with the participatory design service and product rental service. Due to its mobility, popularity, and convenience, the digital platform is more accessible for the target user group—the newlywed couple and the participants who are invited by the couple to co-design the wedding space. Based on the analysis of consumer demands and new system concept, this research visualises the user interface of the Floating Chapel mobile application to describe the service procedure and how it works for the users to perform sustainable behaviour in detail.

## FLOATING CHAPEL mobile application

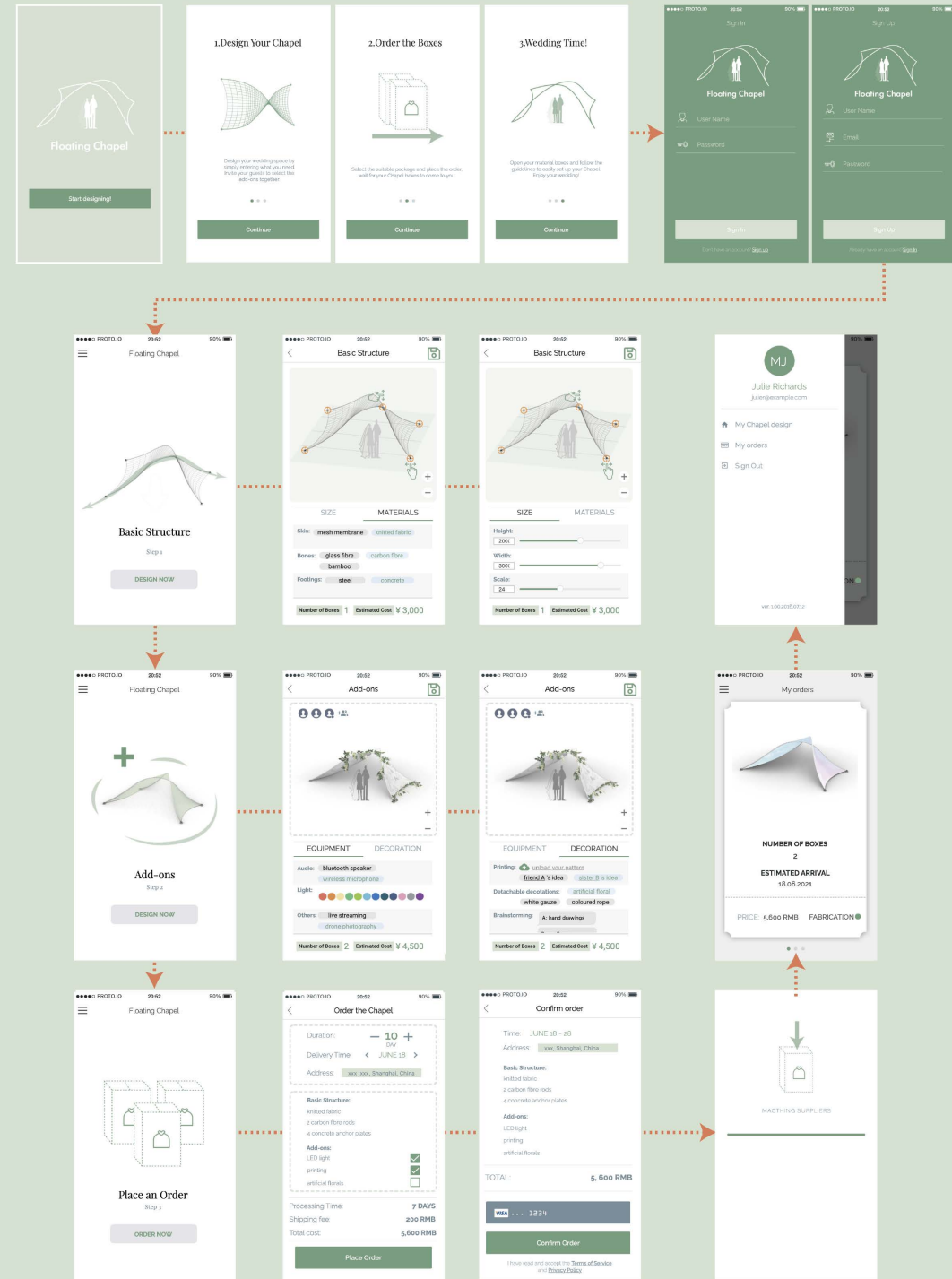


Figure 31: The operating flow of the Floating Chapel mobile application.

As shown in Figure 31, the final concept prototype consists of three major modules: “basic structure”, “add-ons”, and “place an order”. With the mobile application, the couple can easily participate in the design process with intimate friends and relatives, and rent the materials from the company. To gain access to the participatory design service and rental service, the users must register and login in first and then enter into the main page, where three modules are in order.

The first step is to design the basic structure, and it includes two sectors: size and materials. Users can change the shape of the frame by adjusting the height, width, and scale or simply dragging the five control points in the simulator. In the material sector, users can replace the materials of the three main components by clicking on the corresponding buttons. The main interface, the vision simulator, provides the real-time rendering model of the structure according to user actions. Another real-time feedback at the bottom informs the users of the estimated number of boxes and material cost. In this step, material selection is the primary factor in material cost, while the weight and volume of materials influence the number of packages, which is the factor in the shipping fee.

The second step is to select additional elements for the structure, and this module offers two types of add-ons: equipment and decoration. The couple can invite their friends and relatives to participate in this customisation process. Besides the options provided by the platform, users can upload their personalised concept and brainstorm together online. For example, users can upload the pattern by themselves for the printing sector and see how it works on the chapel. Again, the simulator offers real-time visualisation of the co-creation outcome, while the data at the bottom changes with the selections. A more complicated set of material components requires more manufacturing workload and money. This interactive relation between the estimated cost and decisions induces the users to control the consumption behaviour based on the budget.

After deciding the material components of the final chapel, the last step is to place an order of the material boxes. The consumers have to input necessary

information, including the rental duration, delivery time, and address, to generate the order; they also have one more chance to alter the add-ons in this step. Based on all information, this module will work out the estimated processing time, shipping fee, and total cost, which allow the consumers to adjust the relevant content to meet their requirements. Once the consumers place the order, the final action is confirming the order and making payment. Through the navigation menu, the users can check their design project and order situation.

### 4.3.3 Final Evaluation

#### 4.3.3.1 Focus Group Interview

As the new PSS strategy has been elaborated above, the last step is to evaluate the concept and test its validity in practice. To assess the design outcome and summarise its shortcomings from the consumer perspective, the author conducted a focus group interview with six Chinese youth (three couples) who plan to hold wedding ceremonies this year and desire an optimised wedding planning experience. Firstly, the interviewees were informed of the details of the existing wedding planning system map (see figure 19) and the proposed PSS map (see figure 26) as well as the transformable product (see figure 27-29). Then, they were required to test the prototype of the mobile application as potential customers. Lastly, they were asked to give feedback on the design project by answering the following assessment questions:

1. Can this project help you realise your ideal wedding concept? Why?
2. Does this project help induce your sustainable consumption behaviour (e.g. reduce material utilisation) in the design process? Why?
3. What do you think of the step that you invite relatives and friends to co-design your wedding space? What are the advantages and problems of this step?
4. Are you personally willing to use this wedding planning service? Does this service provide you with enough opportunities for self-expression and participation? Why?
5. What do you like the most about this project, and what do you like the least about it? Why?

The interview was conducted in Chinese in April 2021, and the record was translated into English. According to the feedback from the interviewees, the design outcome of this research—the Floating Chapel platform and the customisable product can satisfy the demands of consumers, optimise their wedding planning experience, and most importantly, induce their sustainable consumption behaviour.

According to the feedback from the interviewees, they all gave positive statements to the design concept and valuable suggestions for future optimisation. Firstly, the three young couples all agreed that the design project could satisfy their requirements for an ideal wedding, while couple 1 and couple 2 indicated the lack of real product photo show might decrease the trust of the customers. For the question about behaviour change, all interviewees responded that the design project has great help for them to control the utilisation of materials due to the transparency of financial flows and simplified disposal system. For the question of the co-design process, interviewees agreed that participatory design is a creative approach that can improve the wedding experience of participants and add emotional values to the wedding space. At the same time, couple 1 and couple 3 expressed the concern that the involvement of other people might consume plenty of time and influence the final effect. Therefore, couple 1 suggested offering a separate part for co-design, and couple 3 emphasised the process should ensure the dominant role of the couple. When talking about the acceptance of the service, these three couples all showed a strong willingness to purchase the service, and some of them hoped the service could offer more opportunities for customisation; for example, couple 2 suggested a module of “theme”, which enables consumers to design the wedding space in a comprehensive way and has the potential to promote local industries by integrating distinctive culture, while couple 3 suggested more equipment selections. Lastly, the three couples were required to list the greatest advantage and disadvantage of the design project. Table 7 shows the feedback on the last question.

	advantage	disadvantage
couple 1	the financial flows are transparent; the process is simple and convenient	the virtual scenario cannot guarantee the final effects
couple 2	consumers have full freedom to customise their wedding space	the basic structure has limitation in forms
couple 3	the flexibility and mobility of the project meet the desire that hold the wedding in a random venue	the customisation process lacks a professional guide

Table 7: The consumer feedback on the advantages and disadvantages of the design project.

In conclusion, the focus group interview for assessment demonstrates the validity of the design outcome from the consumer perspective. In other words, the new wedding planning PSS concept can not only satisfy the consumer demands but also induce the sustainable consumption behaviour.

#### 4.3.3.2 PSS Sustainability Radars

To answer the research question “How can a participatory wedding planning product-service system help Chinese weddings move towards sustainability?”, it is significant to evaluate the new PSS in a comprehensive way. This section utilises the Sustainability Radars to describe the comparison between the existing reference and the new PSS. According to Tischner and Vezzoli (2009), the three radar diagrams correspond to the three dimensions of sustainability—environment, society, and economy, and each of them has six criteria to evaluate the newly developed PSS. Because not every criterion is significant for the wedding planning system, the first step is to prioritise these criteria according to their importance for the system: high (H), medium (M), low (L), or no (N) priority. Then the improvements of the new PSS compared to the existing one can be marked for each criterion in the three radar diagrams. The comparison has four levels: radical improvement (marked as “++”), incremental improvement (“+”), the same level as

the existing situation (“=”), and even worsening level (“-”). By connecting the marks, the radars show if the new PSS is a better solution for sustainability. Figure 32-34 illustrates the sustainability profile of the proposed wedding planning PSS system compared to the reference system in three dimensions.

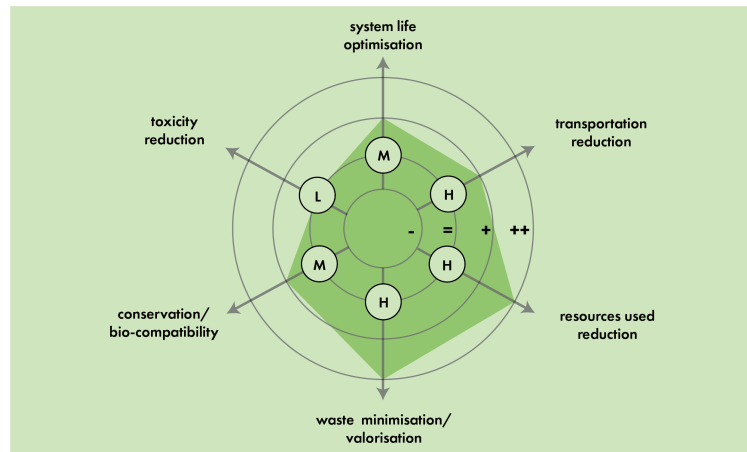


Figure 32: The environmental sustainability radar of the new PSS.

For the environmental dimension, Figure 32 shows that the sharpest edge of the radar is the criteria of resources used reduction and waste minimisation. The two high (H) categorised criteria got “++” value because the resources consumption is more precise in the new PSS. Compared to the existing system, the products in the new PSS are produced only for the customised demands. The customisable structure also influences the disposal of materials because the additional elements can be reserved as personal products while the basic materials are reusable. Another high (H) categorised criterion is transportation reduction with “+” value due to the innovation in logistics. Besides, the life system optimisation and conservation/ bio-compatibility in the new PSS also have an improvement due to the innovation in the design-production process. These two criteria are related to production equipment and energy consumption, which are less significant in the new PSS. Because the new concept focuses on the consumer

perspective, these two criteria are worth exploring in future studies concentrating on companies.

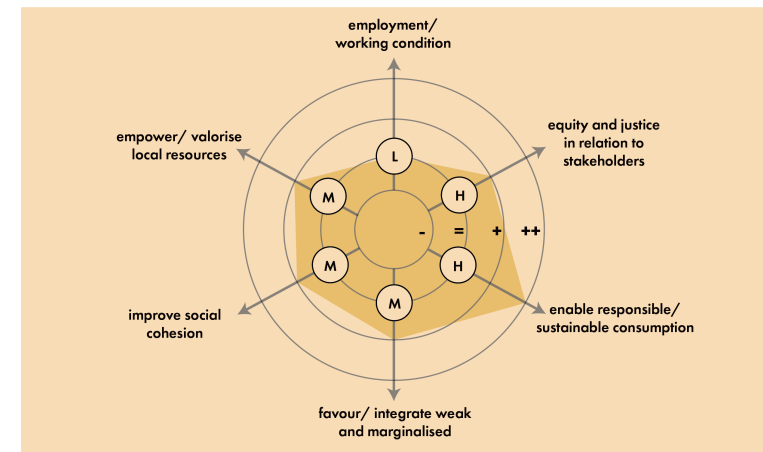


Figure 33: The socio-ethical sustainability radar of the new PSS.

Figure 33 is the sustainability radar for the socio-cultural dimension. As the goal of the proposed PSS concept, the criteria of enabling responsible/ sustainable consumption has the high (H) value and the sharpest edge of the radar. Another high (H) categorised criterion is equity and justice in relation to stakeholders, which has “+” value due to the simplified and efficient organisation. The medium (M) categorised criteria include empowering/ valorising local resources, improving social cohesion, and favouring/ integrating weak and marginalised group. These criteria have incremental improvement as the new PSS allows the consumers to utilise the local and biological resource, cooperate with local suppliers, and fulfil the requirements in a reasonable budget.



## 5 Discussion

This study has investigated the overconsumption in Chinese weddings to propose an alternative design solution for Chinese weddings to move towards sustainability. The research process consists of two parts: a theoretical study and a design exploration. The theoretical study aims to answer the explanatory research question—"RQ 1. What cultural, social, and historical factors shape the current state of Chinese weddings?" While the design exploration part aims at two exploratory questions—"RQ 2. How do Chinese weddings impact sustainability?" and "RQ 3. How can a participatory wedding planning product-service system help Chinese weddings move towards sustainability?" The answers of RQ 1 and RQ 2 work as the user analysis and the reference system map for the design concept development that turns to answer RQ 3.

The theoretical study has comprehensively explored the context in which the distinctive Chinese wedding culture evolved, and it covers three dimensions: the cultural context, the social context, and the market dynamics of the Chinese wedding planning industry. The findings of the literature review answer the RQ 1 that the distinctive features of Chinese weddings are shaped by a mix of cultural, social, and historical factors:

Firstly, familial significance, social identity, and relations construction are three essential cultural factors deeply rooted in the traditional Chinese culture that focus on the collective values for a long history. The traditional values still influence most Chinese people to keep the tradition that spending a considerable amount of money on a high-end wedding space. As the cultural factors set the tone for Chinese weddings, the social and historical factors emerging in recent decades have significant impacts on the evolution of Chinese weddings. The economic development, the one-child generation, and western influences are three factors that increase the purchase power and self-awareness of young Chinese couples, which intensify the distinctive features of Chinese weddings. Lastly, the market dynamics of the wedding planning industry also shape the wedding consumption patterns of Chinese people in recent year. The outsourcing service and diverse

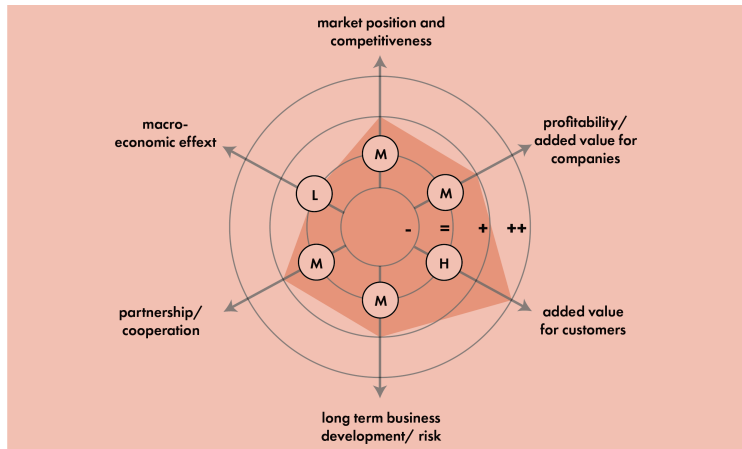


Figure 34: The economic sustainability radar of the new PSS.

Figure 34, the sustainability radar for the economic dimension, shows that the most significant criterion is added value for customers, which has “++” value due to the increased level of participation of consumers in the product customisation and personalisation. The shift in the role of the consumers also accompanies with a reorganisation of the business actors, which brings incremental improvements in the four medium (M) categorised criterion—market position and competitiveness, long term business development/ risk, profitability/ added value for companies, and partnership/ cooperation.

The outcome of the evaluation for all three sustainability dimensions indicates that the proposed PSS strategy can help Chinese weddings move towards sustainability in a variety of criteria, and it also shows several weak points that can be amended further.

selections intensify the overconsumption in Chinese weddings nowadays. Meanwhile, the emerging challenges that call for alternative solutions to ease the burden show design opportunities for Chinese weddings to move towards sustainability.

To sum up the theoretical study, all the factors mentioned above intertwined with each other to shape the distinctive features of Chinese weddings, which consequently pose challenges to sustainability.

To address the challenges that Chinese weddings posed to sustainability, the chapter of design exploration has elaborated on an experimental design project. The primary goal of the project was to develop a product-service system that would induce newlywed couples to make more reasonable decisions during their wedding consumption and consequently reduce the environmental, economic, and social impacts. In this case, the findings of the concept development answer RQ 2 and the results of the design project answer RQ 3.

The concept was developed upon the knowledge gained from the literature review, which presented various suitable DfS approaches for the context of Chinese weddings. The selected approaches include design for sustainable behaviour (DfSB), product-service system design (PSSD), participatory design, and transformable design. The final strategy combined these four approaches to provide an alternative solution for Chinese weddings moves towards sustainability. The concept development started with a requirement workshop that identified the consumer demands for a simplified and flexible wedding planning procedure as well as a co-design experience in the design-production process of their wedding spaces. Thus, the initial concept was a new wedding planning PSS that activates the role of the end users in the design-production process of the product.

To explore the generated concept, a system map of the existing Chinese wedding planning system was illustrated to describe the traditional interaction flows between the involved actors. The content of the existing system map gave the answer to RQ 2 (see figure 19): the invisible and complicated interaction flows cause overconsumption of materials, labour, money, and time of both consumers

and service providers. In the reference system, the consumers played a passive and inert role as observers and receivers, which turned into a great design opportunity for a responsible wedding planning service. As the resource utilisation in a Chinese wedding is closely related to the budget of the consumers and their requirements for customisation, a higher participation level of consumers was emphasised in the new system. On this point, a use-oriented product-service system design and a transformable structure design were developed to induce the sustainable behaviour of consumers. In addition, the consumer perspective was considered again through the evaluation interview that gathered feedback to refine the final wedding planning PSS concept.

Finally, a combination of a transformable and customisable product and a mobile application was designed as a concrete outcome to present the feasibility of the concept in practice. According to the literature review, product customisation and personalisation as well as the participation of consumers in the design-production process provide consumers with easy access to self-expression and consequently improve the efficiency of resource utilisation. In this experimental design case, the basic transformable structure and various customisable add-ons enable consumers to easily participate in the design-production process of the wedding space. According to the requirement workshop, the consumers attached great importance to the participation, as it would satisfy the consumer demands for customisation and enable the wedding to become more memorable. However, the current system normally offers limited opportunities for consumers to engage in the process. Because a higher level of participation requires more money and time, which turns into a typical barrier for the company to deliver satisfaction to consumers. On this point, this research combined the customisable product with intangible services based on PSSD theory to provide a simple and flexible procedure for consumers to save time and money at the same time. In this way, the new PSS can truly activate consumers to make reasonable and sensible decisions during the process and consequently reduce the total impacts of the wedding.

The proposed concept presented a PSS with a simplified organisation and efficient interaction flows allows the consumers to play an active role. In this system, the transformable and customizable structure showed the possibility and

capacity to offer consumers various wedding space patterns. Moreover, by involving them in the design-production process of the structure, the consumers could add emotional value through customising and personalising their wedding spaces with reusable materials and select retainable elements. In this way, consumers could fulfil the demands for a customised wedding space without consuming excessive materials and producing large amounts of waste.

Although the number of participants in the last evaluation interview was small, the feedback from these interviewees suggested that the online participatory design and rental services combined with a customisable and transformable structure have a great potential to impact consumer behaviour during the design-production process. Based on the estimations regarding the user experience of the mobile application, the online co-design service concept can induce the consumers to choose a sustainable wedding space pattern while still fulfilling the demands for customised results. In addition, the sustainability radars indicated the new PSS concept could achieve sustainability in three dimensions (see figure 31-33). Therefore, the evaluation results offered a clear answer to RQ 3: the transparent interaction flows and simplified organisation of the new participatory PSS can induce the sustainable consumption behaviour of the consumers, offer consumers better products and services at a reasonable price, and provide companies economic and competitive benefits.

## 6 Conclusion

In summary, this thesis fills the gap between the fields of Chinese weddings and DfS strategies by proposing an alternative PSS design strategy that enables service providers to satisfy consumer demands in a more responsible way than the existing Chinese wedding planning system. Unlike conventional sustainable solutions limited to innovations in the material component level and product level in relevant fields, the design concept proposed in this thesis focuses on user-oriented innovation and systemic thinking, aiming to cover the impacts on the environment, economy, and society. On this point, it can be argued that the study made an effective start on a reconsideration of the existing Chinese wedding planning system and inducing changes in the prevailing overconsumption in Chinese weddings.

### 6.1 Limitations

The multi-method research process has clear limitations in each research method. Firstly, due to the pandemic of Covid-19, the requirement workshop has to be conducted online instead of face-to-face discussion. The online format only applied texting statement and voice chat for communication, which limited the interaction within participants to a certain extent. For example, only 19 participants proposed their concepts during module 2, while 16 participants did not upload statement on the platform. The second limitation is the selection of interviewees for the semi-structured interview. Due to the coronavirus lockdown, the face-to-face interview was conducted in an intensive way. The four interviewees are from the same professional wedding planning studio, which provides wedding planning services in the luxury, premium and middle-end price levels. Therefore, their statements might provide a more complicated structure than a typical wedding planning company. Although the participant observation with a normal wedding company offering products and services for mass-market confirmed the validity of the reference system map, the ideal sample size should be larger if the condition permits. Moreover, the evaluation interview with three young couples

has a limitation in the selection of interviewees. It is more difficult than usual to find more suitable interviewees that fulfil the requirements include: preparing to hold the wedding in a year, having a basic understanding of the existing wedding planning service, and desiring an optimised wedding planning experience. Therefore, the selected interviewees are found with the help of the social network of the researcher, which might result that the interviewees have a higher acceptance of the design strategy because they all have a high level of education, a middle income, and knowledge about design thinking. In this way, the result of the evaluation does not represent the opinions from different groups, and it can only serve as a small sample of the mass market.

## 6.2 Areas for Future Studies

As the Chinese wedding planning system is based on an integration of tangible products and immaterial services, a one-sided innovation in the product or service sector cannot deliver the desired functional unit and satisfaction unit at the same time. Therefore, the use-oriented PSS concept provides a middle-ground alternative solution for redesigning the consumption structure and business model in the Chinese wedding planning sector. Moreover, the use-oriented PSS with a transformable product does not require the consumers to pay for the full value of all materials; therefore, it is more accessible for the consumers with a low budget compared to a production-based system. Meanwhile, compared to a service-centre business, it can provide consumers more opportunities to choose a novel pattern and add customised elements.

Thus far, the product-service system concept is still unknown in the Chinese wedding planning sector, it would be a great challenge but a valuable subject matter to present the value of use-oriented PSS for both potential consumers and business stakeholders.

Secondly, as discussed above, the core product of the wedding planning PSS should be capable of flexibility and adaptability without excessive material utilisation. In order to provide more alternatives for consumers to choose from but

control the resource consumption at the same time, studies working on the basic transformable structure and its material selections would be worth exploring.

Thirdly, the use-oriented PSS proposed in this study includes a product-based service—consumers could add personalised elements to the structure and reserve the ownership of these additional products. Thus, the consideration of the design-production and after-use phase of these additional elements would be highly valuable for the goal to reduce the total impacts of the new wedding planning PSS.

## 6.3 Future Expectations

Although every consumer in the Chinese wedding planning sector requires a unique customised wedding space and a simplified process, the cumbersome wedding planning procedure intensified in recent years. The shift in the role of consumers in the system requires changes from the inside out. As discussed above, the great challenge to applying the design-production structure based on PSS theory is to increase the acceptance of the new concept by the insiders of the wedding planning industry. Although the proposed concept was based on the demands of the end users, this thesis also aims to reach the business actors in the industry—the dominant roles in inducing consumers to perform sustainable behaviours.

Moreover, this thesis has another goal to inspire other designers to explore alternative design solutions for more cultural practices that seem to go in the opposite direction of sustainability; for example, traditional birthday ceremonies and funeral arrangements in the same Chinese context. In addition, this work also aims to encourage designers to continuously question the existing system and develop the system with system thinking instead of a single innovation approach.

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