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**SOLAR ENERGY TECHNOLOGY AS AN
ATTRACTION IN HOTEL CHILDREN
SERVICE PROGRAM
– QUASI EXPERIMENT, CONJOINT AND WTP
APPROACH**

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Ph.D

The Hong Kong Polytechnic University

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**The Hong Kong Polytechnic University
School of Hotel and Tourism Management**

**Solar Energy Technology As An Attraction
In Hotel Children Service Program
– Quasi Experiment, Conjoint and WTP
Approach**

Jiang Wanyue, Brianda

**A thesis submitted in partial fulfilment of the requirements
for the degree of Doctor of Philosophy
August 2014**

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Abstract

With an increasing number of children staying at hotels on vacations and children following their parents on business trips, more and more hotel managers have begun to realize the importance of children's service program and think of introducing it into their hotel operations. Children's service in hotels provides both parents and kids with a wide range of offers and services. Such activities aim to keep every member entertained during their stay, and are designed with children or kids as the focus.

Specifically, the objectives of the study are as follows: (1) Identify attributes of hotel children service for business and leisure family guests; (2) Design a new and experimental solar themed children service prototype in hotels. The prototype provides a combination of 4E functions: entertainment, education, esthetics and escapist. (3) Examine the guests' attribute towards the designed prototype as well as customers' willingness to pay.

The investigation combines the principles of tourism research, theories of product design and processes of product development to create a product prototype. This prototype focuses on the specific product designs with features appealing to children and their companions while they visit in hotels and resorts. The study elucidates how innovative features are developed, starting from conceptualization to realization, and conducts experiment during their visits.

The investigation uses multi-disciplinary perspectives to study the hotel children services design and explores new form of solar energy knowledge as an attraction in the hotel industry. Multidisciplinary approach includes marketing research, product design, facility engineering, quasi experiment and willingness-to-pay study for this exploratory research.

The methodological framework comprises three stages. During stage 1, the study identifies design attributes and then generates design profile for customers. Stage 2 is Prototype Design that describes prototype as an effective tool for product design and details how the solar prototype is designed. Stage 3 is Prototype Evaluation that comprises the evaluation procedure — site observation, charging mode assessment and information collection from visitors.

The study ascertains 18 relevant attributes for designing the prototype features. A total 53 levels, across five domains, were established importance analysis. The investigation

also found that there are five price settings including Pay for Entrance, Facilities usage fee, Pay for interested DIY activities, Take-away souvenir, and Donation fee. The finding shows that the most important level is linked with Entrance for free and the least important level is Pay for Entrance.

For perception study of willingness to pay, this research uses conjoint analysis to weight the importance of different price settings under Stated Preferences (SP) and Revealed Preference (RP) situations. In order to compare the SP with the RP (i.e. actual preference) and evaluate for designed prototype, the quasi-experiment method is adopted to find the bias between the two. The experimental set up enables different elements of the framework and different stages in the framework to be studied across two levels of contexts: ex-ante and ex-post.

Findings reveal that participants in ex-ante stage tend to rate higher on importance of attributes than participants in ex-post stage. In conjoint experiment, participants also reveal a different preference in attributes. This tendency suggests that responses were different over the choice experiment in these two stages. The results also show that RP behavior data have greater criterion validity than SP data regarding willingness to pay responses. The amount of payment in ex-post is higher than in ex-ante stage. This denotes that customers are willing to pay more after visit than they previous indicated.

The study represents the first of its kind to investigate solar energy knowledge and application as an attraction for hotel guests and visitors. The study contributes to the theoretical advancement in the development of model with theoretical base and empirical test by combining the conceptual hotel product design with tourism experience model. Regarding contribution to the managerial practices, the study provides future insight for hotel value-added service development and a demonstrative reference for managers. Most importantly, this study provides valuable lesson and experience displaying how hotel owners cooperate with designers and the involvement of hotel staffs from different levels. Equally important are the discovered attributes and features which can serve as reference for designing physical facilities and services specific for children in future.

Keywords: solar education, park entertainment, hotel, children service, design

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List of Abbreviations

Choice Modelling (CM)
Choice-based Conjoint (CBC)
Conjoint Analysis (CA)
Contingency Valuation Method (CVM)
Do It by Yourself (DIY)
Entertainment, Education, Esthetics and Escapist (4Es)
Payment to Use (PTU)
Random Utility Theory (RUT)
Renewable Energy Attractions (REA)
Revealed Preference (RP)
Solar Photovoltaics (PV)
Stated Preferences (SP)
Renewable Energy Technology (RET)
Willingness to Pay (WTP)

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Chapter 1 Introduction

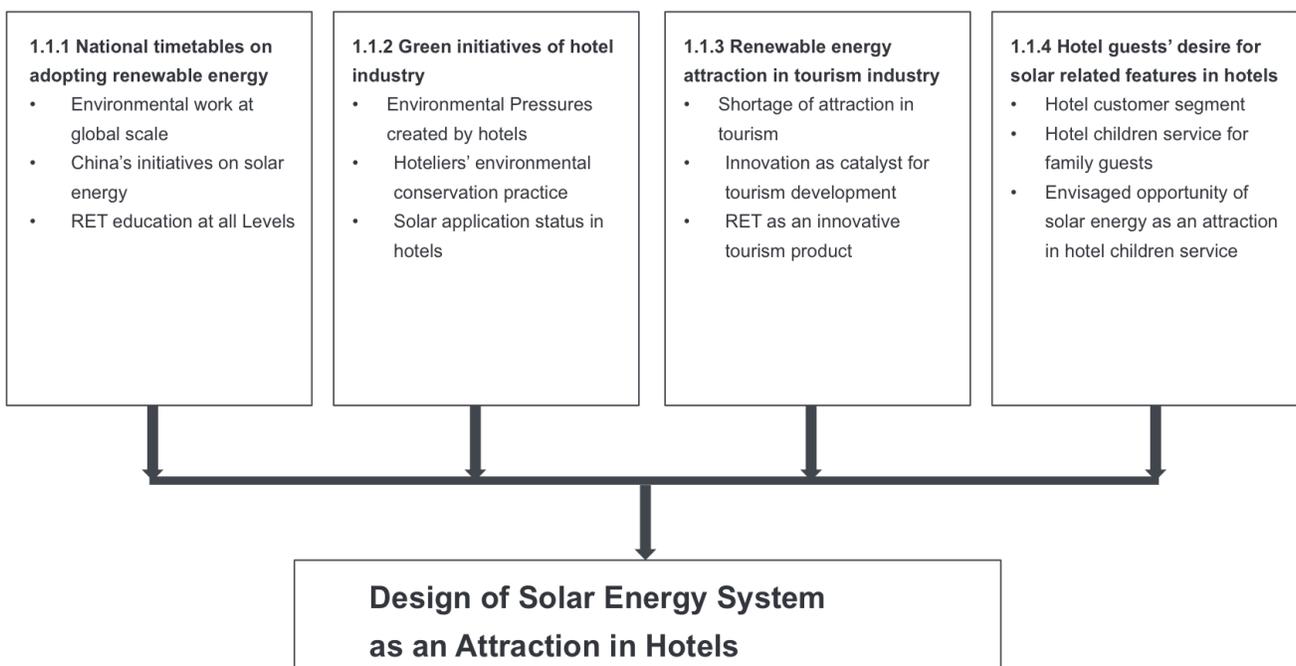
This chapter presents the topic and goal of the current research. It explains the primary motivation for the research work. The first section presents the background of the study. Four aspects including National timetables on adopting renewable energy, Green initiatives in hotel industry, Renewable energy attraction in tourism industry, and Hotel guests segments' desire for solar related features in hotels. The discussion aims to investigate the opportunity of developing solar energy system as an attraction for hotels.

The second section gives research problem, objectives, and study structure. The problem statement describes the lack in the current researches that needs to be solved. Research scope provides the scope of this research with theoretical and methodological alternatives. The study objectives set the direction of this research, and study structure describes the research framework in the remaining chapters.

1.1. Background

This section provides the background of the study. First, it highlights four favorable situations leading to the study of incorporating solar-related knowledge into hotel amenity offering. These situations include National timetables on adopting renewable energy, Green initiatives in hotel industry, Renewable energy attraction in tourism industry, and Hotel guests segments' desire for solar related features in hotels. The structure of the section is shown in Figure 1.1. The investigation of these situations aims to gather and foster the concept of developing solar energy concept into an attraction for hotels.

Figure 1.1 Background of developing a solar energy attraction in hotels



1.1.1 National timetables on adopting renewable energy

Environmental work at the global scale

Hospitality and tourism development contributes greatly to the world economy, with the tourism industry being one of its fastest growing sectors. By the end of 2010, the World Travel and Tourism Council (WTTC) announced that the revenue of the tourism industry reached approximately US\$5.834 billion and generated a global gross domestic product (GDP) that is 9.3% of the total world economy of 2010. The industry has also produced more than 235 million jobs. WTTC projects that global travel and tourism economy will grow by 4.3% per year over the next 10 years and estimates a contribution of about US\$11.270 billion, which is 9.7% of the world's total, by 2020 (WTTC, 2010).

Following the rapid growth of tourism, environmental pressure is also on the rise. As one of world's largest industry, the tourism industry uses a considerable amount of energy for transport (Peeters and Dubois, 2010), heating (Hunter and Shaw, 2007), air-conditioning (Yik et al., 2001), swimming pools (Lam and Chan, 2003), and laundry and catering (Shen and Zheng, 2009). These energy-intensive activities result in a number of negative environmental effects, such as the reduction of energy resources, hastening the pace of global warming, and possibly contributing to the formation of acid rain. Furthermore, the release of substances from packaging, fire-fighting equipment, and refrigeration has an effect on the depletion of the ozone layer (Kirk, 1998). Land and water resources are consumed by the industry, and attempts to reduce the consumption of these resources must be well investigated (Ducrot et al., 2004). The recognition of environmental issues by the tourism industry will become much more significant to customers, who have become increasingly critical about choosing energy-intensive tourism destinations that requires less energy input (Budeanu, 2007).

China's initiatives on solar energy

With the rapid development of its economy, China's demand for energy is very high. However, its reserves of fossil fuels are not enough to sustain its development in the future. Thus, new energy must be discovered. RET sources are expected to play an important role in the future because these sources are renewable, environment-friendly,

and easier to be distributed. Renewable energy sources have captured the attention of the Chinese government and specialists in the past decade (CDIC, 2006).

There is an abundance of sunshine hours and solar radiation available on Earth. The total solar energy absorbed by the Earth's atmosphere, oceans, and land masses is approximately 3,850,000 exajoules (3.85×10^{24} joules) per year (Rhodes, 2010). China lies in the north eastern part of East Asia between 4° and 53° North latitude and 73° to 135° East longitude, with an area of 9.6 million km^2 . The amount of solar energy resources is enormous in large-soil areas (Liu and Wang, 2008). Lam et al. (2006) identify that one of the areas with abundant solar energy resource is located in Southeast China, along the seashore of the East and South China Sea. This region is dominated by large amounts of low clouds, resulting in a relatively low energy annually. The annual-mean-daily global solar radiation varies from 12 MJ/m^2 in the north to just over 16 MJ/m^2 in the south. These advantages in geographical conditions are favorable for the installation of solar energy facilities.

During the Copenhagen Climate Conference in 2009, the Chinese government promised to reduce its greenhouse gas (GHG) emissions per GDP by 40%–45% in 2020 compared with the 2005 levels (Wilson et al., 2011). The Chinese government is making favorable policies for the middle and long-term development of renewable energy resources.

Three state agencies, the Ministry of Science and Technology, the State Development and Planning Commission, and the State Economic and Trade Commission, have jointly set up a major project called “Program on New and Renewable Energy Development in China (1996–2010).” The major target of this program is to increase the application of renewable energy in China Market. Another PV Sunlight Program being set up in 2010 planned to upgrade the country's manufacturing capacity of polycrystalline and other advanced silicon technologies. This program aims to establish large-scale PV and PV/hybrid village power demonstration systems and home-PV projects for remote areas. It also plans to initiate grid-connected PV projects. In addition, the “Brightness Program” is instituted by the SDPC through bilateral and multilateral assistance, aiming the

installation of several large solar and wind power systems in the northwest part of China (Chang et al., 2003; Li and Guohong, 2004).

RET education at all levels

Even many people are concerned about the environmental issues and hope to address the energy crisis as a matter of urgency, but few of them understand the causes of the problem as well as the solutions. Therefore, environmental education is essential and provides insight for public in this area. Education plays a central role in the development of new high technology industries and is also crucial in the development of the renewable energy industry.

Specifically, for solar knowledge, Hasnain et al (1998) early pointed the need of proper knowledge of solar energy among many levels of society. They examined the school and university education in solar energy knowledge and found the solar energy education was far less than enough.

There are several ways to improve the RET knowledge for publics. Jennings (2009) pointed that community plays a vital role in educating RET knowledge's and create confidence in the new products in marketing promotion.

For school children, government funded program helps a lot in broadcasting the knowledge of RET knowledge. For example, Close (2003) proposed schools to launch solar education program with government support. Local power companies, academic researchers, and construction professionals provide hands on experiences for secondary school children. All these intended to raise children's awareness and understanding of RET application so as to make contribution to everyday life.

Hasnain et al (1998) advocated that it is necessary to introduce solar energy concept from very early stage of education. They distinguished the methods of solar education for different level of students from primary, secondary, to university level.

Overall, education in developing sustainability plays a critical role in achieving environmental and ethical awareness, values and skills of public. Such education influences people's behavior which is consistent with sustainable development and environmental actions in decision-making process. People can receive RET knowledge more effectively by using different methods in different levels, which is the major issue for RET education designers' concern.

1.1.2 Green initiatives of hotel industry

Accommodation, one of the most important sub-sectors of tourism, has also extended significant effects on environment deterioration (Buckley, 2004). Hotel buildings in many countries are reported as being one of the most energy-intensive building sectors (Santamouris et al., 1996; Deng and Burnett, 2000; Priyadarsini et al., 2009). Hotel facilities rank fifth in terms of energy consumption in the commercial/service building sector, minor only to food services, sales, health care, and certain types of offices (Lita and Floorspace, 2003; Bohdanowicz, 2006). Gössling (2002) estimated that 97.5 TWh (351.1 PJ) of energy was used in hotel facilities worldwide in 2001. Bohdanowicz (2005) conjectured that hotels in Europe emit more than 10 Mt of carbon dioxide annually and a global hotel-based CO₂ emission is assumed to be at the level of 55.7 Mt in 2001. According to Bohdanowicz and Martinac (2007), a significant amount of the energy used in hotel operations and management is wasted. They suggested employing energy-efficient and resource-conservative measures in the hotel sector.

Environmental Pressures created by hotels

Accommodation, one of the most important sections of tourism, has significant effects on environment deterioration (Buckley, 2004). Hotel buildings in many countries are reported as being one of the most energy-intensive building sectors (Santamouris et al., 1996; Deng and Burnett, 2000; Priyadarsini et al., 2009). Hotel facilities rank fifth in terms of energy consumption in the commercial/service building sector, minor only to food services, sales, health care, and certain types of offices (EIA, 2003; Bohdanowicz, 2006). Gössling (2002) estimates that 97.5 TWh (351.1 PJ) of energy was used in hotel facilities worldwide in 2001. Bohdanowicz (2005) conjectures that hotels in Europe emit

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With these environmental concerns, the tourism industry is taking various initiatives to contribute to protecting the environment. A number of these activities are found to implement energy efficiency measures. Most hotels adopt two main types of activities: the substantive improvement in the energy efficiency of accommodation buildings through the adoption of clearly defined environmental measures and operation procedures (Chan and Wong, 2006) and the adoption and implementation of renewable energy technology (RET) (Deng and Burnett, 2000; Chan and Wong, 2006; Bohdanowicz and Martinac, 2007). According to Bohdanowicz and Martinac (2007), 10%–15% of energy consumption can be reduced by behavior-related measures for low-emission accommodation, and 15%–20% of energy demand can be provided by RET, such as solar and thermal energy, in most tropical and sub-tropical locations. His finding further reveals that RET could be the opportunity for hoteliers to lower their energy usage and related emissions.

Hoteliers' environmental conservation practice

With these environmental concerns, the tourism industry is taking various initiatives to contribute to protect the environment. Most hotels adopt two main types of activities. The first one is the improvement in the energy efficiency of accommodation buildings through the adoption of clearly defined environmental measures and operation procedures (Chan and Wong, 2006). The second one is the adoption and implementation of renewable energy technology (RET) (Deng and Burnett, 2000; Chan and Wong, 2006; Bohdanowicz and Martinac, 2007). According to Bohdanowicz and Martinac (2007), 10%–15% of energy consumption can be reduced by behavior-related measures for low-emission accommodation, and 15%–20% of energy demand can be provided by RET, such as solar and thermal energy, in most tropical and sub-tropical locations. His finding

further reveals that RET could be the opportunity for hoteliers to lower their energy usage and related emissions.

An environmental management tool that hotels can use is a formal EMS. EMS provides a structure for the better control of the company's environmental performance (Rothery, 1993). EMS is defined by the International Organization for Standardization (ISO) standards as a management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving and reviewing, and maintaining the environmental policy. EMS is considered a formal implementation of environmental practices to save on energy and water costs (Barnes, 1996) and is regarded as one of the best ways to comply with environmental protection legislation. To develop systematic approaches to improve environmental performance, many hotels go one step further by adopting EMS systematically or informally. For example, hotels in Hong Kong, such as the Island Shangri-La Hong Kong, Kowloon Shangri-la, Hotel Nikko Hong Kong, and Grand Stanford Inter-Continental Hong Kong, have already achieved EMS accreditation (Chan, 2002b; Chan and Wong, 2006; Chan, 2008). The same trend is also occurring in China. For instance, the Mission Hills Resort in Shenzhen already has an EMS certificate; the World Trade Center Grand Hotel Zhejiang in Hangzhou has also obtained accreditation. Implementing EMS can benefit a company and become a long-term growing trend in the hotel industry (Chan and Ho, 2006).

EMS is a non-compulsory standard. There are a lot of internal and external barriers for EMS implementation in the tourism and hospitality industry. For example: lack of knowledge of effective conservation measures and limitation in staff availability, high level of complexity of ISO standards, legal ramifications, lack of incentives to implement, lack of management commitment, lack of total employee involvement, high cost of implementation are the constraints (Levy and Dilwali, 2000; Quazi, 1999; Chan, 2008). In order to provide more practical suggestions to hotels in mainland China to implement EMSs, the Green Hotel Certification (GH) has been developed by the Central Government of the People's Republic of China (PRC) in 2002 (Lo, 2010). The state's Ministry of Commerce, National Development, and Reform Commission, State-owned Assets Supervision and Administration Commission of State Council, State

Environmental Protection Administration, National Tourism Administration, and Standardization Administration initiated it. This national standard incorporates several commercial and provincial standards. Five grading levels have been set up, which are represented by the same number of the ginkgo leaf logo. The better the performance of a hotel, the more number of leaves are obtained. There are 45 key criteria in GH. The indicators are unevenly weighted, and the score is capped at 300. There are 12 prerequisite criteria in GH under general issues.

However, EMS and GH only provide instructions on environmental management measures and have little information on RET for organizations. In other words, EMS and GH are not standards for RET. Both cannot provide a satisfactory set of knowledge and skills to instruct hotels attempting to install RET facilities, such as solar, wind, hydro-power, bio fuels, and so on (Chan and Wong, 2006). Nevertheless, Dalton et al (2007) find a fundamental interest in RET among tourist operators. There is a high demand for a solid and comprehensive instruction on the knowledge of RET in the hotel industry.

Solar application status in hotels

As regards the literature on the lodging industry, the application of solar energy technology is still limited while these are formatted reports as indicated underneath. Bakos and Soursos (2003) report a successful photovoltaic (PV) setup for a small-scale tourist operation in Greece and conclude that the configuration is economically viable. Bechrakis et al. (2006) demonstrate the viability of a proposed wind/hydrogen system for a small-scale hotel in Greece too. A successful wind/diesel hybrid was implemented in a small-scale tourist operation in the Cocos Islands (Ellis et al., 2000) and a PV/wind diesel hybrid systems in Sarawak and Australia are also reported (Christensen et al., 2006).

As one of the most significant practices for energy saving, RET is technically feasible and financially viable to be applied in the hotel industry (Kaldellis and Kavadias, 2001; Ghosh et al., 2003; Iqbal, 2004; Kaldellis et al., 2004; Dalton et al., 2009). RET is initiated in accordance with the development of the technology for power production by Renewable Energy Supply (Chan, 2002b; Chan and Wong, 2006). Successful PV/diesel

generator hybrids are reported in a medium-sized tourist operation (10–50 beds) in Belize (AES, 1996; Wills, 1997) and a medium-large resort (50–100 beds) in Australia (AES, 1998). The lagging behind of tourism in the application of solar driven-technology in the lodging sector is probably caused by the limited understanding of this technology and the concerns on investment costs (Wills, 1997; Lowe and Lloyd, 2001; Bakos and Soursos, 2002; Bakos and Soursos, 2003).

1.1.3 Renewable energy attraction in tourism industry

Shortage of attraction in tourism

The rapid growth of the tourism and its related industries create both opportunities and challenges. The need of continuing product innovation to gain competitive advantage becomes great challenges to the hotel industry.

This challenge is mainly attributable to the declining number of resources of attractions and increasing demand from customers (Weiermair, 2004). The declining number of resources for attractions and the shortage of new tourism products hinder the continuing development of the tourism industry (Weiermair, 2004). Studies show that today's tourists opt to visit places where they can acquire new information and have a higher demand for novel tourism products (Pechlaner, 2002). To solve these problems, hotels and tourism companies are adapting to the new situation as quickly as they can (Kotler, 2002). According to tourism literature, competitive power in hotel and tourism units are particularly dependent on innovations that may achieve improved services and products, including information, communication technology interactions, and even environment-friendly practices (Chadee and Mattsson, 1996; Ottenbacher and Gnoth, 2005).

The traditional functions of hotel are the provision of accommodation and meals. To gain market share in competitive environment, the lodging industry including hotels and resorts has usually gained market share by increasing their amenities (Bernstein, 1999). The success of hotels in competing market is to bring in hotels that keep creativity and innovation. A number of literatures also recommended a unique combination of tangible and intangible resources that provide added value for guests. These added values can be a new product or a new kind of service, to form a specific experience for guests during their stay.

However, the studies of hospitality innovation and service design are limited (Ottenbacher and Gnoth, 2005). Previous innovation studies on hotels mainly highlight improved services and products, and information or communication technologies interaction. Details in designing service concept and service process in hotels are not

well documented in the hospitality literature. There are few researches developing new-product beyond rooms catering and spa provision (Komppula, 2001). Particularly there is a paucity of information about instruction on how to develop a new facility based on hotel's own demands, and the way to modify the existing facilities so as to adapt the continuously changing needs of customers.

Innovation as catalyst for tourism development

The development of novel tourism products can be hastened by innovations in tourism. The history of tourism features many landmark innovations, dominated by the emergence of new technology such as the invention of the Internet, the introduction of new transport, and the popularization of credit cards (Löfgren, 1999). The Oslo Manual provides a general definition of innovation:

“A technological product innovation is the implementation/ commercialization of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer (OECD, 1997).”

A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods, or a combination of these.

The innovation in tourism should not only follow steps with technology invention but also be contrived within the industry from different aspects and forms, such as creating new products, development of new methods of production, opening of new markets, capturing new sources of supply, and new organizational forms. Innovation may even provide an opportunity for hotels to introduce new concepts in management, operation, and service. Eventually, innovation will serve as a trigger for development in the entire industry.

RET as an innovative tourism product

RET in energy-driven facilities has been proven to be workable and has already been applied in a number of day-to-day lodging operations in recent years. RET has developed into a tourism attraction.

Currently, RET is commonly installed in specific locations, such as the roof of buildings, or in specific equipment rooms invisible to the guests. The situation is different in some tourism destinations. Some visitor programs and exhibits of technology parks and centers offer guided tours to view the technical facilities and provide knowledge about their specific approaches and possible solutions to common problems. Such establishments play a crucial role in knowledge transfer to the interested public. For example, Fuji Eco-park, which is located in Japan, is well known for demonstrating the power of renewable energy through biomass, solar, wind, and electric energy models (Fuji Eco-Park Village, 2011). The EcoPark in Hong Kong aims to promote the local recycling industry and start a circular economy to provide a sustainable solution to the city's waste problems (EPD, 2010). Folkecenter in Denmark has been established to pave the way for renewable energy development, testing, and demonstrating technologies (Nordic Folkecenter for Renewable Energy, 2011). Binn Farm Eco Park in Scotland is taking the lead in demonstrating the "Circular Economy" approach to industry, including waste resource management, renewable energy production, and sustainable and local food production (Binnecopark, 2011).

Upon closer examination of these RET parks, there are favorable factors leading to the materialization of this innovative tourism idea.

1. RET is a tangible physical entity. It is composed of a number of physical components such as a solar panel, solar collector, wind turbine, and heat pump, among others. According to Smith's five elements of tourism products, a tourism product is established with the physical plant at the core (Smith, 1994). RET plants can constitute the primary physical components. Thus, a new type of tourism product can be established based on the existing RET entity.

2. RET is closely integrated with technology development. Technology has been identified as critical for further innovation in the tourism industry (Buhalis and Law, 2008). It does not only act as an instrument for improving the productivity of tourism service but also has its own attractive features of which travelers can take advantage. There is a growing trend in tourism in which a conventional tourism product is refreshed, and its attractiveness is maintained through the introduction of technology. Some new types of tourism, such as high-tech tourism and technology, have good growth potential in the future development of the tourism industry (Buhalis and Law, 2008; Marafioti, 2008). Furthermore, technology is continually changing and is thus able to provide an unlimited content for refreshing the information content to tourists.

3. RET can satisfy tourists by providing knowledge on energy utilization and environmental education. With increasing interest in education as part of the tourist experience, researchers are more aware that the most successful tourism products are those that are combinations of varieties of components. (Orams, 1999) argues that the tourism experience must achieve more than simply providing tourists “a good time.” Pine and Gilmore (2011) originally suggest four design dimensions in tourism products: education, entertainment, escapism, and aesthetic. According to (Prentice, 2008), a key motivating factor for travel is the desire to self-educate. The Prentice Romantic Paradigm (Prentice, 2008) suggests that tourists are considered to be motivated to “consume the extraordinary” partially due to a desire to learn; they subsequently report greater levels of post-consumption satisfaction when their desires are met.

Jiricka et al. (2010) are the first ones to promote the concept of “energy tourism” after examining examples of tourism destinations introducing renewable energy exhibits as an attraction. Two specialized market segments are hypothetically proposed for energy regions: the “expert-oriented energy tourism” and the “experience-oriented energy tourism.” Tripanagnostopoulos (2010) propose that solar energy could be a driver of the development of sustainable tourism and suggest a combination of an efficient solar operation with aesthetic integration for tourism attraction. According to the Australian government paper “Marketing Renewable Energy”, certain types of renewable energy technologies appear to have a strong tourist attraction potential (Australian Government, 2000). A special form of theme park has thus emerged, installing RET facilities and

turning these facilities into attractions for visiting purposes. RET parks usually offer guided tours to view RET facilities and provide RET knowledge to local and overseas visitors, covering the specific technologies and their possible applications. Experimental RET facilities in display forms function directly as marketable and entertaining tourist attractions.

However, the present forms of RET parks are said to be lacking in entertainment elements. A recent survey conducted among Hong Kong college students, after their visit to the renewable energy exhibition area in Ma Wan Park, reveals that over 50% show greater interest in solar energy technology than in other RET exhibits. This percentage is in contrast with their overall perception of the solar energy facilities on display. Their concerns were as follows: there was no detailed interpretation of the solar panels' working principle; there were not enough tangible exhibits for them to visit; and entertainment elements were insufficient. The students suggested making the measurements more tangible and using interactive media or animations for the better understanding of the concepts.

As regards exhibitions on energy-related items, studies show that visitors of renewable energy exhibits are still dominated by professionals and experts in the field of energy. However, the visitors are not aware of the exhibits' benefits, which are also not attractively communicated to them.

The above contents comprise the background of the current study, providing solid evidence to support the implications on the research on renewable energy in the tourism industry and renewable energy attractions (e.g., solar energy, which is the focus of this study) in the hotel industry. Based on the previous literature, the current study proposes that hotels can be a location for renewable energy exhibits.

1.1.4 Hotel guests' desire for solar related features in hotels

Hotel customer segment

From a marketing perspective, implementing eco-friendly activities can benefit a company not only in financial terms (through a reduction of energy costs and other resources) but also in improving the company's image with the general public and other stakeholders. Steigenberger Reservation Service (1994) found that 20% of the surveyed hotels initiated green measures because of financial considerations, 20% were motivated by guest concerns, and 30% were motivated by municipal regulations (Chan and Wong, 2006).

Nevertheless, recent studies claim that a growing number of hotels are willing to adopt green activities to show their concern on and interest in environment protection and energy-saving practices (Pizam, 2009). The number of hotels with environmental concerns and green labels is continuously increasing. The finding proves that being environment-friendly is a long-term endeavor and is a growing trend within the hotel industry not only because of the progress of RET and its higher economic viability but also because of the positive recognition from customers and communities (Mensah, 2006). In other words, hotels' environmental activities have become part of their marketing strategy to increase their competitive advantage (Manaktola and Jauhari, 2007). Hotels that have announced their eco-friendly initiatives gain positive preferences from the customers who are environmentally aware. A growing number of hotel customers are aware of environment issues and tend to choose hotels that follow eco-friendly practices (Manaktola and Jauhari, 2007).

Most previous studies examine lodging customers' green preferences and attitudes towards green practices. Dalton et al. (2008) find that a customer's eco-friendly attitude has a positive effect on green hotels' business. Gelter (2009) confirms that the customers who favor eco-friendly activities in their daily life are willing to stay at environment-friendly hotels. Such hotels with effective strategies of advertising their eco-friendly practices will improve their customers' overall perception of their establishment (Holleran, 2008; Han et al., 2009). These studies show a rising opportunity for merging RET into the hotel environment program, which has become more appealing to both hoteliers and customers than in earlier decades.

Generally, hotel customer segments, based on the purpose of travel, can be divided into business travelers and leisure travelers. The Encyclopaedia of Tourism defines business travel, as “people engaged in all non-discretionary trips which occur either explicitly for the purpose of engaging in work, or incidentally in the course of conducting work-related activities” (Jansen-Verbeke, 2000). Previous studies show that the common features of hotels ranked as the most important ones by both business and leisure travelers are a hotel’s location and its general amenities (Dubé and Renaghan, 1999). The congruence of the two market segments implies the need for developing more hotel amenities and providing more sophisticated facilities for hotel guests.

Hotel children service for family guests

Children service in hotels refers to service that provides both parents and kids with a range of offers with service and activities to keep every member entertained in accommodation, especially with focus on children or kids. Adult guests want to have the opportunities to experience the destination by exploring and learn something. So do kids. As important members of family today, children are no longer appendages in travels, since children influence a lot in the choice of travel patterns and the satisfaction of other family members (Nickerson & Jurowski, 2001; Gram, 2007).

There are many successful examples nowadays showing that children’s programs bring benefits to the hotel industry. These programs vary from day-care centre and family entertainment activities to a variety of activities like children campaign and kids’ clubs. Hyatt was one of the first resort hotel chains to develop a marketing program for children, called the Club Hyatt program. Chains such as Radisson, Holiday Inn and Four Seasons have consolidated the trend. The forerunner in the market, Hyatt, sponsors ‘Camp Kid Council’ made up of 12 members aged 7 to 13. The council conducts focus groups to test new menu items and activities. Club Med North America has added new programs to six of its family villages. A number of cruise lines are now catering to families. Westin Hotels and Resorts have launched a Kid Club. Hilton Hotels is promoting its ‘Vacation Station’ to families with children. All these have led to the emergence of a new kind of tour operators specializing in family travel, e.g., Educational Family Adventures, Families Welcome!, Grand travel, Let’s Take the Kids, Rascals in Paradise.

These programs attract more family guests and children groups, encourage guests for a longer stay, facilitate a higher price, and bring a higher rate of return. Children service has become a universal phenomenon nowadays in hotels. This phenomenon is also gaining increasing recognition in the industry and amongst scholars. Makens (1992) points out children's programs in many resorts are rapidly evolving from simple children care services to supervised activities with individual cultures being indulged. Meanwhile, payment for such services has changed from 'free' to 'charged'. Gain et al. (2004) confirmed the offering of children's programs to be a growing trend. Stringam (2008) also found most resorts in their study to have added children's activities or programmes to attract new markets so as to encourage repeat business. Brey and Lehto (2008) pointed that children's programs are rapidly evolving from simple childcare services to supervised activities with each major culture being indulged.

Despite the fact that children's programs have received great attention in recent years, they continue to be beset by many problems that hinder program success and managerial process.

One problem arises from the fact that their design needs to be addressed through complex collective actions by several departments. Children service in hotels is not merely a separated playground for children; instead, it is a combination of different service sectors containing multi-functions including both tangible and intangible settings. For example, 'Engineering' should take care of the facilities and interior decoration; 'Personnel' should look after hiring new professional managers; 'Marketing' should look after established the promotion plan; 'Security' should provide the safety plan; and 'Food and Beverages' should take care of kids' menu.

Another problem concerns how to design children service in alignment with specific customers' needs. Children's programs in hotels are substantially distinct from those in parks, playgrounds or other public areas. Unlike these areas, hotels need to reconcile the customers' behaviors with regard to accommodation and other in-hotel activities. Titman (1994) emphasized that the design of children equipment should but be regarded

as the simple combination of functional values. And players experiences should be included as well.

Moreover, the emergence of children's program in hotels has been accompanied with market diversification and demand for people-oriented services. Traditionally, most study on hotel family service with children just focus in vacation guests as the market segment (Makens 1992), Evidence shows that the need for children service also comes from business travelers. More and more families are combining pleasure with business travels, and more city hotels are establishing quality children's programs for their corporate guests (Gaines, et al., 2004). There is a need to investigate more on this phenomenon and to supplement the service to the needs from more specified customers' segmentation.

Children programs are diverse, ranging from simple childcare and children's playground to organized activities with local community. Meanwhile, the choice to introduce children's program in hotels is subject to various constraints related to funding, venues, administrator, management, safety and the surrounding physical environment. How to create an attractive children program with regard to the multiple constrains becomes another issue need to be addressed.

It has been observed that the establishment of children amenities is always confusing because of the lack of understanding about children behavior, thoughtful design rationale, as well as unified themes plus meaningful activities. The failure in design step would cause the project failure and unnecessary resource wastage. Therefore, the introduction of children's programs is not only an operational but also a strategic issue influencing the hotel's competitive advantage.

Overall speaking, designing children service in hotels is a complex process. Systematic methodology is necessary to maintain the smoothness and efficiency of the design process in developing hotel children program element as a tourism product amenity. The

set-up of children service establishment requires professional and logical design rationale with supported design theory.

Envisaged opportunity of solar energy as an attraction in hotel children service

Solar energy is green and clean. The usage of solar energy generates zero green gas emission. The sun's energy can be directly used to generate heat (Solar Thermal) or to create electricity using photovoltaic cells (Solar PV) (Dresselhaus and Thomas, 2001). The emergence of interest in solar energy utilization has taken place from 19th century principally due to the rising cost of energy from conventional sources. Solar energy has been becoming more economically attractive and has been reducing the reliance on fossil fuel (Rosemann et al., 2008; Sen, 2008; Stodola and Modi, 2009).

There are mainly two types of energy provided by solar energy applications, one is solar thermal, and the other is solar photovoltaic (PV). Solar thermal technologies can be used for heating up water, space heating, space cooling and process heat generation (Perry et al., 2008). Solar photovoltaic system is a system that uses one or more solar panels to convert sunlight into electricity (Albuquerque et al., 2010; Moharil and Kulkarni, 2010).

Solar energy related knowledge have also emerged as a popular subject in recent years. Apart from burgeoning commercial application of the above convention technology, various governments' effort on promoting the use of solar energy are also evident in their websites (HKEPD, CHINA US, EPA).

According to the Australian government paper "Marketing Renewable Energy," certain types of renewable energy technologies appear to have a strong tourist attraction potential (Australian Government, 2000). Methodologically, Michalena and Tripanagnostopoulos (2010) propose that solar energy could be a driver of the development of sustainable tourism and suggest a combination of efficient solar system operation with aesthetic integration for tourism attraction.

In the tourism industry, it has been observed that some eco-parks install renewable energy as attractions for exhibits, and provide knowledge about their specific approaches or even possible solutions to common energy shortage problems. For example, Fuji Eco-park, which is located in Japan, is well known for demonstrating the power of renewable energy through biomass, solar, wind, and electric energy models (Fuji Eco-Park Village, 2011). The Ma Wan Park in Hong Kong aims to display solar panels, wind turbine, and micro-hydro power generation facilities (EPD, 2010). Folkecenter in Denmark is established to exhibit the ways for renewable energy technology development, test, and demonstration technologies (Nordic Folkecenter for Renewable Energy, 2011). Such establishments play a crucial role in knowledge transfer to the interested groups.

In the hotel industry, amenities and activities combined with environmental concept are also very common, include internal and external design using eco-concept, handicraft and souvenir made by community in co-operation with local culture, selling natural organic food, energy saving and environmental protection facilities, and value added service with ecology as the theme to attract specific customer segment.

Children's activities are often designed around a theme, and the theme can be associated with the hotel's character, history, natural environment and facilities. For the type of hotels, which rely much on the surrounding environment, ecology and environment protection, reference in developing design, concept for children service is usually applied in the entire hotel operation. The concept of environmental protection into hotel children service has existed for long with many examples. It has been found that environmental protection has become an important and popular theme in children's program design (Makens, 1992). Most existing children programs are related to marine creature, nature environment, biological knowledge, and not much to renewable energy technology (Lam & Chan, 2001; Martínez-Ceseña & Mutale, 2011). However, the latter renewable energy technology related activities are an important and popular application among the diverse environmental measures.

Furthermore, choosing eco-theme for children program as part of service in hotels helps position the destination products within sustainable development principles. Considering the current appeal of application of solar energy in commercial and domestic buildings universally as well as its positive significance, scholars highlight that solar energy is one of the acceptable renewable energy from hotel guests perspective (Dalton, et al., 2008). The above paragraphs described latest development makes it possible for selection of solar energy as a theme in hotel children program design. Solar theme in children program can thus help communicating and educating visitors in a friendly way. The unique selling proposition by using children program with environmental contents also helps to convey the right image of hotels to hotel guests and younger generation. It may also encourage them to adopt more renewable energy at home or in communities.

1.2 Research Problem, Objectives, And Study Structure

1.2.1 Problem identification

The innovation process consists of two parts: the research and development of innovation in science and technology and the contacts including the customers and suppliers (Doloreux, 2002; Laursen and Salter, 2004). The first part of the process mostly takes place in industries or other manufacturing and engineering disciplines. Tourism studies mainly conduct investigations on the second part as regards the possibility of utilizing these innovative products, especially in economic sections, which have made a great contribution to providing feedback and guidelines for the future innovation development in industries (Ruger, 1983; Dosi, 1984). However, there is little research on the “real” product design process as a guideline to enhance the research and development (R&D) in tourism for tourism product innovation (Komppula, 2001).

There are implicit problems embedded in this interactive process.

1. The nature of the production from enterprises may not be able to fulfill the tourism needs at the very beginning. Time laps between the information and the feedback the industry receives before modifying their products cause the inefficient utilization of resources (Saxenian, 1991; Hjalager, 2002).
2. Knowledge from the research institution cannot be directly turned into solutions as guidelines for industries supplying the products. The development of a new tourism product is restricted by the knowledge gaps between different disciplines. Thus, the gap should be acknowledged to remove or reduce the significant barriers between different industries (Aldebert et al., 2011).
3. The tourism industry is in shortage of R&D institutions. There are few sources of innovation in tourism from in-house R&D, and technology tends to come from other firms and organizations (Hjalager, 2002). The situation not only inhibits tourism to develop new products according to its own needs but also confines the understanding of the existing innovation product, which has the potential to be transferred to tourism products.

More specifically, for this study, there is no specific research on combining solar concept into hotel service encounter. Second, there is no study on willingness to pay relating the specific solar-related attraction in hotel children program. Third, there are very few studies on service design containing experiences design theory as a guideline.

Based on above these research problems, this study has a predisposition forwards the application of interdisciplinary approaches on the children services design and exploration of new form of solar energy application in the hotel industry, and the involvement of industry partners in design. It is hoped that this study can ascertain new ways for hospitality service method that prompts reflection on the effective service innovation.

1.2.2 Research aims and objectives

In the current study, the investigator attempts to combine the principles of tourism research, theory of product design, process of product development, to create a product prototype. This prototype focuses on the specific tourist product designs for individual tourism businesses. The study explains how new innovations are developed, starting from conceptualization to realization, and conducts experiment during tourist visits.

Research objective of this study revised with the main and a broader aim of sustainable tourism development, and separated into two levels – main objectives and sub-objectives.

The main objectives of the study are as follows:

1. To identify attributes of hotel children service for business and leisure family guests
2. To design and install a new and experimental solar themed children service prototype in hotels
3. To examine the guests' attitude towards the designed prototype as well as customers' willingness to pay

Specifically, the above major objectives are achieved by the following sub-objectives.

- To identify attitudes and levels of hotel children service
- To examine the preference difference between business and leisure travellers
- To design a optimal attributes portfolio of hotel children service
- To design the physical and non-physical setting of hotel children solar park
- To explore the effective way to converting solar energy into attraction in hotels
- To examine the users' critical reflection on the designed prototype
- To investigate the respondents' attitudes on designed price strategy

- To compare the difference in ex-ante and ex-post stage

The overall research agenda is structured around an innovation challenge that may help to conceptualize a new form of service model and value. To ascertain this, this study aims to exploit the innovative applications of solar energy in tourism.

The investigation intends to integrate and synthesize the knowledge and skills from diverse channels. The study also adopts multidisciplinary approaches, including marketing research, product design, engineering, and experiment, for this exploratory research.

1.2.3 Scope of the study

This study uses multi-stage approaches, regarding the three objectives of the study. The scope of the study is covered in two areas.

First, methods were conducted to generate product profile for hotel children program design. Field studies are conducted by visiting hotels with children program during Jan 2012 to March 2012. Fields includes hotels in Macau and Hong Kong, including The Venetian Macao Resort Hotel, Galaxy Hotel, Starwood Hotels & Resorts, The City of Dreams, Hong Kong Gold Coast Hotel, and Hong Kong Disneyland Hotel.

Second, besides conducting survey and interviews like traditional tourism research, this study is going to install a real physical plant inside hotel. The installation and data collection process will last for over one year. Therefore, it is essential to find a hotel that is cooperative to build up a long-term and reliable relationship with the researcher, and provide financial assistance and appropriate location for testing.

For other hotels in Hong Kong, considering limitations of the space and the cost, there is no suitable place to conduct research. In addition, most of Hong Kong hotels are business hotel with very limited outdoor area. Also given the resource constraint, renting an indoor room is also unaffordable to the researcher.

Fortunately, a four-star hotel in Guangdong expressed interests in the proposal. The hotel owner finally agreed to provide site for prototype installation and to conduct research experiments.

The cooperated four-star hotel is located in Guangzhou, Guangdong Province, China. It is situated on Mao Feng Mountain, which is a famous forest park in Guangzhou Downtown. Major customers residing in this hotel are holiday and business travelers. Conferences are also one of the major income resources of this hotel, and the hotel provides a variety of amenities including SPA center, a western restaurant, a Chinese restaurant, a banquet hall, bar, and outdoor BBQ area.

Field research was undertaken in this site. Research activities include the plan, design of the proposed mini-solar park, the collection of park visitors' response to the prototype and charge.

1.2.4 Study structure

This researcher explores solar-themed design for children program in hotels. It is an attempt to investigate if the involvement of renewable energy concept can create a hospitality experience in practice. The research adopts social science theories and design orientations. The research began with an environmental analysis in marketing field to explore the existing children service design in hotels. Then, in a constructive paradigm the study proceed to discuss how should this study form the design and develop a prototype of “solar themed children service” called Mini Solar Park. The content of the park was based on the information gathered in the literature part, and documents for iterative design process. After installation a real prototype the investigation proceeded to conduct a 10-month trial run. The study then carried out an on-field measurement and evaluation of the prototype during the same time. Applicable concepts and improvement scheme for the product and study are thus arisen. The empirical work aims to advance understanding of hotel practices in relation to solar technology, and explore a new form of children service in hotels.

The study is conducted in 3 phases: marketing analysis, design and field-testing, and price strategy analysis. The first section outlines the context for the project. The second section documents initial testing with an extremely rough prototype of the core visiting experience and reflects the strengths and weaknesses of the current design. The third section raises a customized type of price strategy concept. Field-testing and experiment are adopted for measurement. Finally the study offers an overview of the project and defines the key criteria and learning principles being incorporated into the experience of play in the designed prototype.

Environmental analysis

A successful product design always starts from a comprehensive marketing research. Marketing research is the function that links the consumers, customers, and public to the marketer through information — information is used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve understanding of marketing as a process.

In this study, the marketing research mainly focuses on consumer marketing research. Consumer marketing research is a form of applied sociology that concentrates on understanding the preferences, attitudes, and behaviors of consumers in a market-based economy. It aims to understand the effects and comparative success of marketing campaigns.

The study starts from examining children service practice in hotels from previous literature and practical cases in tourism industry. This information provides accurate information that reflects an up-date state of affairs. This form of information is generally used for exploratory purpose that is to identify service attributes for the further steps.

As the first step in design process, this analysis is to gather information about the real setting and market in order to construct a multi-attribute service description. Based on the description, market requirements are extracted.

Preliminary prototype design

Then the second step is to identify critical attributes of hotel children service by interviewing targeted customers. Due to demand of two identified different customer segments, business traveler and leisure traveler are examined separately.

This part of research is mainly about the demonstration of how the investigator conducts the iterative design of proposed solar themed children service for family guests. Based on the findings of previous stage, product attributes are chosen and selected. This design needs collaborative process to generate innovative features with business value.

The project officially started in July 2012. The contract is attached in Appendix 3. In order to cooperate well with hotel operation, meetings with the hotel staffs from different departments were held to share progress and brainstorm for ideas every month. Installation and operation was under taken one year from July 2012 to July 2013. During the period, the prototype was designed and installed in the hotel sites in the first three

months, then operation, experiment, and evaluation was conducted in the following nine months.

Prototype evaluation and price strategy design

Building upon the findings from field observations in the previous sections, the investigation proceeds to explore charging issues of the investigated product by examining guests' willingness to pay. Based on the field study, this research established a real prototype in hotel and conducted on-site experiment to examine guests' willingness to pay under different price settings.

The investigators own background is diversified in engineering, marketing, and hotel management. Research interest is innovative hospitality product design from social and technological perspectives. This is grounded in the investigators' interdisciplinary career connecting the arts and sciences, industry and academia.

Due to the nature of the study, this research pinpoints on children experienced derived from children service design in hotel. Children guests and their supervisors in the experimental hotel are the investigation objects. Sanoff (1995) highlights that children in the range of 5 – 12 years old are in the most critical period of intellectual, social and emotional development.

Technically, Chapter I explains the research background, problem statement, objectives and scope of the study. After this chapter, the literature has been reviewed in Chapter II. Then in Chapter III, the methodology of this study is explained. The results regarding to the three research objectives are described and discussed in Chapter IV and V. Finally in Chapter VI, the major finding in this study is reviewed, and significance are presented. In addition, some recommendations with theoretical and managerial implication are made.

Chapter 2 Literature Review

The purpose of literature review is to organize information and have a clear guideline for research design.

This chapter presents a self-study context review. Existing literature relevant to the research area is examined and discussed to identify the trends or gaps in the literature and determine how and where the current study could fit into the research design.

In connection with the objectives of the study, it draws upon the literature from several disciplines, including tourism, marketing, product design, and engineering, and is mainly separated into four sections. The content of the literature review is divided into four parts. The first section focuses on the concept of developing renewable energy into a tourism product and provides practical and theoretical evidence to support the significance of this study. The second section examines the nature of tourism product and tourism experiences, relating them to the objectives to convert solar technology into a tourism product. The investigator also investigates how the two elements, namely, entertainment, and education, can fit into the proposed prototype design. In section three, hotel children service is dissected in relation to the nature of the proposed prototype. In the last section, the investigator examines the price strategy and willingness to pay, and consider how to apply the factors into the current study.

2.1 Renewable Energy and Energy Tourism

2.1.1 Renewable energy and its application

Renewable energy technology (RET) is defined as the direct utilization of natural resources, such as sunlight, wind, tides, plant growth, and geothermal heat. As explained by the International Energy Agency:

“Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly from the sun, or from heat generated deep within the earth. Included in the definition is electricity and heat generated from solar, wind, ocean, hydropower, biomass, geothermal resources, and bio-fuels and hydrogen derived from renewable resources.” (IEA, 2004a)

In 2008, renewable energy accounted for 19% of the global final energy consumption, and its consumption has been on the increase (REN21, 2010). Renewable energy contributes significantly to two distinct areas: power generation and hot water/space heating. Solar energy makes an important contribution to these two areas. Solar energy is widely applied in China, accounting for about 70% of the global total (180 GWth). Most of the solar water heating systems are installed in multi-family apartment buildings and meet a portion of the hot requirements. China's solar PV-installed capacity is likely to reach 10,000–20,000 MW by 2020, with the implementation of its solar PV roof plan and other supportive measures (REN21, 2010).

Given the rapid development of renewable energy, the concept of energy saving and clean energy is spreading around the world. This situation has aroused the interest of some tourism developers. Thus, a novel tourism market for visiting RET facilities and related products has emerged in recent years. Evidently, there are many visitor programs, exhibits, technology parks, and centers offering guided tours to view technical facilities. These destinations provide RET knowledge, including the specific technology

and possible application, and play a crucial role in transferring RET knowledge to the interested public.

Many places in the world have already introduced RET facilities, developing them into tourism destinations. Fuji Eco-park, which is located in Japan, is well known for demonstrating the power of renewable energy through biomass, solar, wind, and electric energy models (Fuji Eco-Park Village. 2012). The EcoPark in Hong Kong aims to promote the local recycling industry and start a circular economy to provide a sustainable solution to the city's waste problems (EPD, 2010). Folkecenter in Denmark was established for developing, testing, and demonstrating renewable energy technologies (Nordic Folkecenter for Renewable Energy, 2011). Binn Farm Eco Park in Scotland is taking the lead in demonstrating the “circular economy” approach to industry means, including waste resource management, renewable energy production, and sustainable and local food production (Binnecopark, 2011). Denmark is the home of wind power. In northern Jutland, a great number of wind turbines can be found all over the site, many of which possess novel designs that differ with the past versions (Lund, 2005). A Danish island called Samsøe was designated as a renewable energy island in the 1990s, the idea of which is for the entire place to have sustainable energy. In 2007, an energy academy was opened in Samsøe, offering courses to people who are interested in renewable energy (Meyer and Koefoed., 2003). An electricity museum in Tange features many RET-related exhibits. Electrically-related products and an RET courses are also provided. The Center for Sustainable Energy is a reputable institution that offers one- and two-day courses to the public (European Tourist Guide, 2008). France is famous for the tidal barrage in La Rance, which is one of the few examples of tidal energy technology in the world (EDF, 2010). Spain has installed facilities for harvesting wind energy since 1990. Recently, the country has built a new 11MW solar concentrator in Sanlúcar la Mayor called Sunseed, which is also a destination that attracts visitors and tourists (Sunseed, 2011).

In summary, the common feature of these attractions is that they combine environmental education and experience-oriented tourism with the theme of renewable and sustainable energy use. This infantry tourism product can be new niches of tourism offer creative

product and service design through logistic planning as well as a series of marketing programs. The new product is named as Renewable Energy Attractions.

2.1.2 Renewable energy attractions (REA)

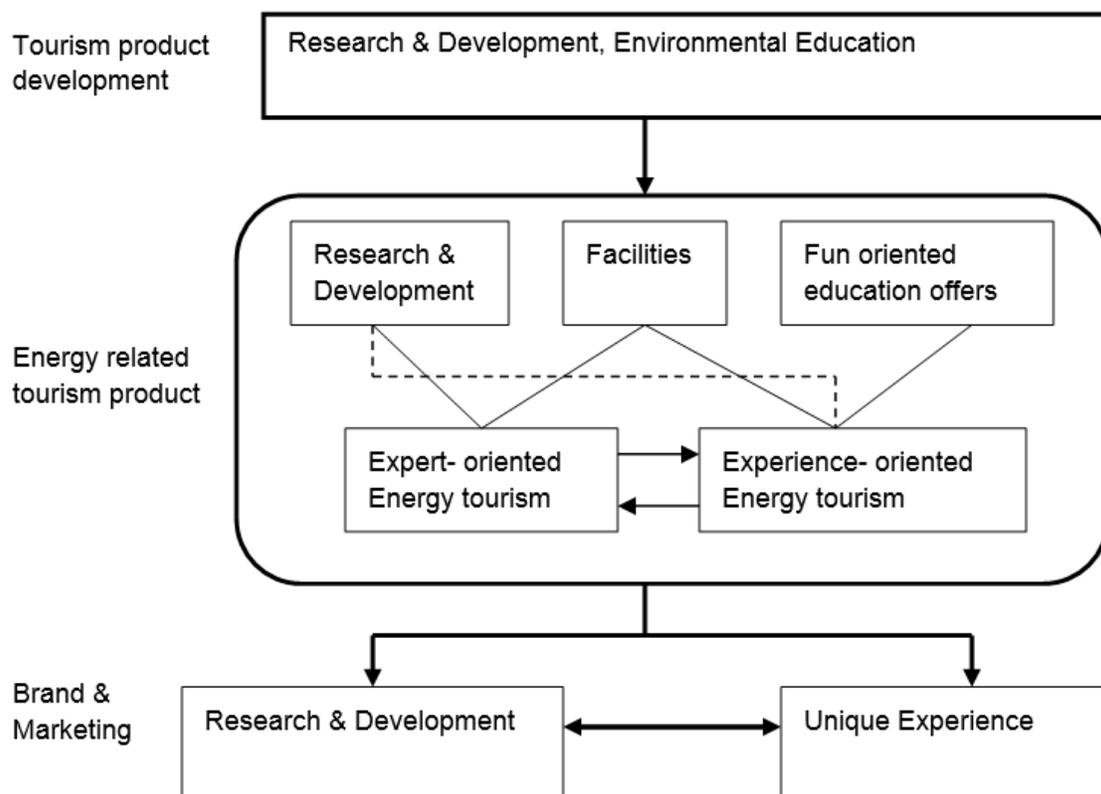
A few tourism scholars are also aware of the emergence of REA and their potential in sustainable tourism. A new research topic on how RET contributes to tourism development has aroused scholars' interest (Uemura et al., 2004). Uemura examines three types of capacity (i.e., energy, accommodation, and transportation) in Japan tourism and discuss the possibility of replacing traditional fossil fuel with RET in Yakushima Island (Uemura et al., 2004). By calculating the energy capacity under the estimated tourist load, the investigator confirms that RET, especially wind and solar energy, is technically applicable in tourism destinations. However, ignoring the economic cost of RET facilities may lead to ineligible results. Duic and Carvalho (2004) discuss the feasibility of renewable energy as energy supply in one of the tourism islands by examining the existing geographic energy resources and the RET financial cost. They suggest a hybrid system to integrate hydrogen with intermittent renewable energy sources to fulfill the high-energy demand from increasing tourism activities. Duic and Carvalho (2004) also suggest the plan of turning the entire island into a renewable energy island for both energy-saving and visiting purposes. Thus, the role of renewable energy in tourism development should not be underestimated particularly following the recent drop of solar panels price. This point has been emphasized by a number of literature and empirical studies (Yaw, 2005; Michalena and Tripanagnostopoulos, 2010).

Most scientists are concerned with RET in tourism from the economic, social, and environmental perspectives, aiming at the continuous improvement of the tourism industry. Other investigators strongly argue that the sustainability of tourism development relies on the creation of specific characteristics of a tourism product in accordance with the needs of the present and future tourists (Burns and Sancho, 2003). In line accordance with this concept, Jiricka first define novel tourism niches as "energy tourism" based on the phenomena of RET attractions and RET tours in tourism, as presented in Figure 2.1 (Jiricka et al. 2010). Energy tourism refers to the tourism activity

related to energy-related products and knowledge, providing opportunities for visitors to gain more information about renewable energy and energy-saving practices.

In Jiricka's conceptual model, he identifies the technologically interested tourism segment and the family-oriented travelers as the two main market segments of energy tourism. The technologically interested tourism segment includes community leaders, enterprises, universities, and technical schools interested in technical innovation. The key motivation of this group for visiting RET attractions is the transfer of know-how and the possible adaptation of such attractions to their own region. The second market segment, that is, families and groups of children, is leisure-oriented. Its main motivation for visiting RET attractions is recreation.

Figure 2.1. Development of energy related tourism as a new niche tourism product



Source: Jiricka et al. (2010)

Nevertheless, studies on energy tourism are still in the preliminary stage. To reinforce the understanding of energy tourism, the current study reviews previous literature that examines RET as a tourism attraction as well as tourist behavior and attributes towards RET attractions.

Hanley and Nevin (1999) conduct a survey to determine the possible economic effect on tourism by developing different renewable energy options. Although they do not provide an option for solar energy technology in their survey, their conclusion based on limited choices shows that visitors' perceptions on the tourism destination vary in connection with the different types of renewable energy. Visitors' overall perception on tourism destination changes according to the kind of renewable energy applied. For instance, the location featuring biomass is "less likely to be visited," whereas the effects of a small-scale hydro scheme seem to be "good." Hanley and Nevin imply that there is potential for some areas within the estate to attract visitors in the future, generating income that would more importantly affect the development of renewable energy sources with perceived environmental costs. Another point of interest in Hanley and Nevin's case study is that when people are told that renewable energy options for the area are community-led, they present more preferable attitudes, causing the area to generate more income. According to the investigators, renewable energy in tourism should be presented as a project undertaken by community members. The benefits of cooperation will gain the acceptance of visitors.

In 2002, an in-depth research was conducted in a highly scenic area in Scotland with high-density wind farms (Binnecopark, 2011). The study indicates that most tourists who knew about the wind farms came with a more positive image of the area. In Denmark, a small country with the world's highest wind turbine development (6,000 turbines), tourism has grown 50% since 1980; the wind farms are considered to have had no negative effects on the tourist industry (AusWEA, 2003).

Up to the moment, only a few studies discuss tourists' behavior in tourism destinations with solar energy. Dalton et al. (2007) discuss the marketing value of RET in tourism destination operation. They agree that the resistance on RET implementation in tourism

is caused by the reservations regarding the RET power supply limitations, reliability, and economic viability. Dalton compares the respondents' acceptance of solar energy with that of other types of renewable energy facilities and determines that solar energy gains the highest public acceptance among tourists and operators. Michalena and Tripanagnostopoulos (2010) further confirm solar energy to be a driver of the development of sustainable tourism and suggest the combination of efficient solar system operation with aesthetic integration for tourism attraction. Therefore, exploring the potential of solar energy and its application for tourism development is important.

2.1.3 Energy tourism

The definition of energy tourism proposed by Jiricka (2010) overlaps with the context of educational tourism. In educational tourism, knowledge transfer is an important business factor. The target customers expect both body and brain to benefit from the vacation. Unlike the tourists of educational tourism, in which the primary purpose is to engage in a learning experience, tourists of energy tourism are more aware of both the education and entertainment factors. Educational tourism visitors tend to stay for several days to months to gain learning experience directly related to the location, whereas the specialized segments in energy tourism tend to stay for a shorter period of time; the location is not the decisive factor. Energy tourism provides opportunities for tourists to visit and learn about renewable energy products and gain knowledge, contributing to the regional economy. This goal is also compatible with the environmental strategy of reducing global warming through the private application of renewable energies and knowledge about energy saving.

These previous studies describe energy-related tourism and identifies the relationship between RET and tourism. However, there is a need to view products from the tourism perspective. Therefore, in the following sections, the nature of tourism products and tourism experiences will be examined.

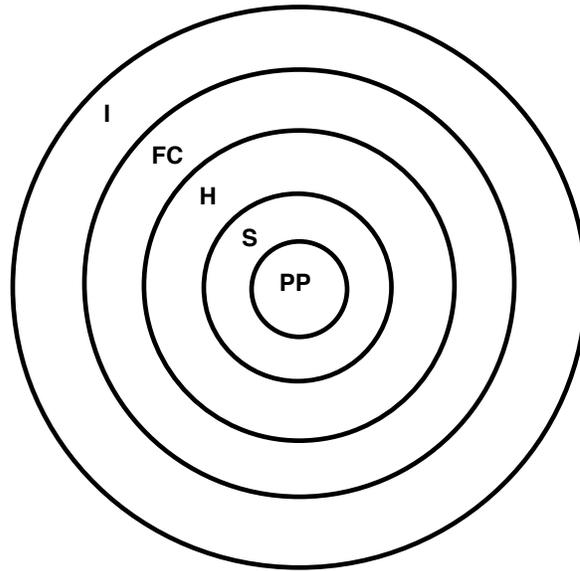
2.2 Tourism Products and Tourism Experience

2.2.1 Tourism product

The tourism industry is characterized by its own product and production process, and can be categorized into different niche markets and special travel forms with each distinctive product and characteristic. Some common forms include cultural tourism, ecotourism, nature tourism, heritage tourism, medical tourism, educational tourism, religious tourism, and wildlife tourism. (Gunn, 1994; Swarbrooke and Horner, 1999). Turtureanu (2005) contended that a tourism product should focus on facilities and services designed to meet the needs of the tourists. This composite product can be regarded as the sum of tourist attractions, transport, accommodation, and entertainment, resulting in customer satisfaction. Middleton and Clarke (2001) insisted that the tourist product means customer value, which is “the perceived benefits provided to meet the customer’s needs and wants, quality of service received, and the value for money.”

Several tourism researchers have attempted to clarify the nature of the tourism product. Most studies consider the tourism product to be inherently heterogeneous and complex, characterized by a combination of product attributes and stakeholders. Hu and Ritchie, (1993) define the tourism product as “a package of tourism facilities and services, which like any other consumer product, is composed of a number of multi-dimensional attributes.” Some approaches divide tourism product into several elements and describe how its multiple components interact with travelers during their trip. One of the most cited and discussed is the model of the generic tourism product presented by Smith (1994). Smith defines the nature of tourism products and develops the “components model” to break down the tourism product into five elements: physical plant, service, hospitality, freedom of choice, and involvement. In the structure of Smith’s model, the physical plant is positioned at the core. The other elements are in a series of encapsulating shells, representing successive phases in the tourism production process. Smith’s generic tourism product model is presented in Figure 2.2.

Figure 2.2 The generic tourism product



PP = Physical Plant

FC = Freedom of Choice

S = Service

I = Involvement

H = Hospitality

Source: Smith (1994)

In Smith's model, the core of the tourism product is the physical plant, which refers to the place and the conditions of the physical environment, including either fixed property such as a hotel or a cruise ship, or conditions of the physical environment, such as weather, water quality, crowding, and condition of the tourism infrastructure (Smith, 1994). The quality of the physical plant can be assessed by whether the design enhances the user's experience, protects the environment, and makes the product accessible to tourists with varying physical abilities or limitations (Gunn, 1994).

The second component of Smith's model is services, which is defined as the performance of a specific task required meeting the needs of tourists. Some examples include the front desk operations of a hotel, food and beverages provisions, and so on.

Hospitality is the third component of the tourist product, which is referred to by Smith as "something extra," to fulfill tourist expectations. For instance, hospitality can be the attitude or style in which a task is performed, or an expression of welcome by the local residents to tourists arriving in their community.

The fourth component is the tourist's freedom of choice, which refers to the necessities a travelers looks for in order for his/her experience to be satisfactory.

The fifth and the outermost element of Smith's model is customer involvement, which refers to the fact that customer participation is a relevant part of a service process. The basis for a successful consumer participation in producing tourist products is the combination of an acceptable physical plant, good service, hospitality, and freedom of choice. Involvement is not only a physical participation but also a sense of engagement in the activity. The progression of elements from the core to the shell is correlated with the declining direct management control, increasing consumer involvement, increasing intangibility, and decreasing potential for empirical measurement. Smith's model emphasizes that tourism product has multiple components; he establishes his model at both the "specific" and "total" levels (Middleton, 1989). He also describes how various resources, facilities, services, and other "inputs" from the destination can produce experiential "outputs" for tourists by adding value and benefits.

On the other hand, tourism experience is regarded as part of the experience economy, which is proposed in an article titled "The Experience Economy" (Pine and Gilmore, 2011). In this article, Pine and Gilmore describe the experience economy as the next economy following the agrarian economy, the industrial economy, and the most recent service economy. In the experience economy, business must emphasize on orchestrating memorable events for their customers, and that memory itself becomes the

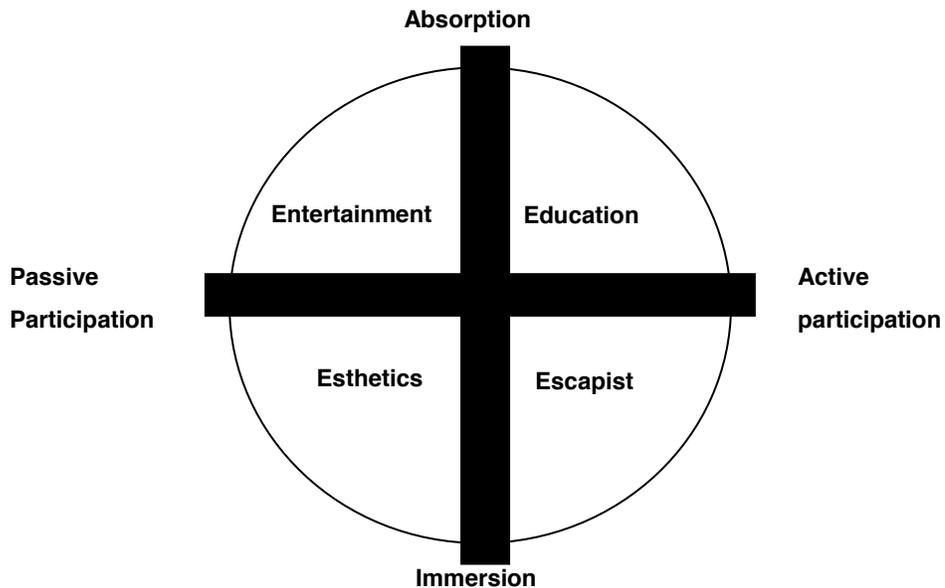
product. The "experience" had been widely adopted by many tourism researchers in recent years (Stamboulis and Skayannis, 2003; Tsaour et al. 2007).

2.2.2 Tourism experience

Recently, many researchers on tourism experience or tourists' experiences have confirmed that the tourism industry is an "experienced" industry. Many have also acknowledged the shift from traditional tourism to an experience-centered tourism (Stamboulis and Skayannis, 2003). Developing an experiential product is about taking the essence of a product and amplifying it into a set of tangible, physical, and interactive experiences that reinforce the offer (Gautier, 2004; Williams, 2006). Stamboulis and Skayannis (2003) point out that innovation in experience tourism should "re-innovate old myths and invent new ones" instead of trying to "improve and change infrastructure and services in order." The novelty of an experiential tourism product lies in the fact that "experience" is designed, produced, organized, budgeted, calculated, priced, and charged for (Pine and Gilmore, 2011).

To design successful tourism products, understanding how to design experiences to create value for customers is imperative. As illustrated in Figure 2.3, Pine and Gilmore (2011) provide a preliminary model to conceptualize "customer experience" across two axes. The essence of this conceptual model is that an experience is not an amorphous construct. It is as real as an offering of a practical service defined by customer participation (passive vs. active) and environmental relationship (absorption vs. immersion) (Pine and Gilmore, 2011). Connecting these two axes defines the four dimensions of an experience: entertaining (passively absorbed), educational (actively absorbed), esthetic (passively immersed), and escapist (actively immersed). A destination should deliver experiences that encompass all four realms, although different points of emphasis may occur, to achieve a "sweet spot" when all four realms are experienced. Pine and Gilmore (2011) extensively quote Walt Disney World as an example: "Generally, it is found that the richest experiences—just as going to Disney World or gambling in a Las Vegas casino—encompass aspects of all four realms, forming a 'sweet spot' around the area where the spectra meet."

Figure 2.3 Four realms of an experience



Source: Pine and Gilmore (1999)

For a better understanding of the nature of tourism experiences, Schmitt (1999) proposes five experiences: SENSE, FEEL, THINK, ACT, and RELATE. The sense experience includes aesthetics and sensory qualities. Consistent with recent research on consumer behavior (Richins, 1997), the feel experience includes moods and emotions. The think experience includes convergent/analytical and divergent/imaginative thinking. The act experience refers to motor actions and behavioral experiences. The relate experience refers to social experiences, such as relating to a reference group. Tsaur et al. (2007) review Schmitt's module and compare it with Pine and Gilmore's four realms of experiences; they find similarities between this two models. Sensory and affective (FEEL) experiences are intuitively similar to entertainment and esthetics, whereas the creative cognitive experiences in the THINK component are similar in characteristics to educational experiences. The ACT component seems to be related to education and escapism. The final component of Schmitt's taxonomy of experience characteristics, RELATE, does not appear to be expressed in Pine and Gilmore's experience realms. Jurowski (2009) assumes that education is linked to THINK, escapism is linked to ACT, and esthetics is linked to SENSE and FEEL.

More efforts have been made to develop a theory of tourist experiences. Aho (2001) suggests four core elements of experiences: emotional impression, informational effects or learning, practiced capacity building, and transformational impacts. Emotional experiences are the universal elements of tourism present in most touristic experiences. Learning experiences are separated into learning intentionally and learning unintentionally. Practice experiences are explained as having a variety of forms, from hobbies to professional experiences. Transformational experiences refer to experiences that modify either the body or the mind, such as health and cultural tourism. Experiences can also be differentiated based on mental or physic motivations. Physical aspects include physical comfort, safety, and natural and manmade environs. Mental elements include meanings, connections, and connotations. Social elements refer to status, inner reflections, enjoyment, and social contacts. Motivational elements are combined to create deeper experiences. For example, enjoying mental harmony while in natural beauty is defined as a physical/mental experience. Other proposed typologies delineate the personal resources needed for experiences, that is, time, money, knowledge, skills, and attitudes.

Many researchers on tourism experience also consider physical elements to make up the core of the environmental effect on tourists. Researchers agree that travel experience should describe how tourists desire particular experiences from the physical setting itself as well as from the service infrastructure that supports their visit (Joppe et al., 2001; Kim and Prideaux, 2005). A particular study by Mo show that a tourism environment's "ambience, store design, and social characteristics" is the primary factors of experience (Mo et al., 1993). Watson and Kopachevsky (1994) argue that tourist experiences should be properly analyzed by considering the external context and setting where these encounters take place. Consumer research on service experiences also corroborates this notion. Aside from the service itself, the physical environment where the encounter takes place plays a significant role in the consumer's experience (Bitner, 1992). Physical elements of the tourism product may include features such as the site or facility, attractions, natural resources such as scenic landforms, or physical conditions (Dunn and Iso-Ahola, 1991; Buckley, 1994; Murphy et al., 2000). The level, use, or lack of infrastructure and technology in a destination (e.g., new tourism attractions, use of

computer technology and communications, etc.) are also tangible features of developed and under-developed tourism products that can factor into the tourists' travel experience (Buhalis and Law, 2008; Law et al., 2010). In accordance with Smith, the current study agrees that physical elements make up the core of the environmental effect on tourists and that travel experience should describe how tourists desire particular experiences from the physical setting itself as well as from the service infrastructure that supports their visit (Oddou et al., 2000; Joppe et al., 2001; Kim and Prideaux, 2005).

2.2.3 Combination of tourism product design and tourism experiences

Komppula (2005) challenges the feasibility of Smith's model in today's tourism. He points out that Smith's model was built upon the understanding of tourism products in terms of demand rather than supply. More importantly, Komppula argues that Smith's model lacks the role of human experience. Murphy (1985) finds that tourism product and market commodity is disturbed by both the demand and supply sides. Gunn (1994) points out that a tourist product is fundamentally a complex human experience, which is an output of a production process where tourists utilize the facilities and services to generate the final output: tourism experience.

However, tourism experience is not solely derived from the consumption of various services or product. An ideal tourism product should consider tourism experience in the design process. To be effective, tourism product planning objectives should define the type of experience from the early stages of the design process (Graefe and Vaske, 1987). The product's physical attributes (i.e., dimensions, color, composition, and features) should be considered intensively with experiential quality (i.e., functionality, aesthetic, social/psychological attractions, value for money, safety, desirability, and reliability) (Chow et al., 2007). Concepts define the strategic goals of the product launch. Thus, product design and experience designs should be created at the outset.

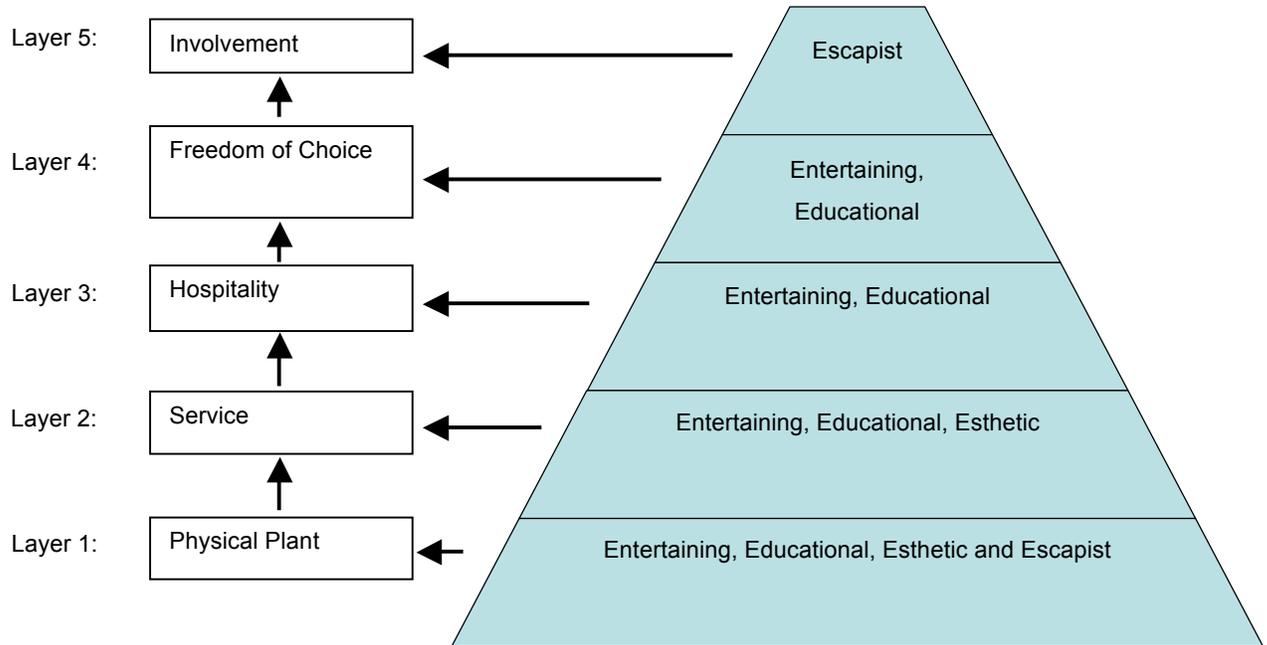
After reviewing the concepts of product design and experiences, the current study tries to combine Smith's five tourism product elements model with Pine and Gilmore's four realms of experiences model for the proposed prototype design. Figure 2.4 presents the process called experience-based tourism product design.

Figure 2.4 Experience-based tourism product design

Tourism Product

Design Process (Smith, 1994)

Tourism Experience (Pine and Gilmore, 2011)



As shown in Figure 2.4, there are five layers of product design. The design process starts begins in layer 1 (i.e., physical plant design) and ends in layer 5 (i.e., involvement setup), with experiential elements added in each step. Value can be created through each step to reach a final desirable tourism experiential product. The first layer is the physical plant, which is the starting point of every tourism product design (Smith, 1994). The physical plant should be deliberately selected or designed to contain tangible facilities for entertainment, education, esthetics, and escapist purposes.

The other elements in Smith's model, which is, service, hospitality, freedom of choice, and involvement, are considered intangible but a highly valued set of experiences. Therefore, the four dimensions of tourism experiences, namely, education, entertainment, aesthetics, and escapists, can also be introduced as intangible elements into the tourism product design. Therefore, in layer 2, service is the utilization of this physical plant for customers/visitors to enjoy the product. Service is organized by operators instead of being controlled by visitors. Three elements are combined into

service: entertainment, education, and esthetic. Layer 3 is hospitality, which is the attribute or atmosphere operators can bring to customers. Tourism operators can present a friendly and relaxing atmosphere to customers while showing their social responsibility at the same time.

In layer 4, visitors can select education and entertainment. They can decide whether they want to be educated (e.g., follow the appeal to save energy) or entertained (e.g. use the entertainment service or facility). The last layer is involvement, which is much similar to the escapist element. Tourism product or destinations can ultimately create an environment for people to indulge in the activities.

Elements of tourism experiences is embedded into the tourism product design process. Ignoring or separating these elements may cause an unsatisfying result in today's "experience age."

2.2.4 Enable the playful and educational experiences

Playful experience also called entertainment experience remains as an essential component of the tourism product (Hughes and Benn, 1995). This allows for a great number of tourist destinations famous for the level, provides variety, and quality for their entertainment.

Pine and Gilmore (2011) define entertainment to be a passive aspect of an experience: the elements of the experience are simply absorbed through the senses. In other words, when people are entertained, they are inactively undergoing the experience that interests them, which gives them some amount of pleasure or release (e.g., watching concerts, listening to the opera, attending music festivals, or watching a clown ride at an amusement park).

Historically, entertainment is one of the oldest forms of experience and the most developed and pervasive in the business environment (Pine and Gilmore, 2011). The forms of entertainment that evolved from live-action events, such as gladiator battles in ancient Rome or horse racing in British stadiums (Zillmann and Bryant, 1994; Zillmann, 2000b) to today's multimedia, are the central providers of entertainment production and distribution. The pursuit of entertainment appears to be the dominant theme in modern cultures. As there are virtually countless ways to "be entertained", most industries today are concerned with the production, distribution, and retail aspects of entertainment (Wolf, 1999). The forms of today's entertainment that can be considered in the proposed product design include animation, cartoons, storytelling, jokes, pictures, video clips, music, and games.

Evidence shows that using cartoon characters or spokes-characters symbolizes fun and enjoyment and creates a friendly atmosphere (Bryman, 1999). Storytelling is another good medium for entertainment and learning. Crucial elements of stories and storytelling include plot, characters, and narrative point of view. Stories are one of the primary ways through which the self is presented to others. In the entertainment domain, the design of storytelling has focused on interactive games and types of fiction, including short fairy tales, plays, films, comic books, and video games.

As in the entertainment experiences, the customers in the educational dimension are still outside the experience rather than immersed in the action (Evanschitzky et al., 2007). However, unlike entertainment, the educational dimension of an experience involves an active participation in the event, from which the customers acquire or increase their skills and/or knowledge. To truly gain knowledge or skills, the customer's mind (for intellectual education) or body (for physical training) must be actively engaged in educational events (Pine and Gilmore, 2011).

Research shows that when customers turn from their traditionally passive role as receivers of marketing communications to having greater control over the information search and knowledge acquisition process, they actively participate in both information exchanges and learning activities (Ind and Riondino, 2001). Generally, consumers that engage in an educational experience increase their knowledge or improve their skills. Ultimately, consumers should be left with the impression that "I felt I have learnt something" (Hosany and Witham, 2010). In tourism literature, a key motivating factor to travel is the desire to self-educate (Prentice, 2008). The Prentice Romantic Prentice (2008) suggests that tourists are considered motivated to "consume the extraordinary", partially due to a desire to learn and they subsequently report greater levels of post-consumption satisfaction when their desires are met.

Moscardo (1999) depicts several principles applicable in tourism and recreation situations as well as describes how people deal with, learn, and use new information. He provides a practical and theoretical suggestion on how to encourage mindful visitors and how to tell a good story that makes sense. Moscardo identifies three main ways that his interpretation can contribute to the quality of visitors' experience. These are: (1) providing information on the available options, so tourists can make the best choices about what they do and where they go; (2) providing information to encourage safety and comfort, so tourists know how to cope with and better manage the difficulties they encounter (e.g. sea sickness) and understand messages given by the warning signs (e.g. 'you cannot swim here'); and (3) creating the actual experience, so tourists can

participate in activities such as guided walks, eco-tours, visit art galleries, fauna sanctuaries or zoos, and learn about areas which are of educational interest.

Interpretation of information in this study is related to the knowledge that requires careful selection of solar technology information, which in turn can arouse the interest of visitors. According to Moscardo, the way one expresses and communicates instrument for information interpretation is also needed to be carefully identified. The designed prototype should be appropriate for displaying and sharing in various physical and intangible forms, from children's playground to family services that penetrate into daily hotel operations. One of the innovative ideas generated here is, the research has considered a space for visitors to participate in solar souvenirs co-creation process that leads to creating solar toys by themselves. Previous findings show that Do It Yourself (DIY) activities are prevalent nowadays in children's activities.

2.3 Hotel Children Service

The literature review includes two sources – journal papers and hotel web search. The latter provides up-to-date industrial practice for reference in shaping the investigations. This part aims to gather information to construct a multi-attribute description of children service setting.

Table 2.1 Domain, attributes and levels of hotel children service

Type	Domain	Attributes	Levels		
Non – physical settings	Family Activity Types (L1)	Family Interaction	Family sport (S1)	Family dining (S1)	Family recreation (S1)
		Individual Involvement	Children custody (S1)	Camping and Club (S1)	
	Family service within hotel operation (L1,L9, L10)	Welcoming gift in Front Desk	Toys (S1)	Cookies, candy and drinks (S1)	T-shirt, caps with hotel logos (S1)
		Children Service in Restaurant	Children's menu(S1)	Special discount for families (S1)	Dine package with toys (S1)
		Children Service in Guest Rooms	Children's television program (S1)	Toys in room (S1)	Children lavatory kit (S1)
	Safety Management (L2, L3)	Insurance Policy	Self-expense insurance (comprehensively) (S1)	Free- expense insurance (basic) (S1)	No-insurance (S1)
		Monitoring Method	Safety notice call (S1)	Remote CCTV monitoring (S1)	
	Price Strategy	Charging Mode	Pay for days(S1)	Pay for hours(S1)	Pay for activities (S1)
		The payment for use	Pay for service(S1)	Pay for souvenir (S1)	Pay for donation and charity (S1)
	Physical Settings	Playground design (L11, L12, L13)	Playground area	Separated indoor playground (S1)	Separated outdoor playground (S1)
The size of children playground			Below 30m ² (S1)	Between 30-100 m ² (S1)	Over 100m ² (S1)
Staff organized children activity			Reading books for children (S1)	Teach skills and knowledge	Leading children with a tour
Activity Area			Indoor activity within hotel area (S1)	Outdoor activity within hotel area (S1)	Activity outside hotel area (S1)
Activities design			Entertainment dominated (S1)	Education dominated (S1)	Enjoyment of art(S1)
Toys Design			Traditional toys (S1)	Novel designed toys (S1)	Self-handmade toys(S1)
Music			Light music (S1)	Classic music (S1)	Children's music (S1)
Video			Cartoon movie (S1)	Children educational program (S1)	Children art program (S1)
Theme			Region-Specific Activities (S1)	Fairy World and Cartoon Character (S1)	Eco-theme (S1)

Table 2.2 List of resources of domain, attributes and levels of hotel children service

Nos.	Literature List	Nos.	Hotel list	Nos.	Hotel list
L1	Milman (2009)	S1	Gleneagles Hotel in Scotland (2012)	S22	Hotel Dynasty Bali, (2012)
L2	Makens (1992)	S2	Babyhotel Austria, (2012)	S23	Hyatt Regency Tamaya Resort & Spa, (2012)
L3	Gaines et al, (2004)	S3	Allamanda Laguna Phuket, (2012)	S24	Ritz-Carlton, Naples, (2012)
L4	Nickerson & Jurowski, (2001)	S4	Gaylord hotels in Orlando, (2012)	S25	Mohonk Mountain House, (2012)
L5	Malene, 2007	S5	Cavallino Bianco, (2012)	S26	Smugglers' Notch, (2012)
L6	Ramanathan, (2012)	S6	Laguna Holiday Club, (2012)	S27	Gaylord hotels, (2012)
L7	Belch & Belch, 2004	S7	Franklyn D. Resort, (2012)	S28	Ritz-Carlton in Amelia, (2012)
L8	Staff, 2001	S8	Rio Mar Beach Resort & Spa, (2012)	S29	The Ritz-Carlton Grand Cayman, (2012)
L9	Burgess, J. 1982	S9	Seaport Hotel, (2012)	S30	Guangzhou Furong Resort, (2012)
L10	Woods & Deegan 2003	S10	Omni Chicago Hotel, (2012)	S31	Zhuhai Yu Hotspring Resort, (2012)
L11	Yesawich et al 2001a	S11	Solaris Kids Hotel, Andrija, (2012)	S32	Laishing Holiday Resortel, (2012)
L12	Han, et al, 2009;	S12	Four Seasons Hotels and Resorts, (2012)	S33	Sheraton Huizhou Beach Resort, (2012)
L13	Han, et al, 2010	S13	Ritz-Carlton, (2012)	S34	Hawana Howarjohnson Resort GuangZhou, (2012)
		S14	Fairmont properties in North America, (2012)	S35	Dragon Bay Natural Hot Spring Resort, (2012)
		S15	Trump Hotel, (2012)	S36	Sunnybay Hotspring Resort, (2012)
		S16	Four Seasons Hotel, Boston, (2012)	S37	OYC Hotel, (2012)
		S17	Apex International Hotel, (2012)	S38	Sheraton Dameisha Resort, (2012)
		S18	Ritz-Carlton, Cancun, (2012)	S39	The Venetian Macau Resort Hotel, (2012)
		S19	Kids Suites in Chicago, (2012)	S40	City of Dream Hotel Macau, (2012)
		S20	Four Seasons, Hualalai, (2012)	S41	Galaxy Macau, (2012)
		S21	Four Seasons, New York, (2012)		

Table 2.1 and 2.2 above summarizes the family and kids related attributes originated from literature and hotels' web search. In the Table 2.2, L1- L11 are items raised by researchers, and it construct the domain as the structure of the description, while S1- S41 represent the items learned from the hotel practice investigated in this study, each items forms the updated different practice summarized in the current hospitality industry. Specifically, the detailed review for literature and industrial practice is presented in the Section 2.3.1 and Section 2.3.2.

2.3.1 The features of hotel children service from reviewed journal

Children service in hotels is those service which provide both parents and kids with a range of offers, services and plenty of activities to keep every members entertained in accommodation, and most family service are designed with children or kids as the focus. Milman (2009) pointed that adult guests want to have opportunities to experience the destination, spend time to explore and learn something, and so do kid. Instead of being ignored or dismissed as the "passive role", children are important members of family today, and no longer as appendage or ignorable role in travels. Children influence the choice of travel patterns, and their satisfaction directly influences the satisfaction of other family members (Nickerson & Jurowski, 2001; Malene, 2007). Many hotels begin to realize importance of children guests and take such one as a necessary service to provide more extra value and thoughtful accommodation experience to family guests.

Hotels with family service, also known as family-friendly hotel or child-friendly hotel, pioneer the genre in the 1970s. Nowadays, family service in hotels has becomes a universal phenomenon, and are more popular as a growing trend in lodging industry (Ramanathan, 2012). As a value-added service, family service can attract more family guests with kids, and also encourage them to stay longer. It not just a special designed place for children to play around, but can also relieve parents from daily children care duties by like baby sitter service and kids club provided by hotels in accommodation. Moreover, separated children amenities away from hotel public area can reduce the chance of annoying other hotel guests by children who are making noise by playing around. For a successful hotel service prevision design, it is essential to assure that the service offer consumers what they needs at good value and convenience. Secondly, it is

also minimize the risk to prevent unnecessary cost by introducing value-added service. Offering special management to obtain a substantial competitive advantage is the third factor. Finally meeting hotels' growth objectives is also another consideration.

Makens (1992) has examined several exclusive resorts offering children's programs to family guests. His work was probably the first to analyze the common characteristics of children's services in the lodging industry. Following an analysis of the children's programs on offer at Omni Hotels children program, Hyatt camp and Club Med, he identified several strategic issues impinging on the design, operation and management of children's services.

With respect to design, he emphasizes psychological issues related to how children adapt mentally to physical environment. He also talks about the importance of matching resort design to the corporation's culture and style.

In regards to marketing, he encourages an independent marketing strategy through mail, selected print, broadcasting and television advertising, vertical media, and promotional events. He advocates a heavy dose of publicity and public relations with a mix of a variety of existing marketing distribution channels.

As per operations, Makens (1992) focuses on staff and safety management. He advocates professional staff majoring in primary education, recreation management, nursing, and child guidance. He also emphasizes the importance of personality requirements and an appropriate cultural background while selecting directors and first line employees. Inappropriate staff could precipitate unpredictable disasters involving children followed by legal wrangles. The recruitment process should include considerations of character, leadership ability, interpersonal skills, physical endurance, hobbies, and so on into consideration. At the same time, staff training is important. Makens also recommends that the Director of Children's Programs must be treated on par with the directors of F&B, Operations, Reservations, Engineering, Sales, and the like.

According to Maken, nothing is more important than the safety, health, and security of those kids". Supervision is the main ingredient of safety control. The ideal supervisors are the parents. However, one reason for instituting children's programs in hotels is to give parents some free time by relieving them of the chore of babysitting. So the children's facility design should be catered for children for three years old or above. At the same time, it should be remembered that children do not like to be away from their parents for too long. All these issues have a bearing on staff selection and training as well on program design.

Another study examining hotel family services with children as the focus can be found in the paper written by Gaines (Gaines et al, 2004). Gaines also confirms that children's programs represent a growing trend in the resort hotels market. However, unlike Makens (1992) who focused just on vacation guests, Gaines notes the need for children services for business travelers too. He points out that more and more families are combining pleasure with business travel, so more city hotels are establishing quality children's programs for their corporate guests. Compared with pure leisure travelers, business travelers usually require more spare time and even solicit higher demand for children programs within the hotel premises.

Both Makens and Gaines emphasize the selecting personnel, maintaining safety, and implementing different forms of family activities focusing on children. However, neither has thrown light on the design of children's service and amenities in different hotel contexts. Likewise, neither has provided empirical evidence from the customer perspective. In consequence, there continues to be a paucity of practical knowledge support to hotel operators.

From a marketing perspective, it is important to understand how family consumers experience children's amenities and what type of experience attributes they prefer. Such knowledge should be helpful in enhancing the hotel's competitive advantage by facilitating the development of products fitting the needs of the family markets segment (Belch & Belch, 2004).

Their advice on personal selection, safety management, health concern and security measures would be taken into consideration of designing the prototype featuring RET for family guests in this study.

Based on the analysis of this part for the proposed mini-solar park in hotel, specific forms of children service is summarized and categorized, so as to facilitate the distinguishment of relevant service design attributes.

2.3.2 Industry practices of children service from industrial web search

In order to collect information of industry practice to generate product attributes. The investigation collected information from different channel. The first one is to examining the content and description of hotel official website, hotel brochure, and business report through content analysis. This method is used extensively in the studies of consumer behavior to identify relationships within text (Spriggle, 1994). Total 41 hotels' documents were compiled and examined to form the description of the theme. The examined hotels belong to worldwide chains, including both business hotels and resort hotels.

Second, field observation was also undertaken for understanding exiting service setting in hotels (Dann et al, 1988). It was conducted in Macau and Hong Kong. A total of six hotels were the research subjects. Interviewing service staffs on duty was conducted during the field observation period. Open-end questions are set for the procedure of service operation and management.

Combined with the literature collected above, the study summarized their characteristic and described hotel children service and the common features as below.

A. Family activity categories

The preliminary study (described above) revealed two types of customers' behavior with respect to hotel family service. The first, Family Interaction, is characterized by the interactive activity involved by both parents and children. The second, Individual Involvement, refers to parents and children playing separately.

Parents nowadays have spent less time with their families because of work commitments. So, to compensate this, an increasing number of parents are looking to resort-based family vacations (Staff, 2001). In response, recreation programs supporting family interaction have developed within hotels and resorts (Gaines et al., 2004). Exercise gyms, football games and on-water activities fall within the domain of family interaction. However, it is noted that guests without children can only enjoy such

activities too. In other words, activities focusing on children can be labeled as belonging to the family interaction domain.

Another type of family interaction program is family sports. Many hotels offer courses or classes conducted by professional staff in a selected set of sports. For example, Gleneagles Hotel in Scotland organizes group water sessions with music in swimming pools for mothers and babies aged under two. Likewise, Babyhotel Austria arranges family excursions such as visiting a nearby village, baby-steamboat trip, family contests, fishing, and horseback trekking. These activities have become quite popular among family guests.

Family dining is another commonly found interaction activity in hotels. Some hotels even provide special restaurants decorated with cartoon characters. In some cases, children can interact with the characters. There are also separate menus for children. For example, Allamanda Laguna Phuket holds monthly theme nights combining a supervised activity for kids with a dinner treat for parents. Likewise, children staying at Gaylord hotels in Orlando can join the Summer Fun with Shrek & Friends package which includes a ShrekFeast interactive character meal for one morning. At the Omni, miniature French toast sticks, chocolate and strawberry milk, and other child-friendly foods bedeck a kids-level buffet table. Children seem to love such facilities (Makens, 1992).

For 'Individual Involvement' types of children program, Programs of this kind keep kids occupied within the program while the adults rest and relax elsewhere (Makens, 1992). Thus, while parents can drop their children off daily to participate in organized activities and enjoy some free time, children play more "freely" in the absence of parental monitoring.

The simplest form of Individual Involvement is to provide a babysitter or childcare at the hotel's childcare center or at a certified day-care facility. Children needing such a service are usually very young. This means that the staff members providing such services need

to be specialized professionals. For example, a family hotel in South Tyrol, Cavallino Bianco, offers a nursery for a baby starting as young as one month, and another 1,000m² 'indoor paradise' provides all-inclusive services for toddlers. Laguna Holiday Club in Phuket provides babysitter services for young children. When parents check in to the Franklyn D. Resort, hotel guests are assigned their own personal nanny for the duration of their stay, including bathing and dressing the kids and feeding them breakfast and lunch. Some hotels rely on agency-affiliated services and independent local sitters to provide a child-watching service.

More advanced forms of Individual Involvement have evolved for older children. Such programs tend to be more compelling and immersive and are often called clubs or camps. Many international and large hotels have developed well-designed programs, campaigns or clubs where kids engage in 'knowledge is fun' type of activities under an attractive theme and the supervision of professional staff.

b. Family service with hotel operation

It is also found that many family services with children focus are linked with the hotel's daily operations. These take three basic forms: a) Welcoming gifts at the front desk, b) Family service in restaurants, and c) Family service in guest rooms. This service requires much lower upfront investment to implement children's programs within existing facilities than to build an exclusive amenity. It is also easier to be implemented.

Family service at front desk: welcoming gift at check-in counter

Welcome gifts at the reception desk are common features in hotels (Burgess, J. 1982). A warm welcome can positively influence the customers' perceptions of service quality (Woods & Deegan 2003). In the Rio Mar Beach Resort & Spa, children get a Kids' Club bag, T-shirt and hat upon check-in. Seaport Hotel gives their child-guests cookies and milk upon arrival. The Omni Chicago Hotel offers a Sugar and Sweet All-American candy display on the night of arrival. Omni hotels also give each kid a \$10 gift card that can be used anywhere in the hotel. Solaris Kids Hotel, Andrija, entertains children by volcano as their mascots when parents check in or out. Four Seasons Hotels and Resorts entertain

young visitors with scavenger hunts and age-appropriate welcome amenities. Many of them are customized to suit the property locations—a stuffed owl and a S'mores snack kit at the Four Seasons Resort, Scottsdale, or a pair of antlers at Four Seasons Resort, Jackson Hole. More personalized fun are available in the bathroom, where the name of each visiting child is spelled out in alphabet on bath sponges. At Ritz-Carlton properties, "Very Important Kids" are presented with directions for a prize-bearing scavenger hunt and the opportunity to "check-in" at a special pint-sized desk. Fairmont properties in North America present each baby or toddler with a bottle of bubble bath, lotion, shampoo, and a sweet stuffed animal.

Family children service in restaurant

Providing special catering to children has become an integral part of children's services at many hotels. Trump Hotel provides children's room service menu whereas the Omni Sensational Kids program delivers milk and cookies to their child-guests on their first night. Trump Hotel has separate children's menu and children specific pricing when compared with adults. At the Four Seasons Hotel, Boston, kids are invited on Saturday nights to join staff in a free "Raid the Fridge" late-night snack finding mission.

Family service in guest rooms

Some hotels convert their common rooms into family rooms by introducing some special decorations such as cartoon books, toys, and children's television channel. Family rooms at Apex International Hotel feature 42 inch LCD TVs, a toy box, board games, and even a treasure hunt game so children can stay entertained. At the Ritz-Carlton, Cancun, moms and dads booking an "Itzy Bitzy Room" can rest easy and rock the baby to bedtime bliss, and a special suite outfitted with thoughtful baby-ready equipment: a rocking chair, a sleep-friendly phone designed to light up instead of ringing. Kids Suites in Chicago have created suites offering kids their very own separate but adjoining room filled with kid-sized table and chairs, coloring books, DVDs, video games and stuffed animals.

A number of hotel and resort properties deliver 'sweet dreams' along with memorable bedtime treats. At Four Seasons, Chicago, a "Bedtime Stories Butler" will help lull little ones to sleep with soothing nighttime tales, from classic to contemporary. At Four Seasons, Hualalai, children's program counselors deliver a Hawaiian story along with a good night snack. At Ritz-Carlton, Chicago, and Four Seasons, New York, "The Candy Man" delivers sweet dreams via a travelling candy cart.

These examples underscore the importance of combining family service with conventional hotel facilities. In this study, considering the practical situation, it borrows the methods from Family Service at Front Desk: to give welcoming gift to children at check-in counter, and it also does not require large upfront investment.

c. Playground design

Most family service settings in hotels comprise a separated children's area, exclusive amenities focused on children, a range of services, and a unifying theme. In general, the services combine entertainment with education.

The services studied by us could be classified into two types: tangible, and intangible. With respect to tangible facilities, it is found most hotels accommodate children in a separate play area, a swimming pool, a dining area, or a specially designed family guest room equipped with toys, books, and small-sized furnishings. The popularity of a separate children's area confirmed the observation by Yesawich et al (2001a) that most customers want a separate area for "kids to hang out". Common features among playgrounds studied were multi-climbing facilities, fall slides, bridges, barriers, climbers, merry-go-rounds, balloon pools, padded floors, and colorfully decorated children' furniture. All facilities were supervised. By contrast to theme parks or other public children's parks, mobile games or electronic rides were rare in hotel setting.

The visited children's playgrounds consisted of an indoor area, an outdoor area, or both. Indoor areas were better equipped with children facilities and toys. The indoor playground, Kid's Play Zone, at the Venetian Resort Macau was over 1,000m² in area.

Kids' City at City of Dream Hotel Macau was even bigger. In these areas, children could engage in physical activities, play arcade games, paint, play with different roles, watch movies, and even hold a themed party. The main feature of the outdoor areas consisted of multi-climbing facilities. Some included a sand pit occupying a much less area than the indoor playground. At Galaxy Macau, the outdoor areas were used only for organized activities held at scheduled times. There were also differences in the activities undertaken. In the indoor areas, most children were engaged free play whereas play in the outdoor areas was organized and led by hotel staff. Among the activities so organized were kid golf, kid yoga, and handicraft making.

All elements in kid's clubs were usually designed around a theme associated with the hotel's character, history, or natural environment. Hotels relying on ecology and environmental protection as the unifying design concept. In fact, the concept was extended to the entire hotel premises. It may be noted that the use of environmental protection is not new. As early as in 1992, Makens had noted its popularity. Literatures summarizes the three themes identified and elucidation of those three themes is presented underneath. Early literature review in Section

Region-specific theme

One attractive way of integrating the local environment is to exploit certain special or interesting features of local culture and history while designing children's activities involving storytelling, real life experiences, handmade handicraft, or locally purchased trophies. Hotel Dynasty Bali introduces some traditional Balinese games and crafts. Hyatt Regency Tamaya Resort & Spa in New Mexico has a 500-acre resort located on a part of a native American Pueblo where kids are offered the chance of experiencing the art and history of that culture first-hand. Kids are also encouraged to play native American games and explore the Rio Grande River on a guided stroll of the Bosque.

Eco- theme

Activities combining the natural environment as the theme are also quite popular in family hotel. However, it is noted that such activities are sensitive to weather and

seasonal effects. For example, the seaside resort often prefers to choose maritime activities as the theme, such as exploring marine biology, understanding marine environment, and teaching sea sports, While the mountain resort will utilize their mountain environment, such as mountain climbing, camping, animal and plant reconnaissance. In the skating resorts, designers always use snow as the theme to organize a series of activities. The Cloister at Sea Island, located on five miles of private beach on the Georgia's Atlantic coast, has a seasonal kid's club with a different theme in each. In Ritz-Carlton, Naples, one of the famous beach resorts, 11 aquariums housing fish, sharks, crabs, jellyfish, eel and even alligators, Touch talks are also available for kids to get hands-on experience. Older children can make use of a small lab with microscopes, slides and Petri dishes to learn about tiny marine life. Mohonk Mountain House as the typical mountain resort, has its full day program open from mid-June and kids can join in hikes, take pony rides, go on frog hunts, go swimming, and take boat rides. For skating resort in cold season, Smugglers' Notch not only provide their ski lessons for kids but also offer snowboarding, snowshoeing, dogsledding, air boarding, snowmobiling, skating and tubing.

More examples relating to eco-theme of kids club are kids program in Ritz-Carlton, In 'Fun With the Sun' kids program, where children make solar prints and eat cookies they've baked in a solar oven. Camp Hyatt works with National Geographic Kids to create eco-friendly activities. In The Ritz-Carlton Grand Cayman's Discovering Sea Turtles program, kids learn all about the creature's habitat, as well as environmental threats to their wellbeing. Environmental or eco-friendly theme has significant benefits for hotels to present their social responsibility and enhance their green image. This seems to be effective in attracting more environmentally concerned customers (Han, et al, 2009; Han, et al, 2010).

Fairy world and cartoon theme

A fairy world and cartoon character is also another popular theme in Individual Involvement. Gaylord hotels hold summer activities for kids to meet their favorite characters from DreamWorks Animation films like "Shrek," "Madagascar," "How to Train Your Dragon" and "Kung Fu". A special Pirate Tuck-In package in Ritz-Carlton is

available in Amelia, where Pirate Luis Aury, Princess Amelia and the hotel's "mascot" are the major characters. In addition, Amelia's Treasure is a program that storytellers read a pirate story and present a surprise keepsake treasure to children.

D. Safety management

The literature reviews also noted that safety issue is always the number one priority among all design factors. It is critical that children enrolled in the children's program are safe during their activities. This safety concern goes from physical setting to various mode of operation. In the field study, it was also found that individual children's playroom or playground is open from 9:00 or 10:00 in the morning to 20:00 or 21:00 in the evening. In the Venetian Hotel Macau, it is observed that all playing items are labeled with age restriction, whether it is supervised by staff, or under parental supervision. Camera with CCTV is installed to monitor the playground. Some large playing amenities such as long slides and climbing game has specific dress code. Children are required to wear long-sleeved shirt and trousers with socks to prevent physical injury.

Before every child enters the playground, parents are required to fill a form. They should fill in the information including children age, sex, and parents contact information. Before signing the form, parents are required to read the terms and conditions specified in the form. Both parents and the playground staff are legally bound to instructions specified in the consent form. Different hotels have different terms and conditions with regard to what is permissible and what is not. The regulation varies with the setting, size of the venue, and types of facilities. Some hotels have a condition that children under the age of 6 should not be left alone in the playground, and some hotels loosen the restriction and allow children up to 3 years old to be left unsupervised.

For staff management, it is found that, in general, children's playgrounds that are about 100 square meters in area have two members of staff on duty. They are responsible for looking after registration, sale of gifts or food, and assisting the children in their activities. For other organized activities, there were employees who are professionally trained to be able to interact and communicate with children. Their responsibility is to organize

performances, and educational activities. Their job is to entertain and interact with the children. These activities usually last for half an hour to one hour.

E. Price management

For the price setting, it is found from websites that, most hotels charge USD 1.00 to USD 10.0 per hour for children's playroom or playground. For organized activities, the charges depend on the type of activity. Families can pick and choose the activities depending on the child's interest. It was found that some children's amenities were free of charge. These included relatively simple activities within a small area (usually less than 100 square meters), with not much choice and not conducted in an organized way.

Kids' clubs and children's campaigns usually exist in one-stop service hotels, and are inclusive services for children and family. Above a certain age, children can choose from various well-designed and organized activities to participate without extra charge. However, not all service is free of charge. Some like babysitting, night care and special care, require separate fee or additional charge. The Camp Hyatt amenity package at hotels is free of charge. How to allocate the running costs of the program is left to each individual hotel. At the supervised resort programs, fees are charged based on the number of activities in which a child participates. The charges are approximately \$5.00 inclusive meals per child per hour or \$30.00 per child per day. Revenue to these programs comes not only from the entrance fee but also from other sources like sale of souvenirs, clothing, and toys for children. Beverages and food can also be purchased at these locations. Moreover, families can apply for monthly or annual membership to enter the playground any number of times. It can thus be seen that there is more than one way to charge for children's programs.

To sum up, the hotel children service has the following characteristics:

1. Most children service in hotels contains physical (children playground, children swimming pools) and non-physical setting (children service in front office, children service in guestrooms).

2. Service recipients are not only just for kids. Instead, it is a service system for the entire family. Design should facilitate each member's demand by offering each more customized service, and enable them greater flexible control of their time and activities.

3. Children service has a wide variety of forms from day care services to interactive childcare programs. It provides a variety of indoor and outdoor activities depending on the property's location. The availability of these programs varies among properties.

4. Children services management involves many aspects: it is not independent as an individual service section, but as a venture which contains interactive cooperation with other service departments. The well designed children service should be appropriate for display and sharing in various physical and intangible forms, from children playground to other hospitality service penetrating into daily hotel operation.

As shown in Table 2.1 in Page 51, all the information was summarized and made categorization. 18 designing attributes within five domains was summarized to be the design features. Besides the findings in this part, the research added more levels to some attributes by brainstorming with hotel experts to enrich the outcome. According to Gustafsson et al (1999), they provided a list of rules for choosing attributes when evaluating service quality: choose attributes that are important when the interviewees are buying, ones that can be modified and ones used to compare with competitors. Since there is no consensus in the literature about the elements, 18 relevant attributes, across five domains were chosen for future investigation as shown in Table 2.1.

2.4. Willingness to Pay (WTP) and Price Strategy

2.4.1 The definition of WTP and price strategy

In any commercial arena, price is an important factor affecting consumer choice (Winer, 1986). In order to maintain business sustainability, the most important operational issue is financial benefits of most company. Price's strategy is that business owner want to improve profits by selling more products or increase price.

Many product designs and marketing studies have investigated the maximum amount that clients are willing to spend for a novel product or service (Bovea and Vidal, 2004; Grunert et al., 2009; Claudy et al., 2011). In economics, the maximum amount a person would be willing to pay is called "Willingness to Pay" (WTP). WTP is what customers are willing to sacrifice or exchange to receive a product or avoid something undesired, such as pollution (Plott and Zeiler, 2005).

In the classic study of WTP, it is thought that WTP is the expression of self-judgment utility on product utility. In the experience economy written by Pine, & Gilmore, they mentioned people are more willing to buy souvenirs created by them, and such interactive process can be leveraged in their overall visiting experiences (Pine, & Gilmore, 2011). The conclusion of Pine, & Gilmore provide inspiration for this study that it is possible to transfer hospitality service into interactive process and test customers' WTP towards this newly designed service.

2.4.2 Price strategy in lodging Industry

In hospitality studies, WTP is usually taken to be a self-judgment or product utility. Guests are heterogeneous in terms of price sensitivity to amenities and WTP for specific characteristics of hotel service. Monty & Skidmore (2003) evaluated WTP for different hotel attributes and found that customers are particularly willing to pay for a hot tub, a private bath, and a larger room.

WTP also varies according to different customer segments. Hartman (1989) notes that business travelers are willing to pay for hotel amenities such as speed of check-in and

check-out times, the availability of free parking, and guaranteed reservations. Khattak et al. (2003) found that users of public transport are unwilling to pay as much for travel information as car users. Clearly, some services are significantly WTP-sensitive and some are not. Therefore, the service type has an obvious effect on WTP.

However, most of WTP researches lack the investigation on the interactive service on WTP, and considers the influence of the experiences types with the customers' perception.

2.4.3 Price and WTP for eco-related service in lodging industry

In response to increasing worldwide attention to environmental issues, the lodging industry has implemented a range of initiatives contributing to environmental protection. In this context, two major types of eco-activities can be identified: the improvement of hotel operation procedures by introducing environmental measures (Chan and Wong, 2006), and the adoption of environmental facilities and renewable energy equipment (Deng and Burnett, 2000; Chan and Wong, 2006; Bohdanowicz and Martinac, 2007). The increase in WTP and WPM for eco-friendly amenities and services in hotels has drawn attention to several new strategic questions in hospitality management. An important set of such questions address how one may profitably embed eco-concepts into the design hotel amenities and services. Such questions are exemplified as follows: Can hotels charge more by introducing eco-facilities? Will customers prefer to pay for eco-service? Are they willing to donate money to an eco-fund?

To investigate more specifically, this part starts with admission fee as a charging method. Many researchers have examined how the ticket price influences revenue. Dixon complemented their market-based valuation study of the Bonaire Marine Park in the US with a survey soliciting customer views on WTP fees for the eco-park (Dixon et al., 1995). They found that an overwhelming 92% of respondents agreed that an entrance fee system was reasonable and were willing to pay the proposed rate of US\$10/diver/year. 48% of respondents expressed a WTP of at least US\$30 per year. Petrosillo examined the tourists' WTP for recreational environment and management in Italy. They found that 75% of the surveyed tourist were willing to pay 2.50–3.50 €/day for environmental goods

and services (Petrosillo et al., 2007). Tse (2001) conducted a survey of Hong Kong hotels and found that, in general, guests were willing to pay for extra services. His pre-test involving several randomly selected places from each category revealed that HK\$30, 70, and 180 were acceptable to the market.

Furthermore, the eco-labeled product/service may have potential to attract customers and increase their willingness to pay. Although many of the eco-activities mainly address the question of energy saving, several have also become a part of marketing strategies to increase the competitive advantage of the hotel in question (Manaktola and Jauhari, 2007). Hotels announce their eco-friendly initiatives to customers through both tangible signs (marketing campaign, advertisement, brochures, a recognized green logo, and so on), as well as intangible signs (cooperation with the local community, introduction of renewable energy equipment, managing operations in an eco-friendly way). In general, eco-practices in hotels can enhance customer satisfaction, market demand, and corporate image (Manaktola and Jauhari, 2007; Mensah, 2006). They also enhance both the customers' willingness to pay (WTP) and willingness to pay more (WPM) (Han et al, 2009; Dalton et al, 2008).

Last but not least, several studies have confirmed that consumers do recognize the special nature of products based on eco-concepts and are willing to donate to certain environmental activities (Bhate, 2002; Czap & Czap 2010; Wirtz, 2011). Recognizing this trend, some hotels have even established eco-funds to which guests could contribute. For instance, Banyan Tree established The Green Imperative Fund to further support community-based environmental initiatives in the region. Guests at Banyan Tree properties were billed US\$2 per room night while those at Angsana properties billed guests US\$1 per room. Guests were generally happy to contribute to such meaningful activities (Wirtz, 2011). Such a generous WTP can be attributed to several reasons: 1) guests are interested in the attractions and think the service is worth paying for; 2) hotel guests may be aware of the importance of environment protection after the visit and would be willing to contribute to such projects; and 3) hotel guests may want to donate their money to charities or public service organizations in general.

In summary, admission fee, payment for eco-labeled product/service, and donation, are the three accepted ways for charging eco-related service in tourism, and these two types of strategy will be adopted in the following investigation.

2.4.4 Actual WTP and hypothetical WTP

For WTP investigation in new product development, there are two major preference methods are commonly used. One is stated preference (SP) the other is revealed preference (RP).

SP methods have been developed to solve the problem of valuing those non-market goods that have no related or surrogate markets. RP methods use actual choices made by consumers in related or surrounding areas. In these approaches, consumer preferences are elicited directly based on hypothetical, rather than actual scenarios. RP data have high “face validity” because the data reflect real choices and take into account various constraints on individual decisions, such as market imperfections, budgets and time (Louviere et al. 2000). However, RP has a major drawback of using revealed preference data. Coefficients on an attribute in models is being estimated from choices in actual settings, provide only limited predictions of the impact of changing policies (Louviere et al. 2000).

SP methods can be used to cover a wider range of attribute levels in cases where revealed data do not encompass the range of proposed quality or quantity changes in the attributes of a public good. However, stated preference methods are commonly criticized because the behavior they depict is not observed (Cummings et al. 1986; Mitchell and Carson 1989). And thus SP generally fail to take into account certain types of real market constraints (Louviere et al. 2000). Louviere et al (2000) also believed RP models are suitable for short term forecasting of small departures from the current state, whereas SP models are more appropriate to predict structural changes that occur over longer time periods.

Both stated and revealed preference methods have advantages and disadvantages. A large number of studies compare actual WTP obtained from laboratory experiments and field surveys with hypothetical WTP. Divergence in actual and hypothetical WTP is evidence of hypothetical bias. List and Gallet (2001) and Murphy et al. (2005) perform meta-analyses of these studies by regressing study characteristics on the ratio of hypothetical to actual WTP. They find that private goods generate less hypothetical bias than public goods. Questions based on familiar behavior (i.e., behavior that leads to use value) generate less hypothetical bias. These results suggest that SP behavior data should have greater criterion validity than SP willingness to pay responses.

Fisher and Gerking (1987) test the demand for stated and revealed strawberry purchases and find no statistically significant differences in demand functions. Loomis (1993) compares intended length of recreation trip collected at a lake with a hypothetical water level versus actual length of recreation trip when the hypothetical water level has been realized at the lake. There is no statistically significant difference between the average intended length of stay of 5 hours and the actual length of stay of 6 hours. Whitehead (2005) finds that survey respondents significantly overstate their hurricane evacuation behavior when compared to their actual behavior.

Grijalva et al. (2002) conduct an out-of sample predictive validity test of rock climbing trip behavior using panel data. Respondents are surveyed about their actual trip behavior and stated preference behavior under future access conditions. Following the realization of the hypothetical scenarios (closure of rock climbing areas), respondents are surveyed again. With hypothetical closure of rock climbing areas, stated preference rock climbing trips fall. When the areas are actually closed, actual trips differ in the expected direction.

Whitehead (2005) compares the within sample and out-of-sample predictive validity of hurricane evacuation behavior with panel data. Respondents are surveyed about their RP evacuation behavior after low-intensity storms, a discrete choice, and SP behavior after hypothetical low-intensity and high-intensity storms. Two hurricanes followed the survey and respondents are surveyed again to determine their actual behavior. Models using actual and stated preference evacuation data forecast actual behavior with

prediction error of less than 20%. Furthermore, Whitehead et al (2012) tested the predictive validity of stated preference survey responses. SP are generally accurate when predicting real behavior of respondents. They still found stated preference of respondents on some certain items lacks criterion validity. Respondents tend to overstate their concert attendance behavior.

In summary, for application in specified area, especially for the development of new products, the accuracy of SP is hard to judge. In order to obtain a more reliable result, this research project will use anti- and post scenarios to collect data and compared SP and RP, respectively. The differences between two methods would be worked out.

2.5 Preference Method for Environment Related Products

2.5.1 Contingency valuation and choice modeling

There are two types of methods available for choose. One is Contingency valuation method (CVM) and the other is Choice modeling (CM). In order to evaluate customers' preferences on the designed prototype, it is necessary to decide the most appropriate method for evaluation, so as to fit for the eco-aspect and environmental features of this prototype.

Contingency valuation method (CVM)

CVM is a survey-based economic technique that is used to measure both price and non-price preference model, especially for environmental related products. This approach asks people to directly report their willingness to pay (WTP) to obtain a specified good, or willingness to accept (WTA) to give up a good, rather than inferring them from observed behaviors in regular market places. Contingent valuation is often referred to as a stated preference model.

Contingent valuation has proven particularly useful when implemented alone or jointly with other valuation technique for non-market goods, such as the travel cost method or hedonic approaches. It remains the only technique capable of placing a value on commodities that have a large non-use component of value, and when the environmental improvements to be valued are outside of the range of available data. Many applications of the method deal with public goods such as improvements in water or air quality, amenities such as national parks, and private non-market commodities such as reductions in the risk of death, days of illness avoided or days spent hunting or fishing.

Choice modeling (CM)

Choice modeling (CM) is a family of survey based methodologies for modeling preference for goods, where goods are described in terms of their attributes and of the levels. Respondents are presented with various alternative descriptions of a good

differentiated by their attributes and levels, and are asked to rank the various alternatives, to rate them or to choose their most preferred. Choice modeling may be used to estimate non-market environmental benefits and costs. The main choice modeling alternatives includes: conjoint analysis, choice experiment.

In a CM application, respondents are presented with a series of choice sets, each containing usually three or more alternative goods. An alternative is a combination of several attributes, with each attribute taking on a value, usually called a level. For instance, an alternative could be described as h hectares of additional forest with p percentage of tree species that would cost c monetary units. One of the alternatives in each choice set describes the current or future “business-as-usual” situation, and remains constant across the choice sets. From each choice set, respondents are asked to choose their preferred alternative. The attributes used are common across all alternatives. Their levels vary from one alternative to another according to an experimental design. For details, Bennett and Blamey (2001) documented the method in a detailed way.

CVM vs. CM

Both models are utility-based. Typically the survey asks how much money people would be willing to pay (or willing to accept) to maintain the existence of (or be compensated for the loss of) an environmental feature. A number of studies have compared welfare estimates derived from CVM and CM. The results of these studies are summarized in Table 2.3. Given that CM may offer some advantages over CVM,

Table 2.3 Comparison between CM and CVM

Reference	Application	Conclusions	CVM compare with CM
Mogas et al (2005)	Preference on an afforestation programme in the northeast of Spain	Choice modeling is the method recommended for use in policy evaluation contexts, such as cost–benefit analysis applications	CM over CVM
Jin et al (2006)	Macao residents' preferences for alternative solid waste management policy changes in Macao	Both double-bounded DC-CVM and CM can be successfully implemented for environmental valuation in Macao	Equivalent
Mogas et al (2006)	The estimation of non-market values from alternative afforestation programmes in the Northeast of Spain	CM is able to control a more significant proportion of the unobservable consumer utility, giving superior estimation efficiency and a better understanding of the choices made by respondents.	CM over CVM
Veisten (2007)	Investigating willingness to pay (WTP) for an environmental attribute through certification and eco-labeling	CVM provides less information than CM, is simpler for obtaining quick preference assessment. CM normally provides higher estimated WTP than open-ended CVM, the CM estimates may converge with estimates from close-ended CVM	CVM over CM in information assessment, but CM is over CVM in estimates
Tuan and Navrud (2007)	Cost-benefit analyses to assess the benefits to cultural heritage of measures	Both CVM and CM are suited to estimating the economic benefits of preserving cultural heritage	Equivalent
Ryan and Watson(2009)	Women's preferences for Chlamydia screening	CM results in higher WTP estimates than the CVM	CM over CVM

In Table 2.3, even some researchers consider choice modeling (CM) and contingency valuation method (CVM) is equivalent in evaluating customers' preferences of alternatives. Most researchers recommend using CM instead of CVM. As Mogas et al (2006) mentioned CM is able to control a more significant proportion of the unobservable consumer utility, giving superior estimation efficiency and a better understanding of the

choices made by respondents. CM is over CVM in estimates willingness to pay (WTP) for an environmental attribute through certification and eco-labeling (Veisten, 2007).

Besides, CM also could minimize many of the biases that can arise in CVM studies where respondents are presented. The method has the potential to reduce problems such as expressions of symbolic values, protest bids, and some of the other sources of potential bias associated with CVM (Hensher, 2010; Hoyos, D. 2010; Alberini & Kahn, 2009). Taken all the aforementioned comments into account, this study chooses to use CM instead of CVM. Therefore, the detailed methodology about CM is described in Chapter 3.4. But the theoretical basis of CM will be reviewed in the section underneath.

2.5.2 Theoretical basis - Random Utility Theory (RUT)

The approach of choice modeling conducted in this study is a sort of customer value measurement that is based on utility theory. Random Utility Theory (RUT) is a long-standing and well-tested choice behavior theory. RUT provides an explanation of the choice behavior of humans, not numbers (Lockshin et al., 2006).

Specifically, RUT proposed that there is a latent construct called “utility” existing in a person’s mind. That is, a person will evaluate “utility” for each choice alternative, but researchers cannot observe these “utility”. RUT assumes that the latent utilities can be summarized by two components, a systematic (explainable) component and a random (unexplainable) component. Systematic components comprise attributes explaining differences in choice alternatives and covariates explaining differences in individuals’ choice. Random components comprise all unidentified factors that impact choices. More formally, the basic axiom of RUT is:

$$(1) \quad U_{ij} = V_{ij} + \varepsilon_{ij},$$

Where U_{ij} is the latent, unobservable utility that individual i associates with choice alternative j , indexed $j=1, \dots, J$, V_{ij} is the systematic, explainable component of utility that

individual n associates with alternative i and ϵ_{in} is the random component associated with individual n and option i (Louviere et al., 2010).

Suppose indexed $j=1, \dots, J$ and described by vectors of attributes X_j . The systematic component of utility V_{ij} can be written in the linear form:

$V_{ij} = X_j \beta$, where X_j is the attribute vector of the j th alternative, and β is coefficient vector representing the weight of attribute in the valuation of alternative j . Then, the utility function for the individual i in (1) can be rewritten as:

$$(2) \quad U_{ij} = X_j \beta + \epsilon_{ij},$$

Because the random components ϵ_{ij} , and the utility U_{ij} are inherently stochastic, researchers can predict the probability that individual i will choose alternative j . Instead of the predicting the exact alternative that individual i will choose, RUT leads to describe choice probabilities respond to changes in choice options (or attributes) and covariates representing differences in individual choices. Thus, the probability of an individual choosing the m th alternative is

$$(3) \quad P(m | C, \beta) = P(X_m \beta + \epsilon_{im} > X_j \beta + \epsilon_{ij}, \forall j \in C \text{ and } j \neq m)$$

where C denotes the choice set. In the case of independently and identically distributed extreme value disturbances, the probability of an individual choosing the m th alternative can be expressed as follows:

$$(4) \quad P(m | C, \beta) = \frac{\exp(X_m \beta)}{\sum_{i \in C} \exp(X_i \beta)}$$

This equation can be estimated from the consumer choice data generally collected in surveys.

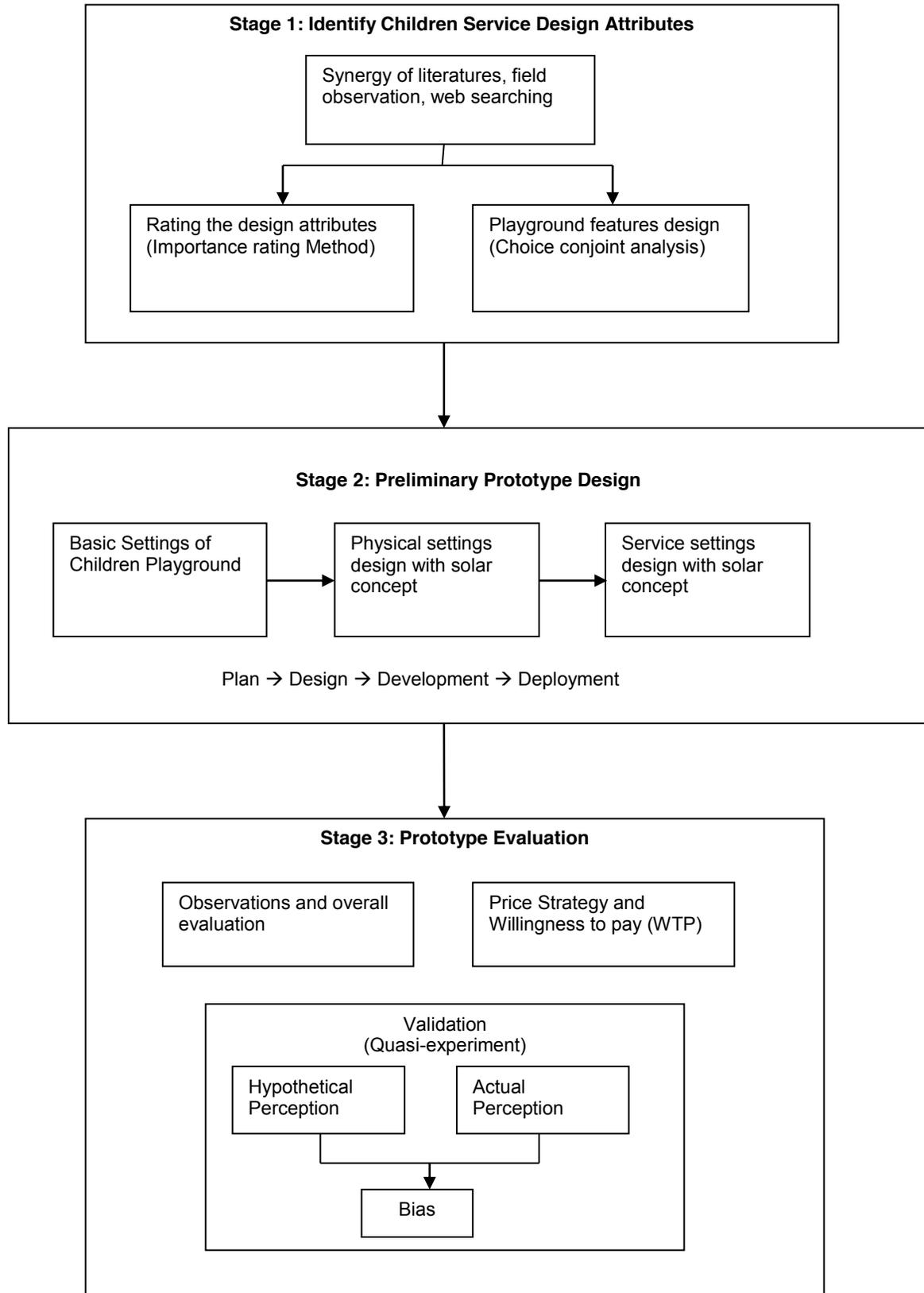
Chapter 3 Methodology

This chapter presents the methodology used to accomplish the objectives of the study and divided into four main sections. The first section depicts how the study uses the qualitative, quantitative, and interdisciplinary approaches in research in three stages. Then overall methodological framework comprising three stages is presented in Figure 3.1.

Stage 1 (i.e Section 3.1) that is also the second section is to identify and design attributes plus sub-segmentally generates design profile for customers. The context in this section includes objective 1, which is about how design attributes are being identified. The third section (3.2) is about Stage 2: Prototype Design. This section provides how the solar prototype is designed and describes prototype as an effective tool for product design. The fourth section (3.3) is Stage 3: Prototype Evaluation. This section introduces the evaluation procedure including site observation, charging mode design, and a quasi-experiment. The latter is used to examine the research validity.

To elucidate the research method, an outline about the flow of the methods is given of in the following Figure 3.1, which describes each step of research design and the methods used for data collection and analysis.

Figure 3.1. Procedure of the study



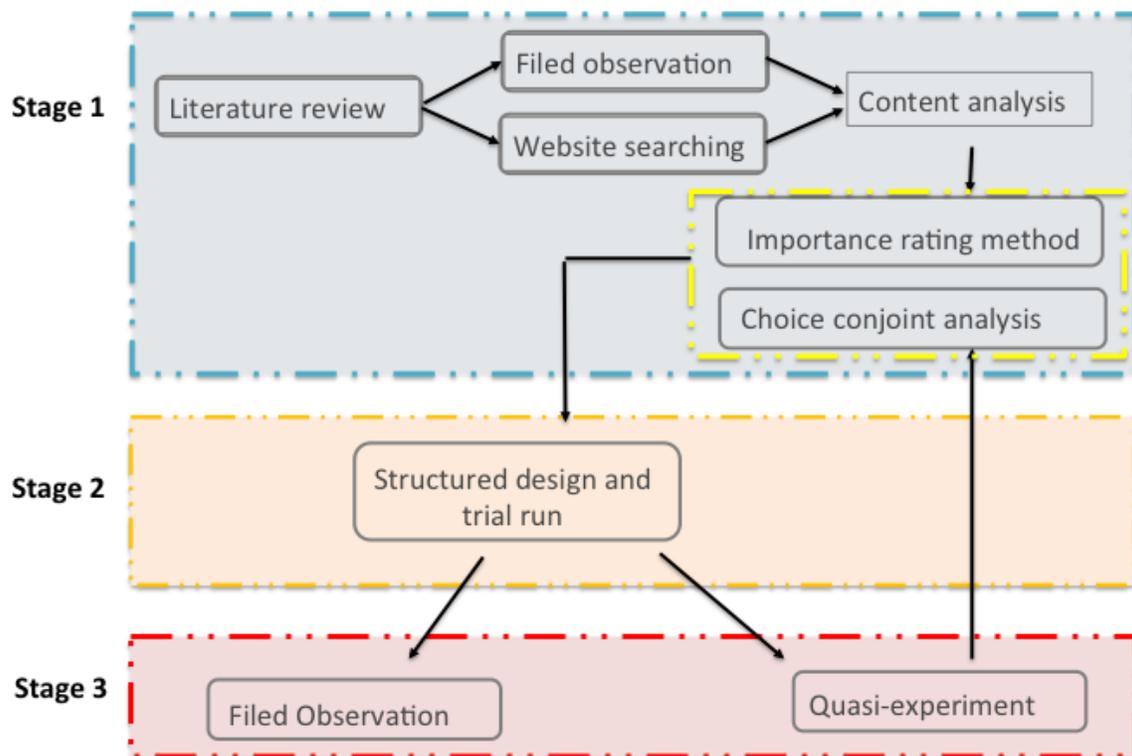
3.1 Method Involving Qualitative, Quantitative, and Interdisciplinary Approaches

This section describes the methods adopted in this study process and its contributions. The first part deals with the process development within the interdisciplinary research context. The second part is the multi-approaches as integrated methodology within interdisciplinary research context.

3.1.1 Research methods

The research method being used combines both qualitative and quantitative analysis, with the application of various methods in interdisciplinary context. Discussion of these characteristics is presented below.

Figure 3.2. Flow of research methods



To accomplish the research objectives, the study adopted both qualitative and quantitative methods. Qualitative research is often used as a precursor to quantitative research, in that it is often used to generate possible leads and ideas that can be used to

formulate a realistic and testable hypothesis. The design of qualitative research is flexible of the various experimental techniques, encompassing a variety of accepted methods and structures (Wong et al, 2004; Ghodsypour and O'Brien, 1998). Recent tourism research design always use qualitative and quantitative research approaches together to reach an ideal design process. In Stage 1, the research firstly adopted qualitative analysis to understand current family service in hotels. This helped investigator to identify the product attributes. Quantitative research also needs to examine customers' preferences on these attributes from a marketing perspective. In the end, qualitative approach assisted the study to create leads and ideas on how to design a service product.

In Stage 2, the research mainly adopted approaches of design science research that forms a developmentalist paradigm for the study to go through the interactive design process to create a novel hospitality product. The design of qualitative methods in this part is flexible and allows for the provision of various experimental techniques, encompassing a variety of accepted methods (e.g. scenario simulation, brainstorming and observation,) to formulate an interactive design process in a practical context.

In Stage 3, the study addresses price strategy and evaluation. The research mainly adopted quantitative research methods to evaluate prototype performance, investigate the optimal price settings of this prototype, and examine the validity by comparing results in ex-ante and ex-post conditions.

Traditionally, the two approaches — qualitative and quantitative also have weaknesses in terms of validity. For example, it may not be easy to obtain reliable answers from respondents and also have difficulty in controlling the data-collecting environment.

Therefore, it may not be realistic to follow a single method for the entire study. On the other hand, Mumford (1985) advocates studies of a "total" situation through action-centered, interdisciplinary, and participatory research in which research questions and hypotheses evolve as new developments are introduced. Lyytinen (1987) makes a

similar observation with case studies and action research on the grounds that "this research strategy seems to be the only means of obtaining sufficiently rich data" and because the validity of such methods "is better than that of empirical studies." Thus, there has been a strong sentiment that product design researchers need to move beyond case studies to more experiments or field tests (Benbasat, 1984). Considering the nature of this study, an action-centered product design research has been adopted.

Based on the above concerns, the following section discusses how this study has conducted a series of approaches with multiple methods.

3.1.2 Integrated methodology within interdisciplinary research context

As the study plan to test, develop, and evaluate an original and novel hospitality product, a number of methods involving several disciplines are required. Thus, an interdisciplinary research agenda that spans across social science, technological development, process engineering, operational marketing and economics, WTP is used. During the research process, the interview technique, importance rating method and action case study that have been commonly employed by social scientists are applied. The knowledge of technological development of solar device has also been updated and put on the knowledge cards in the experimental mini park. Also the process engineering in product prototype development has also been used in the study.

In addition, business-marketing field's pricing and promotion methods are also used for the set-up prototype. Besides, the study also harnesses economists' approaches – utility based conjoint analysis and examination of willingness to pay. Thus this study is characterized by multi-disciplinary approaches. Since there is a strong interdependency among the various parts of the product development and investigation, and integrated methodology is deemed to be necessary. The methods within different disciplines are intended to combine and became one coherent engineering methodology within find-bind-execute paradigm of services-science.

By doing content analysis on data collected through field study and interviews, ideas were generated in environmental analysis. Designing a process linking up workshops, picture books, storytelling and scenarios simulation is a real value added technique. Such a process was evaluated by means of monitoring, observation, on-site experiments, and interviews with hotel guests after the real visiting experience. All of these methods are used to constitute a complete design research project within a constructive and participatory paradigm. The applied interdisciplinary approaches have provided a demonstration at showing how these methods can contribute to the integrated methodology.

As discussed in the previous section, developing a complete hospitality product requires coordination within different designing aspects so as to fulfill its technical, engineering, operational, financial and even business purposes. Although each of these aspects comes with an individual development methodology, overall development process cannot be executed independently. For example, based merely on the multi-attribute service description, it is not sufficient to realize how to innovatively embed the solar concept into prototype.

The innovative ideas, detailed content and well-planned logistics of modeling (through souvenir co-creation activity, solar barbecue activities, and layout decoration) would not be unrevealed in the multi-attribute analysis. However, without environmental analysis of the market requirements, the designing outcome cannot be achieved with realized a business value (acceptable financial income, and increasing customers' satisfaction level). Moreover, the measurement of effectiveness of managerial innovation in price strategy can only be realized based on a real established prototype after a period of operation time. Three price settings that consult the marketing discipline and take into the consideration of the nature of designed activities were used in the study.

In addition to these inter-dependencies, the need for an integrated methodology also results from the question of how to construct the multi-approaches as a whole. The goals of this study determine that it is a functional-centric study. This is different from a process-centric design that is concentrating only on the decomposition of each step of

the design process. This study focuses more on how to realize its functional objectives in practical contexts. The overall methodology leveraging marketing, process engineering, and final evaluation, provides opportunities to realize the overall functional investigation.

It is important to emphasize at this point that, through designing solar-themed children's product, the research have additionally explored the concept of a novel souvenir service in hotels. The design builds on our earlier insights to embrace a complex activity of souvenir consumption. Guests are involved in the production of souvenirs, which not only becomes a part of their experiences, but also implies that there is a higher opportunity of increasing souvenir sales.

3.2 Stage 1: Identify, Design Attributes, and Generate Design Profile for Customers

In this stage, first, it identifies new functional and physical features that could be incorporated into product design by synergic analysis on reviewed literature, field observation, and searched website. Based on the attributes and levels found in this part, the concurrent section employs two commonly used approaches for measuring the importance: importance-rating method and choice conjoint technique. The two approaches are stated in one questionnaire attached in Appendix 1.

3.2.1 Synergy of literature review, field observation, website searching

To identify promising new functional and physical features that could be incorporated into product design, these data collecting methods including literature review, documentation collection and field study are used.

For documents collection, it refers to examination of the content and description of hotel official websites, hotel brochures, and business reports by using content analysis. First, a primary web search through Google was conducted by using combinations of the following keywords: “hotel, children”; “hotel, kids”; “hotel, family”. Second, inputting these keywords to find hotels’ website contains description in children and family related services and facilities. Third, each hotel websites was re-examined. Then keywords or phrases that can be used to categorize the characters of family service are marked with codes. This process was taken from November to December in 2011. Result of this part has been introduced already in the literature review parts Section 2.3.

Meanwhile, field studies were also conducted in Macau and Hong Kong during Jan 2012 to March 2012. Hotel visits include the Venetian Macao Resort Hotel, Galaxy Hotel, Starwood Hotels & Resorts, The City of Dreams, Hong Kong Gold Coast Hotel, and Hong Kong Disneyland Hotel. These hotels are all five star hotels with children playground and service. During the visits, the author observed children facilities as well as the way of management. The information collected during the field study was used as practical evidence to complement the information collected in the documents collection

part so as to generate an up-to-date product profile based on industry practice. The approaches to find comprehensive attributes and levels for forming product profile are suitable to hotel children program design.

The rules for choosing attributes include opting features that are important and driving interviewees to make purchase decision, that can be modified and that can be used to compare with competitors. Details of this part are present in Table 4.1 in Section 4.1.1.

3.2.2 Importance rating method

After the identification and selection of the attributes, from the literature review, web searching and field observation, the study proceeds to do shortlisting. Customers were asked to rate the importance of attributes within each domain. In the importance-rating task, participants were asked to state the importance of attributes within each domain when choosing hotel children program.

In order for customers to better understand the concrete meaning of each attribute, a verbal description is necessary. According to Table 3.1, each attribute has two or three levels, which were used with explanation to describe the concrete setting of such attribute in hotels.

In this study, 300 copies of the survey were distributed during the period March 2012 to May 2012 through website and email. 293 copies of questionnaires were collected afterwards. The response rate is as high as 97.6%, except some very unusual cases. Questionnaire was excluded when it was not completed or filled. After exclusion of 17 invalid questionnaires, the study finally obtained 266 valid questionnaires, and questionnaire response rate was 88.67%.

For each attribute, participants were asked to state how important the feature would be in their purchase decision on a 0- 10 interval scale, from the least important rating of 1 to the most important rating of 10 following previous rating approaches (Sethuraman et al 2005; McKinney et al., 2002; Raybould & Wilkins.,2006).

Responses were averaged to calculate a mean importance. These aggregate numbers were labeled “stated importance”. The stated importance was obtained from matched samples using on-field data collection method. The technique is a very common method in product design and used to determine the priorities for each design requirement (Chan et al, 1999; Pullman et al, 2002; Chen et al., 2004). Several papers using rating methods in a large number of tourism and hospitality studies, such as McKercher et al (2006); Chung & Law (2003); Chu & Choi, (2000), are taken as reference too.

The participants in this phase were all parents or supervisors who have experience in hotel accommodation. They were believed to have experience in raising children. So the study expected them to be familiar with their children’s preferences and demands and was able to make the purchasing decision for their kids. It actually found that they were able to provide sophisticated suggestions about other managerial and designing issues. All qualified respondents were then asked to proceed the interview.

3.2.3 A choice conjoint technique

The concept of conjoint analysis

Conjoint Analysis (CA) is a generic methodology that is used to establish what factors influence the demand for different products and what combinations of product attributes would maximize the profits or sales (Cattin and Wittink, 1982). CA original is used in psychology, principally associated with research dealing with ways to mathematically represent the observed behavior of rankings as an outcome of systematic and factorial manipulation of independent factors (attributes). The method has also been used extensively in the field product design in the area of preference evaluation, demand analysis, and forecasting. Choice-based conjoint (CBC) analysis has become an attractive alternative for measuring preference structures (Wellman and Vidican, 2008; Eggers and Sattler, 2009; Meghani, 2010), particularly in the marketing research field.

Generally, in a conjoint analysis survey, respondents are asked to rank or rate a group of alternatives which are defined by various levels of several attributes. Compared to the

traditional ratings- or rankings-based conjoint analysis, the Choice-based conjoint (CBC) analysis has become an attractive alternative for measuring preference structures (Wellman and Vidican, 2008; Eggers and Sattler, 2009; Meghani, 2010), particularly in the marketing research field. There are several reasons for the increased interest in this approach. First, the task of choosing a preferred concept is similar to what buyers actually do in the marketplace. Choosing a preferred product from a group of products is a simple and natural task that everyone can understand. Second, compared to most other conjoint analysis studies using “main effects only” assumptions, the CBC approach can generally quantify main effects and most interaction effects (depending on the experimental design) as well. Third, it is possible to measure alternative specific effects on consumers’ preferences for the products in the CBC analysis. Finally, the analysis of CBC data is much simpler relative to ratings- or rankings-based conjoint data.

Analytical procedure

In data analysis, the study computed each respondent’s self-determined utility score (with individualized importance weight) to obtain a set of predictor variables. Mathematical modelling was used as appropriate in assessing the data. This study used SPSS 17.0 for Windows (PASW Statistics 18.0 for Windows) for data analysis. According to Green & Srinivasan (1990), utility values (part-worth) is used to measure attributes.

The utility of each alternative is a linear function of the part-worth utilities (β_{ij}) of the attributes:

$$(1) \quad U(c_k) = \sum_{i=1}^{i=q} \sum_{j=1}^p x_{ij} \cdot \beta_{ij}$$

where β_{ij} is the part-worth utility of level j of attribute i and x_{ij} is a dummy variable that indicates the presence ($x_{ij} = 1$) or absence ($x_{ij} = 0$) of the level j of attribute i for alternative c_k . The parameters β_{ij} needs to be estimated for each level of the attributes considered in the design. One part-worth utility within each attribute is scaled to zero to constitute the reference category for the other attribute levels.

The importance of each attribute (I_i) was estimated as the maximum part-worth utility within that attribute (Sayadi, González-Roa, & Calatrava-Requena, 2008):

$$(2) \quad I_i = \max\{\beta_{ij}\}$$

The attribute's relative importance (W_i) was estimated by normalizing to ascertain its importance relative to other attributes:

$$(3) \quad W_i = \frac{I_i}{\sum_{i=1}^q I_i}$$

Profile generation/design

Attributes among each domain were analyzed separated. Statistically, a full factorial design of each domain is achieved by multiplying the numbers of levels in each attribute, and the result is presented as follows.

Table 3.1 Number of combination of full factorial design

Domain	Nos. of combinations full factorial design
Family activity types	2x3= 6
Family service within hotel operation	3x3x3=27
Safety management	2x3= 6
Price strategy	3x3=9
Playground design	3⁹=19683

As shown in Table 3.1, the numbers of combination for “Family Activity Types”, “Safety Management”, “Price Strategy” is less than 10 and is reasonable for interviewees to evaluate. However, for “Family service within hotel operation” and “Playground design”, the numbers of combination should have $3^3=27$, and $3^9=19683$ for unique prototype combinations. It is acknowledged that it would be impossible to ask respondents to select their most preferred one from them (Louviere and Hensher, 1983). Therefore, a fractional factorial design, which can significantly reduce potential profiles without sacrificing efficiency, can be used. The current study uses fractional factorial designs specified by SPSS Conjoint 17.0, which present an appropriate fraction of the possible

alternatives. Interactions between levels of one factor with levels of another factor are assumed to be negligible.

The application in this study

Using conjoint analysis, the study investigates participants who made choice decisions among several product profiles. Each represents different combinations of attribute levels. The rated attributes are applied in design of the prototype within the park. Aggregate consumer preferences (part-worth utilities) for the different levels of each attribute were estimated using a multinomial logit model specification. The importance of each attribute was obtained as the difference in utilities between attributes. These estimates derived from importance rating were labeled because importance estimates were derived from a choice task. Aggregate importance was obtained from matched samples on site.

Since objective is about designing playground features, this section only investigate “playground design” domain with details and left other domain for further investigation. After finalizing the list of attributes and their experimental levels for “Playground design”, a 27 orthogonal profiles with nine blocks allowing a reliable estimation of the main effects was worked out and was shown in Table 3.2 (Horowitz and J Louviere, 1990).

Table 3.2 27-Profile with night block (choice sets) in CBC design for domain playground design

No.	Playground area	Size	Staff organized children activity	Activity area	Activities design	Toys design	Music	Video	Theme
1	Separated indoor playground	Below 30m ²	Reading books for children	Indoor activity within hotel area	Entertainment dominated	Traditional toys	Light music	Cartoon movie	Region-specific activities
2	Separated indoor playground	Below 30m ²	Reading books for children	Indoor activity within hotel area	Education dominated	Novel designed toys	Classic music	Children educational program	Fairy world and cartoon character
3	Separated indoor playground	Below 30m ²	Reading books for children	Indoor activity within hotel area	Enjoyment of art	Self-handmade toys	Children's music	Children art program	Eco-theme
4	Separated indoor playground	Between 30- 100 m ²	Teach skills and knowledge	Outdoor activity within hotel area	Entertainment dominated	Traditional toys	Light music	Children educational program	Fairy world and cartoon character
5	Separated indoor playground	Between 30- 100 m ²	Teach skills and knowledge	Outdoor activity within hotel area	Education dominated	Novel designed toys	Classic music	Children art program	Eco-theme
6	Separated indoor playground	Between 30- 100 m ²	Teach skills and knowledge	Outdoor activity within hotel area	Enjoyment of art	Self-handmade toys	Children's music	Cartoon movie	Region-specific activities
7	Separated indoor playground	Over 100m ²	Leading children with a tour	Activity outside hotel area	Entertainment dominated	Traditional toys	Light music	Children art program	Eco-theme
8	Separated indoor playground	Over 100m ²	Leading children with a tour	Activity outside hotel area	Education dominated	Novel designed toys	Classic music	Cartoon movie	Region-specific activities
9	Separated indoor playground	Over 100m ²	Leading children with a tour	Activity outside hotel area	Enjoyment of art	Self-handmade toys	Children's music	Children educational program	Fairy world and cartoon character
10	Separated outdoor playground	Below 30m ²	Teach skills and knowledge	Activity outside hotel area	Entertainment dominated	Novel designed toys	Children's music	Cartoon movie	Fairy world and cartoon character
11	Separated outdoor playground	Below 30m ²	Teach skills and knowledge	Activity outside hotel area	Education dominated	Self-handmade toys	Light music	Children educational program	Eco-theme
12	Separated outdoor playground	Below 30m ²	Teach skills and knowledge	Activity outside hotel area	Enjoyment of art	Traditional toys	Classic music	Children art program	Region-specific activities
13	Separated outdoor playground	Between 30- 100 m ²	Leading children with a tour	Indoor activity within hotel area	Entertainment dominated	Novel designed toys	Children's music	Children educational program	Eco-theme
14	Separated outdoor playground	Between 30- 100 m ²	Leading children with a tour	Indoor activity within hotel area	Education dominated	Self-handmade toys	Light music	Children art program	Region-specific activities

No.	Playground area	The size	Staff organized children activity	Activity area	Activities design	Toys design	Music	Video	Theme
15	Separated outdoor playground	Between 30- 100 m ²	Leading children with a tour	Indoor activity within hotel area	Enjoyment of art	Traditional toys	Classic music	Cartoon movie	Fairy world and cartoon character
16	Separated outdoor playground	Over 100m ²	Reading books for children	Outdoor activity within hotel area	Entertainment dominated	Novel designed toys	Children's music	Children art program	Region-specific activities
17	Separated outdoor playground	Over 100m ²	Reading books for children	Outdoor activity within hotel area	Education dominated	Self-handmade toys	Light music	Cartoon movie	Fairy world and cartoon character
18	Separated outdoor playground	Over 100m ²	Reading books for children	Outdoor activity within hotel area	Enjoyment of art	Traditional toys	Classic music	Children educational program	Eco-theme
19	No separated place	Below 30m ²	Leading children with a tour	Outdoor activity within hotel area	Entertainment dominated	Self-handmade toys	Classic music	Cartoon movie	Eco-theme
20	No separated place	Below 30m ²	Leading children with a tour	Outdoor activity within hotel area	Education dominated	Traditional toys	Children's music	Children educational program	Region-specific activities
21	No separated place	Below 30m ²	Leading children with a tour	Outdoor activity within hotel area	Enjoyment of art	Novel designed toys	Light music	Children art program	Fairy world and cartoon character
22	No separated place	Between 30- 100 m ²	Reading books for children	Activity outside hotel area	Entertainment dominated	Self-handmade toys	Classic music	Children educational program	Region-specific activities
23	No separated place	Between 30- 100 m ²	Reading books for children	Activity outside hotel area	Education dominated	Traditional toys	Children's music	Children art program	Fairy world and cartoon character
24	No separated place	Between 30- 100 m ²	Reading books for children	Activity outside hotel area	Enjoyment of art	Novel designed toys	Light music	Cartoon movie	Eco-theme
25	No separated place	Over 100m ²	Teach skills and knowledge	Indoor activity within hotel area	Entertainment dominated	Self-handmade toys	Classic music	Children art program	Fairy world and cartoon character
26	No separated place	Over 100m ²	Teach skills and knowledge	Indoor activity within hotel area	Education dominated	Traditional toys	Children's music	Cartoon movie	Eco-theme
27	No separated place	Over 100m ²	Teach skills and knowledge	Indoor activity within hotel area	Enjoyment of art	Novel designed toys	Light music	Children educational program	Region-specific activities

Then, the following step is to use these established profile to construct profile choice set. As mentioned earlier, for Playground design, 27 profiles are blocked into 9 choice sets

with 3 alternatives in each set. Technically, respondents should each see exactly one choice set. However, more choice sets shown to each respondent does not directly imply that more accurate results will be attained (Kuhfeld, 2005). In fact, too many choice sets might cause respondents to be fatigued of questions. Randomly assigning several choice sets to each respondent is preferred, and this approach has been adopted in most CBC applications (Bai et al., 2007). As an alternative, in this study 9 choice sets (See Table 3.3) are assigned to construct four versions of CBC experiments following the criteria: Version I (Set 1, Set 2, and Set 3), Version II (Set 4, Set 5, and Set 6), Version III (Set 1, Set 3, and Set 5), and Version IV (Set 2, Set 4, Set 6). Table 3.3 presents a selected practice of the choice set in this CBC experiment.

The respondents were asked to rank the various attributes within the domain in the order of the perceived relative importance. Scores were given in the opposite manner: Rank #1 = 3 points, Rank #2 = 2 points, Rank #3 = 1 point as shown in Table 3.3.

Table 3.3 An example of selected choice set in CBC experiment for domain playground design

Question: If a hotel provides a new attraction for you to visit, and the following alternatives are available, please fill“√” in your most preferred product from each choice set.

Attributes	Alternative 1	Alternative 2	Alternative 3
Playground area	Separated indoor playground	Separated indoor playground	Separated indoor playground
The size	Below 30m ²	Below 30m ²	Below 30m ²
Staff organized children activity	Reading books for children	Reading books for children	Reading books for children
Activity area	Indoor activity within hotel area	Indoor activity within hotel area	Indoor activity within hotel area
Activities design	Entertainment dominated	Education dominated	Enjoyment of art
Toys design	Traditional toys	Novel designed toys	Self-handmade toys
Music	Light music	Classic music	Children's music
Video	Cartoon movie	Children educational program	Children art program
Theme	Region-specific activities	Fairy world and cartoon character	Eco-theme

Please tick “√” one with is most preferred; and “X” the least preferred

- a) Alternative 1
- b) Alternative 2
- c) Alternative 3

Sample Size

Johnson and Orme (1996), the author of the CBC System, have recommended the following rule-of-thumb when deciding sample size for aggregate-level CBC modelling:

$$(1) \quad nta / c \geq 500$$

where:

n = number of respondents

t = number of tasks/choice sets

a = number of alternatives per task (not including the "None")

c = number of "analysis cells"

When considering main-effects, c is equal to the largest number of levels for any one attribute.

In the current study, respondents should choose from three alternatives of one choice set, and three times of three choice sets of one version. Therefore, the number of respondents (n) is

$$(2) \quad n = 500 \times c / (ta)$$

Since c = 3, t = 6, a = 3,

Therefore, in this study, the sample size of CBC modeling should more than 250.

According to previous experience (Johnson and Orme, 1996; Dhar, 1997; Haaijer et al., 2000), choice-based conjoint interviews go quite quickly. Average response times ranged from about 35 seconds to 12 seconds. Even for 20 tasks, the longest average interview time was just under 7 minutes. It has also been shown that tasks are answered later in the survey are as reliable as earlier tasks and are answered at a faster speed (Johnson and Orme, 1996).

3.3 Stage 2: Prototype Design

The nature of this study is user-centered design research. It follows the classical design procedure from Plan, to Design, then Development, and last Deployment. The process in real application is a cyclic process and may repeat several times. Due to time limitation, this study only operates the whole process once.

In the planning part, research data were collected to understand customers' preference requirement and details, in order to generate a design plan. In the design phase, when the basic information of the application is ready, systematic method was used to design the conceptual layout and high fidelity prototypes. For development, it comes to resolve the implementation issue. In deployment phase, comprehensive usability tests on the designed prototype were conducted to provide recommendations for the refinement in the next version of the release.

3.3.1 Prototype design rationale

This study is to design a prototype that includes tangible physical settings and a series of intangible service. For a scientific design method, establishing a relatively controllable prototype for user testing is an essential tool to obtain reliable and relevant feedback and reach a cyclic improvement. In this stage, prototype is the physical settings in combination with non-physical service.

In many fields, there is great uncertainty with product design. A number of unexpected problems will hinder the development of a new design, thus preventing what is desirable. The problems can be alleviated by designing prototypes first (Hogg and Terry, 2000). A prototype is often used as a part of the product design process. This enables designers or engineers to explore design alternatives, test theories and confirm performance prior to starting the production of a new product. Designers use their knowledge and experience to tailor the prototype according to the specific unknowns in the intended design (Ulrich and Eppinger, 2000). For example, some prototypes are used to verify the performance or suitability of a specific design approach (Gamma et al., 1995), whereas

other prototypes are used to confirm and verify consumer interest in a proposed design (Yamabe et al., 2009).

Prototypes can be viewed as simulation of the characteristics of planners' or developers' intended design. In general, prototypes differ from the final production variant in three fundamental ways (Buchenau and Fulton Suri, 2000; Sauer and Sonderegger, 2009):

- **Materials** – Prototype materials involve less capital costs than product materials. Designers or engineers may attempt to substitute other materials with close properties that simulate the intended final outcome.
- **Processes** – Prototypes are superior to production in terms of control costs and time consumption because of more flexible processes.
- **Lower fidelity** – Prototypes are built using very limited engineering details compared with production design. The simplified processes should be well designed to be a refinement over the expected design.

Prototype as a design method will also encourage active participation of customers and managers by providing an early visibility of the proposed idea. It helps them to confirm their perceptions that the prototype is an improvement over the earlier design.

The prototype design follows a sequence: plan, design, development and deployment. Each stage in the sequences described with details as follows.

3.3.2 Plan

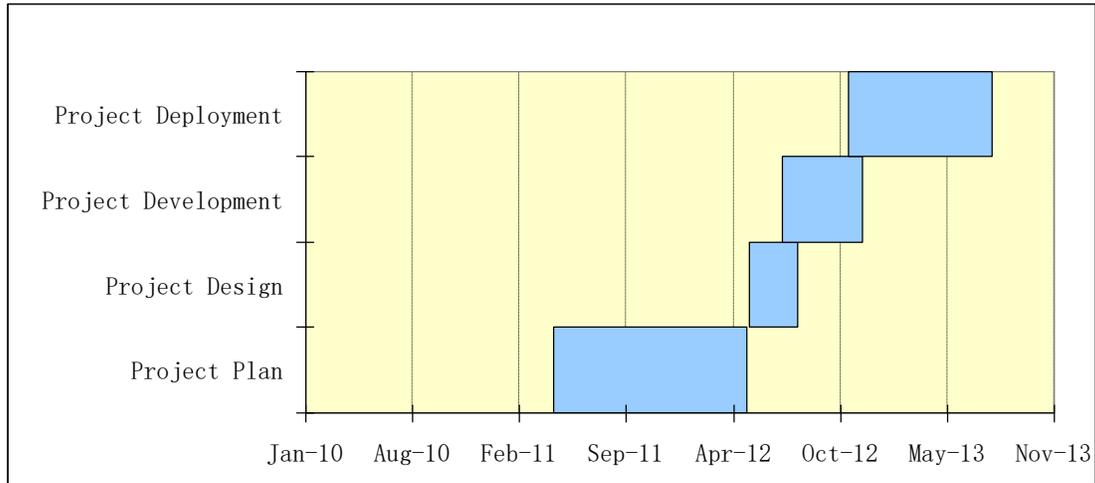
In the planning parts, data were collected to understand customers' preference requirement and details, so as to generate a design plan. To accomplish the plan, specific data collection was conducted in stage 1. The acquired data generates an optimal design profile representing customers' perception framework.

In order to generate a more specific design plan, the design inquiry took place iteratively in the study period by framing discussions at several participatory design workshops. These workshops were held at an early stage in the design process from May 2011 to April 2012. The workshops included an interdisciplinary group of academics and industrial partners. There are three scholars, including the researcher, her supervisor, and a research assistant, and seven hotel managers, including three hotel managers from Lotel in Shanghai and four managers from River Mountain Hotel in Guangzhou. Discussion on the sensitive concepts was supported by presentation of data from previous environmental analysis conducted in the field. Workshop participants then iteratively developed and critiqued a series of conceptual designs for proposed services and settings.

The workshops participants also shared and discussed documents, conceptual maps, and other ideas generated during the workshop. The workshop not only helped make progress in the design process by brainstorming and consolidating ideas regarding the design process, but also brought together ideas from different fields with a common goal of developing a shared vision for its direction.

The goals of these workshops were to: (1) share information among researchers and practitioners from both academia and industry; by encouraging discussion to explore the design content through group activities. In the end, diversified perspectives are embraced into the design. (2) build shared conceptualizations of what constitutes the proposed service prototype, i.e. how the design oriented project is conducted and evaluated, and what knowledge that can benefit both researchers and business owners is generated; and (3) generate project proposals and find hotels that would provide site for experiments with the proposed prototype.

Figure 3.3 Schedule of the design process



Stage	Start from	To	Last Period (days)
Project Plan	2011-5-1	2011-4-30	365
Project Design	2012-5-1	2012-6-30	90
Project Development	2012-7-1	2012-10-31	150
Project Deployment	2012-11-1	201-7-31	270

3.3.3 Design

In this phase, when the basic information of the application is ready, systematic method was used to design the conceptual layout and high fidelity prototypes.

Find the experimental Hotel

After contacting several hotels, one owner of a four-star hotel called Mount River Resort Hotel express interests in the discussed proposal. Eventually, they agreed to provide the site for prototype installation and assist research experiments.

The cooperated four-star hotel is located in Guangzhou city, Guangdong Province, China. Guangzhou is the first tier city in Southern China, located in the south-central part

of Guangdong. Guangzhou has a humid and hot sub-tropical climate. Its solar radiation is strong around noon on a hot and sunny day. Guangzhou has been famous for its two trade fairs in each year in the past one hundred years.

Hotel is situated on Mao Feng Mountain, which is a famous forest park in Guangzhou Downtown. Major customers residing in this hotel are holiday and business travelers. Conferences are also one of the major income resources of this hotel, and the hotel provides a variety of amenities including SPA center, a western restaurant, a Chinese restaurant, a banquet hall, bar, and outdoor BBQ area.

Figure 3.4 Picture of the hotels



After a site visit on May 2012, a memorandum with the hotel manager was reached with the following details: This hotel would allocate an area of about 200 square meters, both indoors and outdoors for the research. The allocated area was used to construct playground for children. The hotel would also provide managerial and operational assistants during the entire process. Financial assistance is provided and free accommodation for the researcher. In order to assist this study, two more field assistants were recruited for the project.

The project comes up with design and provision of solar themed children service prototype for hotel guests. The displayable solar technology configuration consists of solar water system and solar electricity system. Solar water system produces hot water for hotel SPA center, and solar PV provides electricity at night for garden lighting.

Design physical settings

After the inspection of the experimental site, the study proceeds to configure physical environment including interior design of children playground, spatial layout, signage, wall hangings, furniture, toys and crafts. According to the review of esthetical tourism product design in the literature section, decoration is deliberately themed to be part of the overall experiences. The research beholds the notion that physical setting is critical because it serves as the atmosphere that consumers are used to judge the quality of their experience.

To facilitate researcher and helpers to move the facilities, the study chooses facilities with light materials and fabricated properties. Moreover, the prototype development focused on three physical aspects : 1. Aesthetic requirements: meet the aesthetic requirements of children, whilst in consistent with the original decoration style of the hotel. 2. In accordance with the research subject, solar energy is set as the theme. 3. Combined features should exhibit the functional needs as well as fulfill its physical comfort and safety requirement.

Multi-functional layout

The research adopted a multi-functional layout design for the testing venue floor. A multifunctional layout can accommodate a variety of facilities so as to meet different needs. The research considers that multi-functions can better meet visitors' different needs by providing a variety of choices to enrich visitors' selections. The test results of different functional regions can also be observed at the same time, and thus improves the efficiency of the experiment. Based on the deployment of multi-functional requirements, the research further adopts multi-regions to separate space with several

sub-zones. Multiple sub-zones involve multiple areas with different types of activities setting and enable the desired experiences to occur in a coherent way. Multi sub-zones can also allowed staff to observe the areas at the same time.

The physical setting developed at this stage was not positioned as the final product ideas, rather as a means to invite ideation raised by hoteliers and stakeholders in this research.

Deign service settings

After the study finishes designing the physical settings, the study comes to the service design. In order to introduce the customers' behavior and interactive response, the research used storytelling plus *scenario simulation method*, which is a popular design tool adopted and adapted mainly within interaction design disciplines (Mager, 2004). During story description, picture books are also used to assist in presenting the ideas. As a powerful reflexive tool, picture book visually conveys the design rationale made about the service. These tools and methods support the design practice and at the same time contribute to the testing of the service experience.

This approach applies the Activity Theory that has been used to analyze and design the services (Sangiorgi, 2004; Sangiorgi and Clark, 2004). Activity Theory provides a framework to go beyond one-to-one (user-service interface) and sequential interaction models (service scripts) to include wider systems of action and interaction. The benefit of this approach is that the encounters and potential conflicts among service participants can be better understood when their behavior is situated within their wider context of action. Synchronizing the perspectives, goals and existing practices of service participants, can increase the success of designing good services.

3.3.4 Development

When the product almost reaches the conceptual maturity, it comes to the work with the development team to resolve the implementation issues. The development team was consisted of experimental hotel's department heads- engineering, marketing and

security. The engineering department is for installation and retrofit. Marketing department mainly assists program broadcasting and advertisement. Security department is in charge of security and monitoring.

During this stage, the investigator worked closely with the hotel and made sure that all the test cases were implemented as defined the study and collected feedback about designs during trial run.

The investigator also made sure that all the design details were translated effectively to the development team and also maintain a constant communication with all departments involved.

The project officially started in July 2012. In order to cooperate well with hotel operations, meetings with the hotel staff from different departments were held to share progress and brainstorm for ideas on the monthly basis. Installation and operation took place in one year from July 2012 to July 2013. During the period, the prototype was designed and installed in the hotel site from the first three months, then operation and experiment was conducted in the following nine months. Evaluation was also undertaken in this period.

3.3.5 Deployment

In this phase, comprehensive usability tests on the designed prototype were conducted to provide recommendations for the refinement in the next version of the release. The usability issue is critical to the design success and in this study. Two methods have been conducted to evaluate the performance of the designed prototype. One is observational methods with interviews, and the other investigation is about price strategy design. In order to better understand the pre-purchase and post purchase behavior, a quasi-experiment was also conducted for validation. The deployment stage started from November 2012 to July 2013. Data was collected and analyzed separately for research objectives 3. The methodology is specifically discussed in the next section 3.3.

3.4 Stage 3: Prototype Evaluation

In the evaluation period, three types of tests were employed to evaluate the prototype outcome. One is the observational method, another is perception study of willingness to pay, and the last is the quasi-experiment.

The investigation was conducted during November 17 2012 to July 14 2013. There were totally 774 visitors including 390 children and 384 accompanies. Excluding repeated visitors, 278 were first time visitors. Samples were collected during the period, including 380 records for observation, 175 for price strategy, and 275 for quasi-experiment.

Face to face interviews were conducted among parents or supervisors when their children were playing in the designed playground. Since each survey was carried under the strict supervision by interviewers, the response rate is as high as 100% and collected questionnaires were valid.

In order to focus on differences in aggregate preferences arising from two different data collection stage, a blocking approach was used to minimize differences in sample composition. For each observation in the sample, only participant who matched on all available demographic characteristics was selected. For example, both participants in ex-ante and ex-post stages must have homogenous identities, including hotel guests, parents or children supervisors with experience in taking care of children. Nonmatching participants were excluded from the analysis.

3.4.1 Observational methods

Observation is the basic research method and becomes a scientific tool for research in a systematic manner with a scientific attitude (King et al, 1994). It implies accurate watching of phenomena as they occur in nature with regard to cause and effect relationship. In observation, the research goes to places where the event is taking place and records the findings.

The approaches can be in forms of participant observation, followed by archival analysis. Participatory observation granted the research an intimate view of the participants' reactions during the field-testing stage. Participants in this observation process include family members who enjoy the designed prototype in the experimental hotel. Observer is able to unobtrusively observe children on a playground and record the number and types of actions displayed (Denscombe, 2010; Pellegrini et al, 2012).

Observer recruitment and scheduling of observations

Observers were all university students recruited from Tourism and Hotel school of Sun Yat-sen University (中山大学). The University, being one of the leading universities in the People's Republic of China, is located in Guangdong Province. There were totally 6 observers as project assistants and were working in three groups for three months in different period of time.

Technically, the observation period is from November 2012 to July 2013. It is estimated that there would be sufficient data for descriptive analyses after 28 days since each day's business hours are 12 hours of observational time would thus be available. It involved 2 observational shifts by 2 project assistants trained with observational methods by the researcher who received experience through prior observation practices in the testing stage. The changeovers of the group were taken place after 3.5 work days per week. Each group's serving 10 hours per day 9:00 a.m. to 7:00 p.m.

Direct observation methods

During each shift, the observer managed the daily operation of the designed prototype, collected information, made records and conducted interview. The observations were performed in both the children playground area and hotel area nearby. During the observation period, the observers kept basic operating information as well as children physical activities that include demographic information, physical activities, and other information as shown in Table 3.4.

Table 3.4 Table of direct observation methods

Demography Information	Physical Activities	Other information
How old the children are	How long they stayed there.	How they found the service
What the gender they are	Among designed three zones, which they stayed the most time, which they stayed the least.	What their overall opinion about the service
How many parents or supervisors they have, what their relationships were	What types of activities they like the most	
How many accompanies they have, what their relationships were	Duration of each activities	
Whether they are frequent visitors or not	The reaction of DIY solar toys	

Demographic Information is recorded by using registration form. When visitors enter the mini solar playground, they need to fill the form as records. The form is attached in Appendix 2. For Physical Activities, information was kept in observation form and is recorded by project assistants as shown in Appendix 3 and Appendix 4. Other information are dealing with subjective questions. Therefore, onsite interview is also undertaken to supplement their views. Open questions are asked to collect visitors' opinion about the overall service as shown in Appendix 5.

3.4.2 Perception study of Willingness To Pay (WTP)

Determine the charging methods

In the study, the hotel children amenity with eco-concept is relatively innovative for hotel operation. It is a combination of a variety of heterogeneous facilities and activities. These different activities may leads to customers' different attitudes of WTP. So there is a need for testing the effect of different price settings. The price setting is designed based on the result of the previous observational methods that is to be discussed in details in Chapter V Section 4.3.2. Based on the findings, the author designs the combination of price setting. The designed settings are presented in Table 3.5. The five types of monetary receipt were highlighted below.

Table 3.5 Five types of monetary receipt

Nos.	Levels	Payment to use
1	Entrance fee	Pay for entrance or free
2	Facilities use fees	Payment for free
3	DIY activities	Pay for interested DIY activities or free
4	Carried home product	Pay for souvenir product or free
5	Donation	Volunteer donation for eco-fund or charity or compulsory

The first is the entrance fee. According to a lot of literature on eco-tourism destination, admission and entrance fee is the most adopted method (Chase et al, 1998; Kim et al, 2007; Eagles, 2003)

Second is the facilities usage fee. By referencing to the industry experience, most hotels do not charge extra money for ordinary children service. Therefore, the researcher does not charge for the common children play area and facilities utilization.

Third, by overviewing the current toy market, there are many environmental and energy-related toys, such as a solar car, solar plane, and solar boat. Among these, several kinds of DIY (Do It By Yourself) products are particularly appeal. The relevant DIY toys include solar-powered kits, hydrogen model cars, and other science and discovery kits. These products are new and attractive to children since it encourages tactile first-hand learning experiences (Rice, 2010). Therefore, this study attempts to introduce the payment method by which customers choose to pay for interested DIY activities.

Fourth, when participants visit the sites, they may also want to bring souvenir home. The researcher set charging fee for such take-away souvenir.

The last one is the donation fee. By setting up such pricing strategy, the researches want to test consumers' willingness to donate money to eco-fund of hotels or some other charity organization.

Examine the preference of charging modes

The research designed four types of charging method as illustrated in Table 3.5. The designed four charging methods are taken as the four attributes. Different charge setting in each charging method is set as levels as shown in Table 3.6.

Table 3.6 Charge setting in each charge method

Levels	Entrance Fee	DIY Activities	Carried Home Product	Donation
1	Pay for entrance	Pay for interested DIY activities	Pay for carrying home self-made product	Donation is compulsory
2	Entrance for free	All DIY activities are free	Free to carry self-made product	Donation to eco-funding in free will

After finalizing the list of attributes and their experimental levels for the price setting, eight orthogonal profiles with eight blocks allow a reliable estimation the main effects of the attributes in Table 3.7 below.

To enhance the realism of the task, this study adopts a full-profile approach to present the choice set. For a full-profile approach, each profile describes a complete product and consists of a different combination of factor levels for all attributes of interest (Green and Srinivasan, 1978; Green and Srinivasan, 1990).

8 profiles are blocked into 2 choice sets with 4 alternatives in each set. Technically, respondents should each see exactly one choice set. As an alternative, in this study, eight choice sets (See Table 3.7) are assigned to construct four versions of CBC experiments following the criteria: Version I (Set 1, Set 2, Set 3, and Set 4), Version II (Set 5, Set 6, Set 7, and Set 8), Version III (Set 1, Set 3, Set 5, and Set 7), and Version IV (Set 2, Set 4, Set 6, Set 8). Table 3.7 presents an example of the selected choice set in this CBC experiment.

Table 3.7 8-profile with 2 block (choice sets) in CBC design for price setting

Set	Entrance Fee	DIY Activities	Carried Home Product	Donation
1	Pay for entrance	Pay for interested DIY activities	Pay for carrying home self-made product	Donation is compulsory
2	Pay for entrance	Pay for interested DIY activities	Pay for carrying home self-made product	Donation to eco-funding in free will
3	Pay for entrance	All DIY activities are free	Free to carry self-made product	Donation is compulsory
4	Pay for entrance	All DIY activities are free	Free to carry self-made product	Donation to eco-funding in free will
5	Entrance for free	Pay for interested DIY activities	Free to carry self-made product	Donation is compulsory
6	Entrance for free	Pay for interested DIY activities	Free to carry self-made product	Donation to eco-funding in free will
7	Entrance for free	All DIY activities are free	Pay for carrying home self-made product	Donation is compulsory
8	Entrance for free	All DIY activities are free	Pay for carrying home self-made product	Donation to eco-funding in free will

Table 3.8 An example of selected choice set in CBC experiment for price setting

Question: If a hotel provides a new attraction for you to visit, and the following alternatives are available, please fill “√” in your most preferred price setting from each choice set.

Attributes	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Entrance fee	Pay for entrance	Pay for entrance	Entrance for free	Entrance for free
DIY activities	Pay for interested DIY activities	All DIY activities are free	Pay for interested DIY activities	All DIY activities are free
Carried home product	Pay for carrying home self-made product	Free to carry self-made product	Free to carry self-made product	Pay for carrying home self-made product
Donation	Donation is compulsory	Donation is compulsory	Donation is compulsory	Donation is compulsory

Please tick “√” one with is most preferred; and “X” the least preferred

- a) Alternative 1
- b) Alternative 2
- c) Alternative 3
- d) Alternative 4

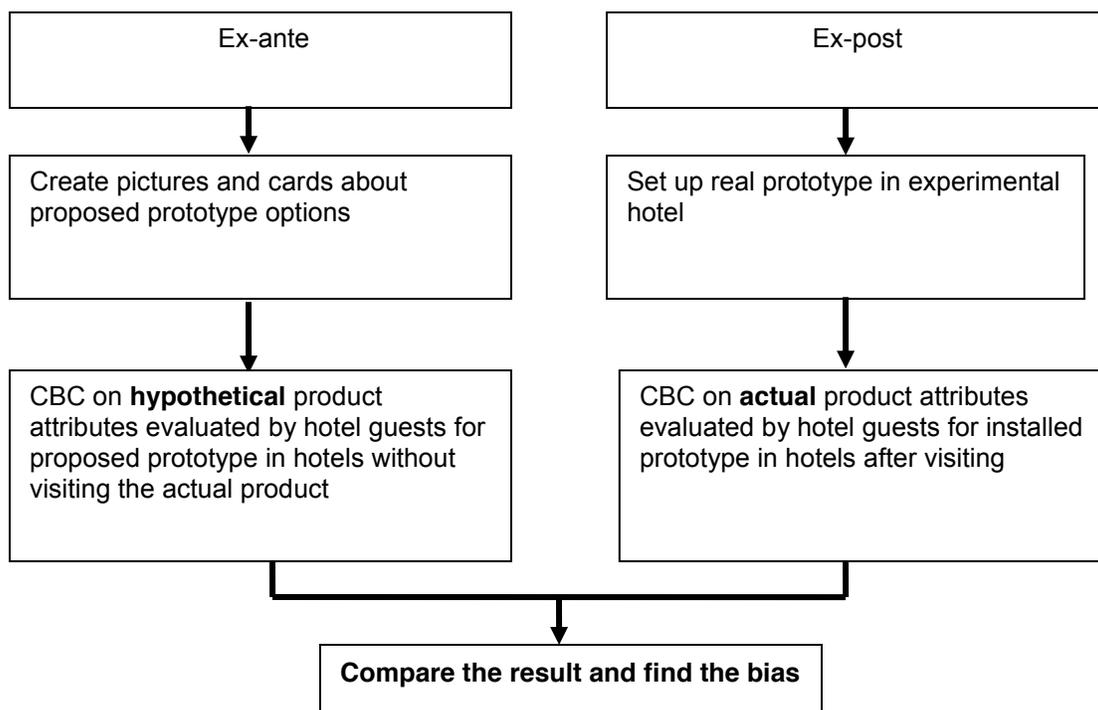
According to Johnson and Orme (1996) the way to calculate the sample size for CBC modeling, the sample size of CBC modeling should more than 125.

3.4.3 Validation quasi- experiment (ex-ante & ex-post stage)

In order to compare the stated preferences with the actual preference as well as the evaluation for designed prototype, the quasi-experiment method is adopted to find the bias between the two.

In the past, validity check is confined to several sub-models under conjoint analysis (Moore, 2004). The proposed investigation will attempt to bring the validity monitoring by a two stages of experiment (See Figure 3.4).

Figure 3.5 Flow chart of customers response



Quasi- experiment

Traditional studying approaches in tourism and hospitality field are qualitative and quantitative. The two approaches –qualitative and quantitative research have weaknesses in validity of obtaining reliable answers from respondents and also have difficulty in controlling the data collecting environment. Especially the proposed mini solar fun park has is novel designed prototype with unique features. It may not be valid to interview people's perception on invisible innovative product. Thus, there has been strong sentiment that product design researchers need to move beyond case study to more investigation using experiments or field tests (Benbasat, 1984).

The quasi-experimental methods proposed here are currently being used in multiple applications, including a study measuring the value of Vietnam-Era student draft deferments and a study using automobile air bag regulations to measure the value of a statistical life (Rohlf's, 2009a, 2009b). Additionally, Eriksen and Rohlf's (2009) examined a special case of a location specific amenity whose dollar value was already known and found that the methods developed in the study were more accurate than are traditional hedonic and discrete choice approaches.

The current study adopts quasi-experiment to provide a relatively controlled environment to investigate visitors' responses. Quasi-experiment has also been recently adopted by some tourism scholars (Kim et al, 2005; Reiser and Simmons, 2005)

The first stage is the empirical study. Proposed hotel guests who have not visited the designed prototype in hotel setting will be given the descriptive cards to examine their response to hypothetical prototype design. After the prototype installed in the hotel, another examination with the same conjoint approach will carry on to investigate the real response of visitors to the actual prototype exhibition. This stage is called quasi-experiment or field experiment. It is hoped that the checking results of these two stages will provide a realistic calibration with the models established in the hypothetical settings.

In this study, the ex-ante stage was taken in March 2012 to May 2012, conjoint analysis of playground design was taken as the data of ex-ante stage.

Quasi-experiment in the second stage relates to a particular type of experiment which has some but not all of the characteristics of a true experiment (Mayer and Davis, 1999). In this study, the element missing is only examining the partial product characteristics to the control and experimental conditions. Utilizing quasi-experimental designs can minimize threats to external validity as natural environments. Findings in one may be applied to other subjects and settings, allow for some generalizations to be made about population (Trochim, 2001). In this study, the ex-ante stage was taken in November 17, 2012 to July 14, 2013 during the operation of designed prototype. All interviewees were asked to finish the conjoint task during or after their visits of the real settings.

At the end of the experimental period, the data collected during the two-implementation stages are compared. This typically involves multi-variation analysis, such as regression analysis and techniques that compare measurements between and within groups (for example student's t-test).

Moreover, comparison between the ex-ante and the ex-post findings also displays how well the performance of the design is, and what implications could be generated as for researches in practical context.

Analysis of difference in conjoint analysis

To estimate the attribute preferences or aggregate part-worth utilities, a multinomial logit choice model was employed using SPSS (Kuhfeld, 1996). To test if the part-worth utility coefficients obtained from the two data collection stage were significantly different, this study applied a procedure suggested by Swait and Louviere (1993). The multinomial logit estimation equation is given by **equation (1)**

The constant μ is the scale factor for a particular data set. Vector x represents the attribute levels of i th profile and β is the vector of logit coefficients representing part-

worth utilities. For testing whether the two samples—Web (W) and mail (M)—share the same population parameters, the appropriate null (H_0) and alternate (H_A) hypotheses are

$$H_0: \beta_W = \beta_M \text{ and } \mu_W = \mu_M; \quad H_A: \beta_W \neq \beta_M \text{ and / or } \mu_W \neq \mu_M.$$

To test this joint hypothesis, Swait and Louviere (1993) suggest the following procedure. Without loss of generality, scale factor μ_W can be set to 1. Let the scale factor for the mail sample be some value μ_M . Then concatenate the Web data (X_W) vertically with scaled mail data ($\mu_M X_M$). Impose the condition $H_{\beta_0}: \beta_W = \beta_M = \beta$, and estimate β and the corresponding log likelihood (L_μ) for different trial values of μ_M . Find the value of μ_M that maximizes the log likelihood. Test H_{β_0} by computing the likelihood ratio statistic: $\lambda = -2[L_\mu - (L_W + L_M)]$, where L_W and L_M are the log likelihoods obtained separately for the Web study sample and the mail study sample, respectively. λ is distributed asymptotically as chi-squared with $k+1$ degrees of freedom, where k is the number of restricted parameters.

Swait and Louviere (1993) state that if hypothesis H_{β_0} is rejected, then the joint hypothesis H_0 is rejected. In this study, H_{β_0} is rejected ($\chi^2_{21} = 38.5$, $P < .01$). Hence, the population parameters corresponding to the ex-ante stage are different from those of the ex-post stage. However, the test does not identify whether the inequality is in the part-worth utilities (β) or scale factors (μ), or both. Because these two effects are confounded, it cannot directly compare the magnitudes of the part-worth utilities from the two stages and interpret them as differences in attribute preferences. However, the relative preference or relative importance of attributes across the two studies can be compared. Relative importance is calculated as the importance of an attribute divided by the total importance of all attributes. Because the scale factor (μ) is in both the numerator and the denominator of the relative importance formula, it cancels out each other.

Chapter 4 Result and Discussion

This chapter presents the findings and the discussion of the research. This chapter is structured as follows. First in Section 4.1, it presents the identified determinant attributes of the proposed product and investigates customers' perception on this new product by evaluating the weights of product attributes. In Section 4.2, outcome is achieved by completing the design process according to two major approaches. A real prototype has been established, one is physical design, and the other is service design. In section 4.3, an insight of the overall performance of designed solar children playground is discussed. Information and data were collected during 10 months trial run, five price settings based on observation and literature was designed. Results of the ranking of levels indicate the importance of perception of each price setting among customers. Quasi-experiment is also used to examine visitors' preference separated under ex-ante and ex-post stage.

4.1 Identify Attributes of Hotel Children Service for Business and Leisure Family Guests

Section 4.1 consists of three parts. The first part 4.1.1 identifies attributes and levels collected via synergy of literature review, field observation, and website searching. The second part 4.1.2 presents the importance of each attribute by using importance rating methods, and the difference between two major customers segments – business travelers, and leisure travelers. The third part 4.1.3 describes the choice-based conjoint analysis that shows the specific attributes portfolio of children playground design.

4.1.1 Synergy of literature review, field observation, website searching

In this part, all information collected in the literature review, field observation, and website searching was taken and summarized. The information was used to provide the foundation of design process. According to Guestafsson et al (1999), they provided a list of rules for choosing attributes when evaluating service quality. Since there is no consensus in the literature and field study about the elements, for the proposed experimented environment (i.e, park), the research opts 18 relevant attributes based on the literature and field observation. A total 53 levels, across five domains were chosen for further investigation as shown in Table 4.1..

Table 4.1 Profile of 18 relevant attributes with total 53 levels within 6 domains

Domain	Attributes	Levels		
Family Activity Types	Family interaction	Family sport	Family dining	Family recreation
	Individual involvement	Children custody	Camping and club	
Family Service Within Hotel Operation	Welcoming gift in front desk	Toys	Cookies, candy and drinks	T-shirt, caps with hotel logos
	Children service in restaurant	Children's menu	Special discount for families	Dine package with toys
	Children service in guest rooms	Children's television program	Toys in room	Children lavatory kit
Safety Management	Insurance policy	Self-expense insurance (comprehensively)	Free-expense insurance (basic)	No-insurance
	Monitoring method	Safety notice call	Remote CCTV monitoring	
Price Strategy	Charging mode	Pay for days	Pay for hours	Pay for activities
	The payment for use	Pay for service	Pay for souvenir	Pay for donation and charity
Playground Design	Playground area	Separated indoor playground	Separated outdoor playground	No separated place
	The size of children playground	Below 30m ²	Between 30- 100 m ²	Over 100m ²
	Staff organized children activity	Reading books for children	Teach skills and knowledge	Leading children with a tour
	Activity area	Indoor activity within hotel area	Outdoor activity within hotel area	Activity outside hotel area
	Activities design	Entertainment dominated	Education dominated	Enjoyment of art
	Toys design	Traditional toys	Novel designed toys	Self-handmade toys
	Music	Light music	Classic music	Children's music
	Video	Cartoon movie	Children educational program	Children art program
	Theme	Region-specific activities	Fairy world and cartoon character	Eco-theme

Table 4.1 shows the complete profile of hotel children program. The profile is used to describe a full-picture of hotel children service. The table provides a basis for the setup of following research and plan for logistics.

4.1.2 Importance rating task

Table 4.2 Result of mean rank of attributes of business guests and leisure guests

Domain	Attributes	Mean Rating of Business Guests	Mean Rating of Leisure Guests	Overall
Family Activity Types	Family interaction	6.4	6.15	6.25
	Individual involvement	8.6	8.85	8.75
Family Service Within Hotel Operation	Welcoming gift in front desk	3.45	5.4	4.64
	Children service in restaurant	8.55	6.4	7.24
	Children service in guest rooms	3	5.25	4.38
Safety Management	Insurance policy	2.2	3.3	2.87
	Monitoring method	7.8	6.7	7.13
Price Strategy	Charging mode	4.1	3.3	3.61
	The payment for use	5.9	6.7	6.39
Playground Design	Playground area	9.9	8.1	8.80
	The size of children playground	4.95	5.85	5.50
	Staff organizing children activity	4.05	4.05	4.05
	Activity area	9	9.9	9.55
	Activities design	4.5	4.5	4.50
	Toys design	3.15	4.5	3.98
	Music	1.8	0.9	1.25
	Video	1.8	2.7	2.35
Theme	3.85	3.5	3.64	

As can be seen from Table 4.2, for the domain of “Activities Design”, respondents rank “Family Interaction” the most important attribute, and then “Individual Involvement”. For domain about Hotel operation”, the most important attribute is Welcoming gift in Front Desk, and then Children Service in Restaurant, the third important attribute is Children Service in Guest Rooms. For domain of Safety

Management, the most important attribute is Insurance Policy, and then Monitoring Method. For domain dealing with “Price Strategy, the most important attribute is Charging mode, followed by the Payment for use, and the third important attribute is WTP Amount. For Playground Design domain, the most important attribute is Playground area, and then Activity Area; the third important attribute is Staff organizing children activity, then Size of children playground, Activities design. It is all followed by Toys design and Music. The last is Video.

Table 4.3 Comparison of attributes between business and leisure travelers

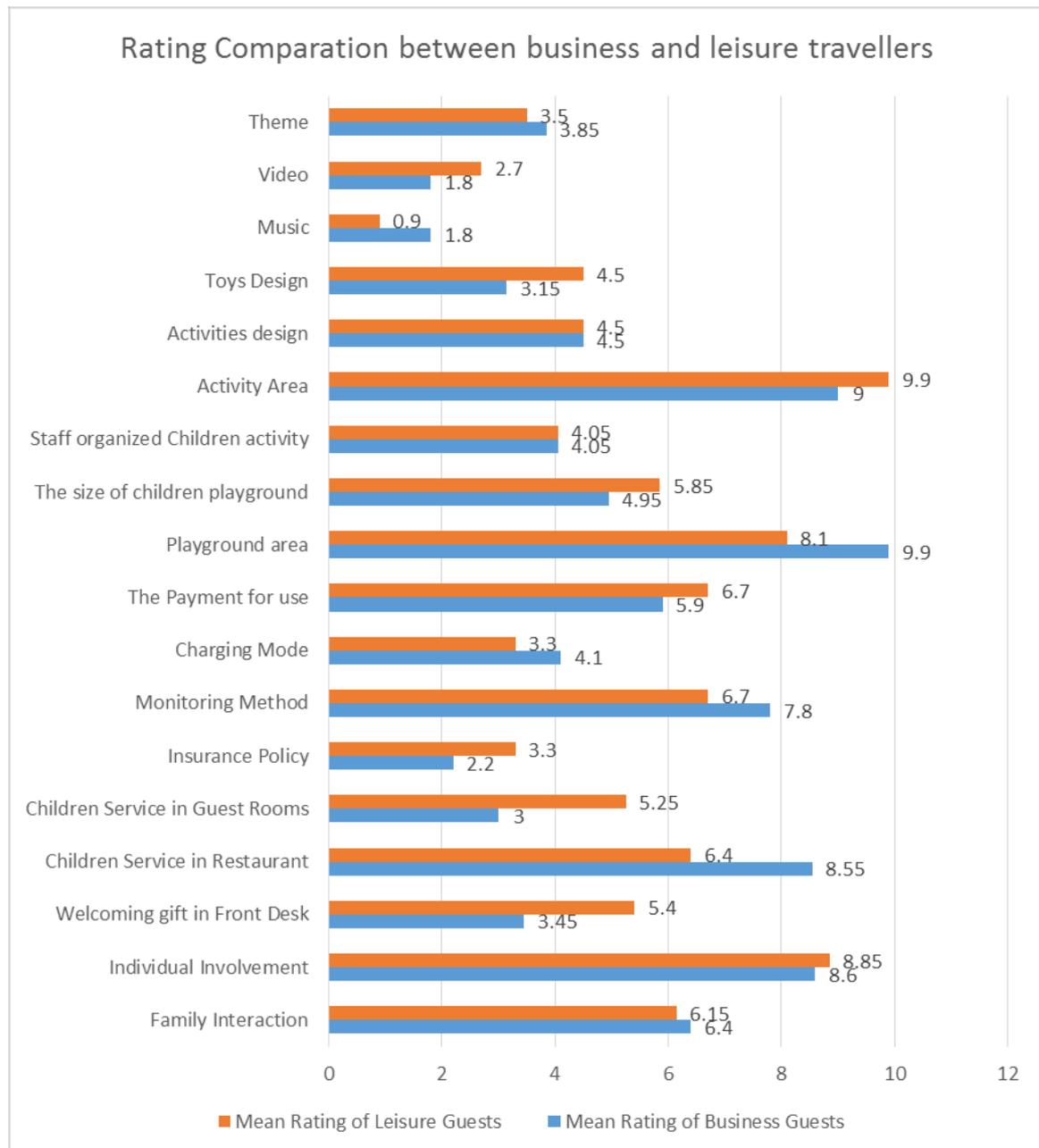
Attributes	Traveler's Type	Mean	Std. Error	Std. Deviation	T	P
Family Interaction	Business travelers	6.4	0.401	2.01	-0.666	0.507
	Leisure travelers	6.15	0.396	1.98		
Individual Involvement	Business travelers	8.6	0.351	1.76	0.666	0.507
	Leisure travelers	8.85	0.296	1.48		
Welcoming Gift In Front Desk	Business travelers	3.45	0.894	1.49	-1.917	0.058
	Leisure travelers	5.4	0.93	1.55		
Children Service In Restaurant	Business travelers	8.55	0.622	1.04	0.851	0.397
	Leisure travelers	6.4	0.763	1.27		
Children Service In Guest Rooms	Business travelers	3	0.832	1.39	1.46	0.147
	Leisure travelers	5.25	0.763	1.27		
Insurance Policy	Business travelers	2.2	0.487	2.44	-1.21	0.229
	Leisure travelers	3.3	0.503	2.52		
Monitoring Method	Business travelers	7.8	0.487	2.44	1.21	0.229
	Leisure travelers	6.7	0.503	2.52		
Charging Mode	Business travelers	4.1	0.786	1.97	-0.334	0.739
	Leisure travelers	3.3	0.817	2.04		

The Payment For Use	Business travelers	5.9	0.732	1.83	-0.312	0.755
	Leisure travelers	6.7	0.659	1.65		
Playground Area	Business travelers	9.9	1.958	2.18	1.365	0.175
	Leisure travelers	8.1	1.75	1.94		
Size Of Children Playground	Business travelers	4.95	1.037	1.15	-0.935	0.352
	Leisure travelers	5.85	1.458	1.62		
Playground Design	Business travelers	4.05	1.849	2.05	0.907	0.366
	Leisure travelers	4.05	1.692	1.88		
Activity Area	Business travelers	9	1.44	1.60	-1.265	0.209
	Leisure travelers	9.9	1.684	1.87		
Activities Design	Business travelers	4.5	2.444	2.72	-0.05	0.96
	Leisure travelers	4.5	1.643	1.83		
Toys Design	Business travelers	3.15	2.358	2.62	-0.083	0.934
	Leisure travelers	4.5	1.171	1.30		
Music	Business travelers	1.8	1.994	2.22	-0.031	0.976
	Leisure travelers	0.9	1.051	1.17		
Video	Business travelers	1.8	1.843	2.05	-0.4	0.69
	Leisure travelers	2.7	0.976	1.08		
Theme	Business travelers	5.85	1.44	1.60	-1.265	0.209
	Leisure travelers	4.5	1.684	1.87		

*p-value less than 0.05, **p-value less than 0.01.

Table 4.3 compares business travelers and leisure travelers rating over the attributes under the five domains. Their corresponding P value is greater than 0.05 indicates no significant difference. However, even the response from both leisure travelers and business travelers is similar. It still has some implications from the result.

Figure 4.1 Rating comparisons between business and leisure travelers



From Figure 4.1, in domain “Family Activity Types”, both business and leisure guests favor family interaction more. The result is contradicted with the research done by Gaines et al (2004). Their study pointed out that business travelers might prefer more individual time and separate from their children because they need to concentrate on their work. One explanation for this study’s ascertained phenomenon could be that since business travelers work the whole day, they would like to spend time with their

children in their free time after their work has been done, rather than having separate activities. On the other hand, since leisure travelers are with their children most of the time, they would prefer alone time and join activities where they can relax without parental duties. Therefore, individual Involvement activities are also in demand.

For domain “Family service within hotel operations”, “Children Service in restaurant” is the most popular attribute, and then welcoming gift in Front Desk, and the least is “Children Service in Guest Rooms”. It implies that parents prefer to enjoy children service in the restaurant. Family service within hotel operation and children service in guest rooms is rated highest by both leisure and business travelers. Welcoming gift in Front Desk is ranked the second by business visitors. While Children Service in Restaurant is rated to be second important by leisure travelers.

For Price Strategy domain, charging mode is the most concerned attributes rated by parents. These results may be affected by different types of tourists’ behavior in accommodation, due to different requirements of service. Business travelers are less free to control their time, and they might have to work or attend a meeting during daytime. Therefore, they tend to select the most appropriate time point and duration to enjoy family service. While leisure travelers’ have relatively more time, and more flexibility, they can have a greater choice with the hotel-organized activities.

The research also ascertains that for alleviating the impact of risk that is likely to happen in the activities, most parents prefer program insurance. It can be seen that, parents place great importance on comprehensive insurance protection for their kids, and are willing to pay a certain amount of money on their own. This implies the possibility that hotels can introduce insurance into their price to ease the safety concerns of participants in activities. Anyway, it needs further research to come to a

more definite conclusion. Both business and leisure travelers give more value to attribute about monitoring methods rather than program insurance attribute.

Although music and watching videos received the lowest ranking, it is interesting to find that music, children movies, and video games are commonly set in most venues as observed in field study during real site visit. Thus there appears a need for management to evaluate the provision of music and video through cost assessment and value assignment. Particularly, the levies imposed by the association of music composers or singers could be a considerable sum to the installation and operation costs.

4.1.3 Choice based conjoint analysis

Based on the result of previous statistical analysis, which indicates insignificant difference in attributes preference between business and leisure guests, so there, is no need to distinguish business travelers and leisure travelers in relative product design. Therefore, data was combined and conjoint analysis is used to investigate the optimal design portfolio.

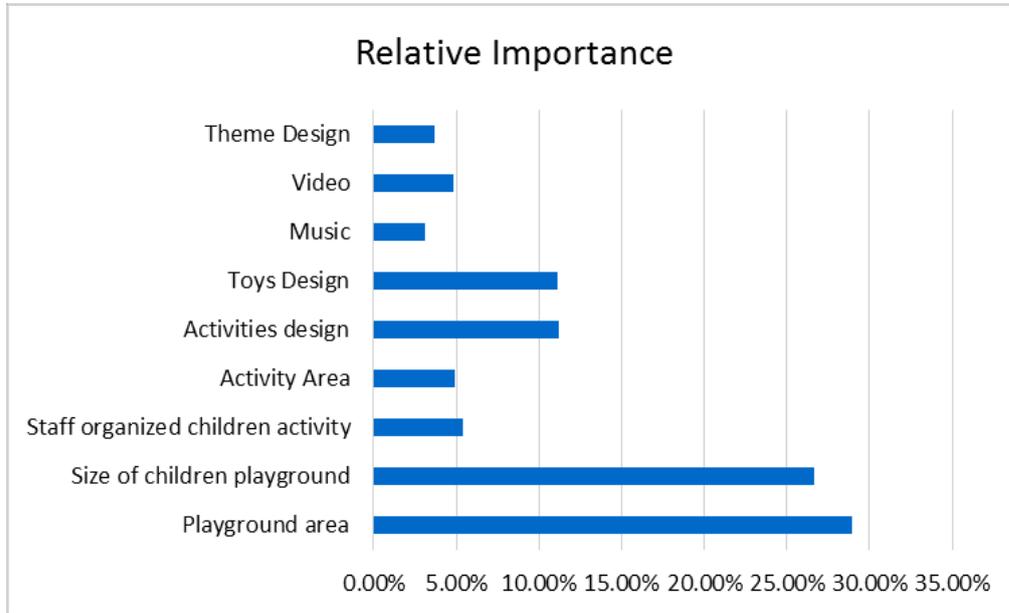
Table 4.4 Playground design profile

Levels	1	2	3
Playground Area	Separated indoor playground	Separated outdoor playground	No separated place
Music	Light music	Classic music	Children's music
Staff Organized Children Activity	Reading books for children	Teach skills and knowledge	Leading children with a tour
Activity Area	Indoor activity within hotel area	Outdoor activity within hotel area	Activity outside hotel area
Activities Design	Entertainment dominated	Education dominated	Enjoyment of art
Toys Design	Interesting toys	Novel designed toys	Self-handmade toys
The Size Of Children Playground	Below 30m ²	Between 30- 100 m ²	Over 100m ²
Video	Cartoon movie	Children Educational program	Children art program
Theme	Region-specific activities	Fairy world and cartoon character	Eco-theme

Table 4.5 Conjoint experiment result of playground design

Attributes	Levels	Utility	Utility range	Relative Importance
Playground area	Separated indoor playground	0.97		
	Separated outdoor playground	1.95		
	No separated place	-1.89	3.84	28.98%
Size of children playground	Below 30m ²	-1.58		
	Between 30- 100 m ²	1.96		
	Over 100m ²	0.97	3.53	26.69%
Staff organized children activity	Reading books for children	0.04		
	Teach skills and knowledge	0.33		
	Leading children with a tour	-0.39	0.72	5.44%
Activity Area	Indoor activity within hotel area	0.20		
	Outdoor activity within hotel area	0.46		
	Activity outside hotel area	-0.19	0.65	4.91%
Activities design	Entertainment dominated	1.01		
	Education dominated	-0.21		
	Enjoyment of art	-0.47	1.48	11.18%
Toys Design	Traditional toys	-0.73		
	Novel design toys	-0.28		
	Self-handmade toys	0.75	1.47	11.14%
Music	Light music	0.20		
	Classic music	-0.17		
	Children's music	0.24	0.41	3.10%
Video	Cartoon movie	0.27		
	Children educational program	0.21		
	Children art program	-0.37	0.64	4.84%
Theme Design	Culture and history Activities	-0.15		
	Fairy world and cartoon character	0.34		
	Natural environmental and eco-theme	0.13	0.49	3.72%
		Sum	13.24	

Figure 4.2 Relative importance of each attribute in playground design



The conjoint results indicate that “size of children playground” and “playground area” plays the most important role in hotel guests’ likelihood to use the solar theme based children park. The relative importance of these two attributes is about 28.98% and 26.69%. Followed by two attributes “activity design” and “toys design”, these later two accounts for the degree of importance 11.18% and 11.14% respectively. The other five attributes has much less importance and they are “staff organized children activity” 5.44%, “activity area” 4.91%, “music” 3.10%, “video” 4.84%., and “theme” 3.72%.

The two most important attributes are “size of children playground” and “playground area”. The specific message of these two attributes rating highlights the importance of space and location. In a classic book “The silent language” written by ET Hall in 1959, he mentioned that most people feel comfortable in large space (Hall, 1959). Parents in hotels in this study shows their major interest lies in space size of children playground, and the size with positive utility of 1.96 for the level “Between 30- 100 m²” associated with the negative utility of -1.58 for level is considered as the most

appropriate size. The size “Below 30m²” indicates a small space decrease the parents’ willingness to let their children to play in. The largest space “Over 100m²” has utility 0.97 that is less than size “Between 30- 100 m²”. This is probably because of the safety concern that parents might consider their children should play in an seeable area and parents can supervise their children’s activity very well.

For playground area, “Separated outdoor playground” has the most positive utility 1.95, “Separated indoor playground” has 0.97, and “no separated playground” has the negative utility -1.89. Result shows that most parents prefer their children having fun in a separated outdoor area. For the playground area design, Greenfield (2004) pointed that not only adults but also children value outdoor playground area a lot. Outdoor spaces are of significant importance to children. Frost (1992) and Barbour (1999) long before pointed that provisions for all categories of play in both the outdoor and indoor environments are important for children’s development. Since the playground is in hotels, the reason of most parents choosing “no separated playground” with the negative utility is that if the children play within normal hotel area, they may disturb other hotel guests and embarrass their parents as well. So parents want children having a separated area and enjoying their playing without interruption.

For activity design, “entertainment dominated” activities are considered as the most important by parents for their children with positive utility 1.01, while “education dominated” levels has negative utility -0.21, and enjoyment of art has the least utility - 0.47. Most parents still wanted their children to have more fun than being educated. Anyway they still valued education not too much negative. One of the reason for the level “The enjoyment of art” has the least utility may be that parents did not consider their children could understand art at their age. It is also guessed that art is a broad concept, and most parents could not have a concrete concept of how to embed art

into activity design. This is partially consistent with the four realms of tourism experience theory by Pine and Gilmore (2002), where consumers identified most strongly with entertainment motives.

For toys design, the most important level is “self-handmade toys” with the positive utility of 0.75. The result is correlated with the situation in commercial orientation that self-learning and self-made tools were popular under different requirement of children. In Seiting et al (2006)’s experiment, the self-made spinners attracted much more attention from the children compared with traditional children toys. Parents’ ranking on most preferred activities goes to handmade toys. This shows that parents may want to encourage their children to build things, use their creative skills and be able to enjoy its outcome, rather than just play around. For “novel design toys” with the utility -0.28 and the “traditional toys” with negative utility -0.73, these ratings shows that parents prefer more innovative toys provided for their children instead another same playground which could be found “everywhere”.

The other five attributes, including “Staff organized children activity”, “activity area”, “music”, “video” and “theme design”, have no more than 5% of relative importance. The obtained value means that these attributes play little importance in customers’ decision. For attribute “Staff organized children activity”, the level “Teach skills and knowledge” has the most positive utility. “Reading books for children” is the second, and “Leading children with a tour” has a negative utility when customers evaluate in this choice. For attribute “activity area”, parents prefer “Outdoor activity within hotel area” with the positive utility 0.46, and then “Indoor activity within hotel area” 0.20, the last is “Activity outside hotel area” -0.19. This results is consistent with the previous analysis on attributes “playground area”, and reflects that parents prefer an outdoor playing area. The reason of the negative utility of “Activity outside hotel area”

may probably due to that parents want their children to stay within hotel's range for better security and supervision.

For attribute "music", parents prefer "Children's music" with positive utility 0.24 than "Light music" 0.20, and has a negative utility of "Classic music" -0.17. This phenomenon can be attributed to parents' preference that they want their children to stay in a pleasant and child-friendly environment. Since "Children's music" and "light music" are assumed to be soft and tender. In addition, "Children's music" is written especially for children, but "classic music" is hard for children to enjoy. The result also confirm the research made by Giles et al (1991). The authors concluded that a music program of Disney music styles could effectively promote emotional health for children.

For "video", parents like "Cartoon movie" the most, with positive utility 0.27. This is followed by "children educational program" 0.21 and the last one is "Children art program" -0.37. For "theme design", the most welcoming level is "Fairy World and Cartoon Character" with utility 0.34, "Natural Environmental and eco-theme" is 0.13, and the last one is "Culture and history Activities" which is -0.15.

Implications of CBC analysis

The finding shows that business and leisure travelers have no significantly different preferences with family services at hotels. Therefore, there is no special need to distinguish business travelers and leisure travelling in designing children service. However, it is clearly suggested that the current hotel family service needs to be improved and more features should be offered to customers.

Based on above analysis, a suggested design of family service for hotel is presented as below. Table 4.6 is the output derived from the data collected through questionnaires and interviews with a view to understand the opinions of hotel guests regarding what kinds of services they desire the most.

The result provides detailed guidelines for the selection over 50 features and services. The findings thus obtained, offer design teams and managers, a clear idea of the characteristics of the specific segments that attract both business and leisure travelers alike. Further, the study helps to focus on how to creatively design and implement activities, and how to integrate the service design, so that hotel guests can find their stay comfortable, satisfying and would want to come back again. However, more investigation in terms of pricing should be conducted if the hotel industry has to sustain its business.

Table 4.6 Suggested design profile of hotel children playground design

Domain	Attributes	Most Preferred
Playground Design	Playground area	Separated outdoor playground
	Size of children playground	Between 30- 100 m ²
	Staff organized children activity	Teach skills and knowledge
	Activity area	Outdoor activity within hotel area
	Activities design	Entertainment dominated
	Toys design	Self-handmade toys
	Music	Children's music
	Video	Cartoon movie
	Theme	Fairy world and cartoon character

4.1.4 Summary of section

In this section, it presents the identified determinant attributes of the proposed product and investigates customers' perception on this new product by evaluating the weights of each attribute. These attributes are not only being backed by previous literature but also contains highlights from industrial experiences.

The finding clearly suggested that the current hotel family service needs to be improved and more features should be offered to customers. It also shows that business and leisure travelers have no significantly different preferences with family services at hotels. Therefore, there is no special need to distinguish business travelers and leisure travelling in designing children service.

4.2 Experimental Solar Themed Children Service Prototype in Hotels

4.2.1 Basic settings of children playground

Based on Table 4.6, the preliminary design of the overall physical settings of the children playground includes the following features.

- Playground area: Separated indoor and outdoor playground
- Size of children playground: Between 30- 100 m²
- Staff organized Children activity: Teach skills and knowledge
- Activity Area: Outdoor activity within hotel area
- Activities design: Entertainment dominated
- Toys Design: Self-handmade toys
- Music: Children's music
- Video: Cartoon movie
- Theme: Fairy World and Cartoon Character

The features are based on but not limited on the previous analysis of hotel children service in section 4.1.

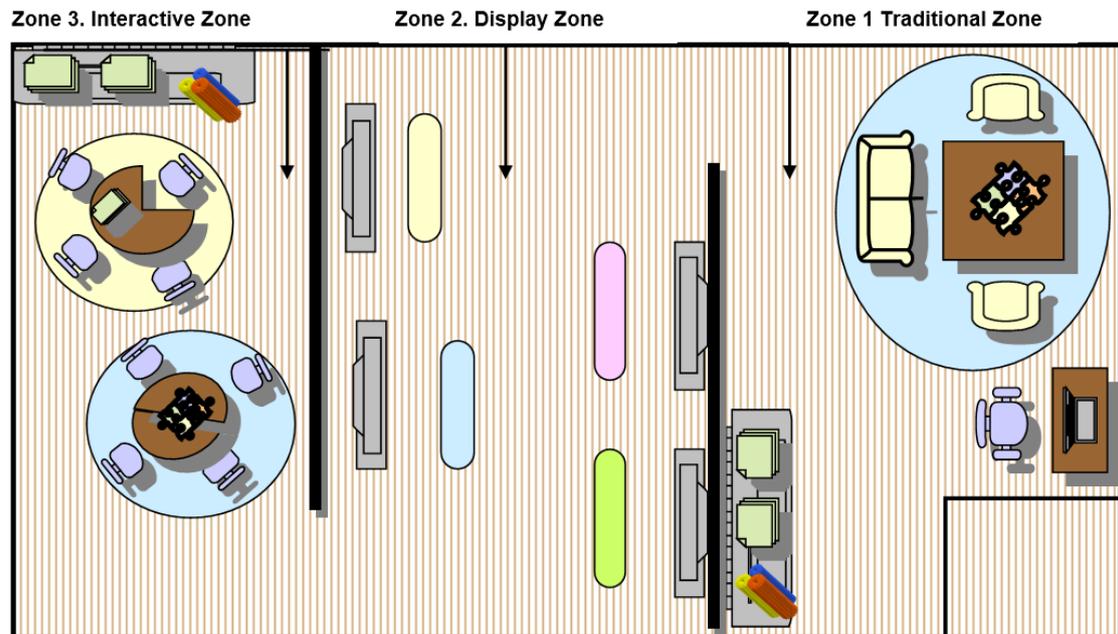
4.2.2 Physical settings design with solar concept

Indoor area design with solar concept embedded

Based on the basic design attributes, the next step is to embed solar concept into physical settings. The research divided the indoor venue into three areas for the multi-functional design purpose, and into two areas in the outdoor space. Each area

has its specific functional purpose. These separated areas are for holding interaction, for placing exhibits, and for setting indoors recreations as shown in Figure 4.3.

Figure 4.3 Indoor area design with three zones



Indoor area design - Zone 1: Indoor Traditional Zone

For the indoor traditional zone, the research included traditional children facilities like ball pools, slides, large building blocks and large toy house. Soft cushions were mounted on the ground and wall to prevent kids' injury while playing. Children, especially toddlers would find it more comfortable with familiar toys and comfortable atmosphere.

Indoor area design - Zone 2: Display Zone

Figure 4.4 Zone 2: Display Zone



In Display Zone, there was a notice board to post information regarding the developing trends of solar technology. The research displayed posters and photos related to solar energy with captions in simple language so children can understand what they are about.

Solar products and applications were also exhibited to educate people. In order to promote this, the research held an exhibition of solar products. Exhibition displayed a dozen solar household products including solar cells for mobile phones, a model solar water heater, a solar cap, solar water bottle, and solar bag. Each was attached with a label and description to explain its function and usage. People who were interested in these products were likely to buy them. This is a novel way of encouraging people to learn about solar energy. It does not only add value as an incremental knowledge but also has a utilitarian value.

This area is designed to enrich the knowledge and stimulate the thinking of participants about solar energy applications. By visiting the Indoor Display Zone, the participants would have a new understanding of energy-saving environmental protection and renewable energy utilization.

Indoor area design - Zone 3: Interactive Zone

In interactive zone, interactive games were introduced. The objective of these games is to make learning activity interactive and interesting. These games could help family visitors to understand the benefits of using solar energy. In addition, solar energy products such as solar energy fan, solar lights, solar sculpture, and solar car were also displayed.

The research raised an innovative concept of souvenir co-creation. It is grounded in the empirical findings as mentioned in the previous section: DIY activities are becoming popular these days in children's activities. With this in mind, the research at first examined numerous types of solar products and their application, and chosen ten types of applications, which are of particular relevance to the design theme. Two types of applications are specifically used as our key product: DIY wooden solar car and solar plane. These two products are powered by solar energy. They are made of wood, with a simple structure, painted colorfully, varied, easy to assemble, and environmentally friendly. These two products were displayed in most prominent positions within the interactive zone, with instructions and pictures to guide through the installation process. The research provided semi-finished products, and children can do it independently or with assistance by the playground staff.

Figure 4.5 Zone 3: Interactive zone



The other nine solar products are: DIY solar boat, DIY solar robot, DIY solar boat, DIY solar robot, DIY solar boat, and DIY solar robot. The first eight types were presented in the display area. For detailed introduction of each item, please refer to Appendix 7.

Table 4.7 DIY solar products

<p style="text-align: center;">Solar Car</p>	<p style="text-align: center;">Solar Plane</p>
	
<p style="text-align: center;">Solar Boat</p>	<p style="text-align: center;">Solar Charger</p>
	
<p style="text-align: center;">Solar Robot</p>	<p style="text-align: center;">Solar Cap</p>
	

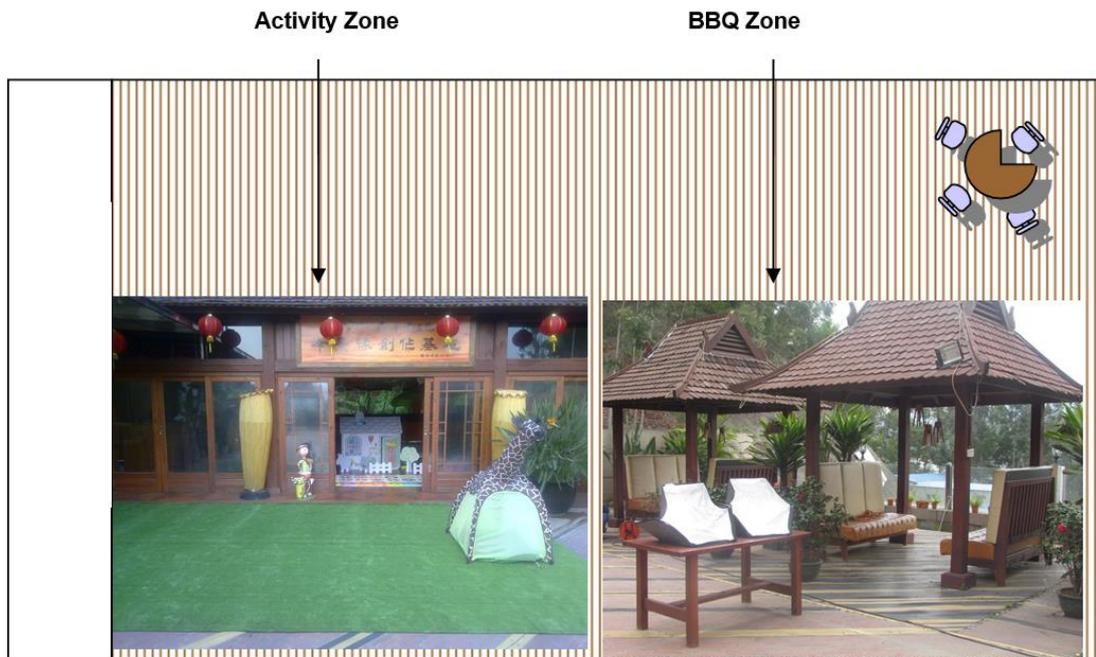
Solar Train	Solar Oven
	

In order to minimize physical injury to kids, all the play equipment used is made of lightweight material. The overall style was consistent with research subject, the researcher painted the indoor area orange as the predominant color. The researcher decorated the room with furniture, dolls, pictures, paintings, and different elements of nature such as clouds, sun, flowers, plants and animals. It is aimed to give a pleasant feeling and to be one with nature. This researcher also decorated the area with pictures and posters of nature with appropriate captions to introduce the subject of solar energy. The researcher had taken this as an opportunity to arouse people's awareness to environmental protection and eco-friendly measures. The researcher propagated the hotels eco-initiatives, such as recycling and utilizing solar energy for hot water and garden lighting.

Outdoor area design

For the outdoors, there is an area for BBQ and an area for games. The layout is presented below, and introduction is as follows.

Figure 4.6 Layout of outdoor playground



There were two zones in the outside area, one was Barbeque Zone and another was Activity Zone. The investigator installed hybrid solar ovens that were fuelled by solar energy with fuel gas as a supplement. The oven heated food and beverage items. The solar oven is a BBQ tool and is hence placed in the outdoor area as presented in Figure 4.6. They were set for fun and demonstrate solar radiation principles.

The connection between outdoor and indoor:

Indoor area was partially open with floor-to-ceiling glass door to separate the outdoor area, yet closely connected to the outdoor area. The reason for such a design is that the research wants to put most of the products inside, so they can be stored and maintained, while at the same time the study enabled visitors to play in the outdoor space with solar energy powered toys. Therefore, by playing solar powered toys, visitors might understand more about the power of solar energy, and get motivated.

It is believed that physical setting alone was not enough to make the hotel service complete. According to Smith's model of tourism products, besides physical product, it needs to include intangible factors such as other services and hospitality features. Therefore, in the next step, the research introduces these intangible elements through scenario simulation.

4.2.3 Service setting design with solar concept

For service setting design, 11 scenarios with pictures has been established to illustrate and scrutinize the requirement for service flow of one family. However, since the simulation is based on one family, it can only involve certain number of activities. Simulation cannot involve all activities designed in this project. Therefore, it can only be taken as a representative sample instead of a complete profile of service. However, this can serve as an example and help us to relate to all possible situations.

Here is the service design outcome by using scenario simulation. The research proposed the following scenario: Jack (aged 45) was on his business trip for three days and he brought his family, wife Rose (aged 40), and two children, Jimmy (aged 10) and Jenny (aged 7) with them. The scenario and characters' development were based on the real-world observation, during the visits to hotels. J

By creating multi-perspective views, the research was able to weave through the scenario's multiple accounts of what was happening.

Picture book of Jack's family accommodation experience

Day 1.



Picture 1: hotel lobby

A family of four checks in the hotel, dad (45 years old) is on a business trip, and mother rose (40 years old), with two children, boy Jimmy 8 year old and girl Jenny 6 year old. When they enter the hotel, a poster display in the hotel lobby about the children solar park which attract their attention and acknowledge them there is a children solar park in the hotel.



Picture 2: hotel front office

At check in, the family is given a brochure describing the children's service. Hotel staff also reminds them that there is a children's playground inside the hotel, and there are also other activities for both children and adults. In the morning, the hotel organizes activities that children are being taught how to make solar toy. At noon, the parent-child activities are organized. There are also facilities for a barbecue using solar appliances.



Picture 3: the entrance of children playground;



Picture 4: traditional zone of children playground inside



picture 5: interactive zone of children playground

After lunch, mother takes the children to hotel's mini solar park. There, Jimmy goes straight to the interactive area and plays the solar wooden aircraft and cars, Jenny rushes to the traditional zone and plays with her favorite toy: wave pool, slide and toy house.



Picture 6: mother fills the form to let children stay in the playground alone

If and when the mother wants to leave to go visit the spa, but the children want to play in the park, they can do so. Before leaving, the mother needs to fill in the contact information, i.e. Name and telephone number, and sign the consent form. By signing it, mothers are giving their permission to leave the kids under the supervision of playground staff and promise to come back to pick them up after one hour. If mothers want to monitor their children's activities, she can watch real-time video placed in the spa central television.



Picture 7: playground staff leads children to play solar toys in the outdoor area.

By observing Jimmy in the park, the playground staff find that Jimmy is interested in DIY solar-powered aircraft and cars. They encourage him to continue playing with them, and play with the solar car as long as he wants. Jimmy find that the solar car runs very fast in the sunlight, and gradually slow down and even stop when it comes into shadow. He is curious about the reaction and excited about what he learnt. He then wants to share this information with his sister Jenny. Both are happily playing with solar toys in the outside area. Staff then gives them each a silver toy car and aircraft. Staff also tells them that if they like to join a DIY solar planes and cars workshop in the morning, they may get a gold medal as a gift. The two kids then play with various other toys, including solar chess, watch the cartoon film, do some drawing, and play in the dollhouse. Program staff kept a record of their activities for data collection purposes.

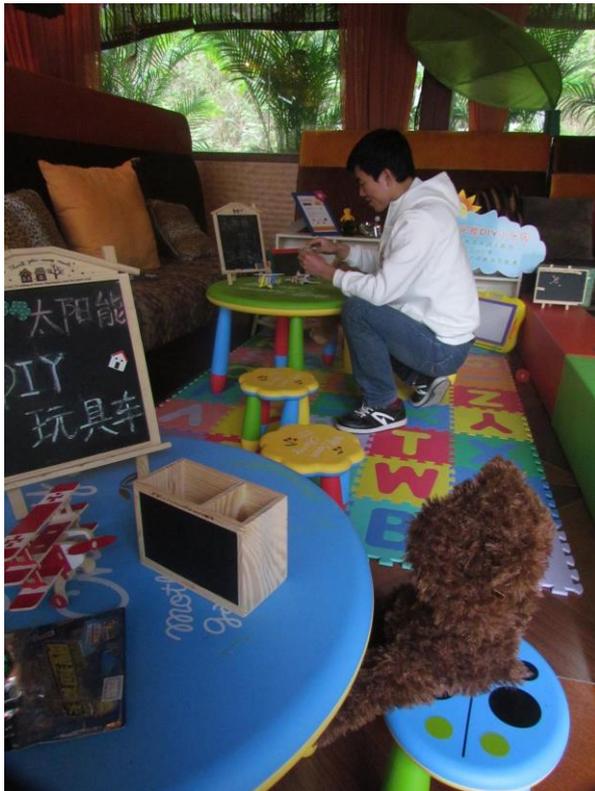


Picture 8: hotel spa center in a separated building

Meanwhile, in the spa, mother uses the CCTV to keep an eye on their children. This may help her to be in genuine relaxation as mothers are able to see their children are playing happily in the hotel park. After the spa, they could call the playground staff to inform them that they will be backing soon to pick up their children.

In the evening, when father comes back from work, the whole family dine together in the restaurant and share their experiences for the day. Children are excited about their experience in the park and are eager to show their golden and silver toys to their parents. Jimmy even tell his parents why the solar car could run in the sunlight but stops in the shadow. They want to attend the workshop the next day and build their own solar car or plane. Parents are very happy to see their children bubbling with excitement, that they have learned something, and agree to take them to the workshop the next day.

Day 2



Picture 9: playground staff leads children to make DIY solar toy

On the second day, in the morning, mother takes both her children to solar mini park on time to attend DIY workshop. This time, solar park hold a workshop to teach children about DIY solar cars and aircraft. Jimmy and Jenny build a car and a plane by themselves with the assistance of the program staff. All the children who complete making the solar toys are awarded with a gold medal. Meanwhile, mother goes to the gym and the swimming pool. By arranging this, mother could relax and have no worry about their kids, because she can check on her kids' activities through CCTV or through her personal mobile device. Program staffs are responsible for guiding the children, assisting them in making toys and do some experiments. They also take children's pictures with their parents' permission and send interesting pictures to their mobile device. After receiving these pictures, mother's happiness are raised,



Picture 9: playground staff leads family to cook food by using solar oven

At noon, mother return to the children's park, and they participated in the solar barbecue workshop organized by the hotel. They bake and cooke sausage in the solar oven.

At night, all the family members sit together, dine and talk about their daytime activities, the children show the gold medals they got from the workshop. Mother also shared children's photos taken in the playground.

Day 3



Picture 10: the farther come to playground and buy souvenir and gift for their families

The third day, father did not have to go to work only wait to check out. He take the children to the children's park. The program staff shows what the children have made. They suggest that the father could buy a set of new toys for the children to play at home. Then the father agrees. He also finds some other solar products that are interesting. Moreover, he also bought himself a solar charger, which could be useful for him on his business trips. The mother also buys a solar oven. Program staff charges them according to the listed price, and fare them well.



Picture 11: the whole hotel building from the outside

At noon, the families check out, children are excited about their new toys, parents are happy with their appliances, and they leave satisfied with their stay at the hotel.

Service design including the following features

- a) Advertising in the hotels: poster was placed in the hotel lobby, to remind guests of the new amenity and service in this hotel. In order to attract children's attention, poster design uses cartoon characters, such as sunshine, sunflowers, smiling girl, and green plants are used to give the guests a pleasant feeling. Front desk staffs were responsible for providing information to customers about the children's park to customers and distributing brochures to families with children and briefly explaining the facilities. Welcoming gifts like badges, toys, and toiletries bag were also distributed at that time.

- b) Operation management: opening hours was set from 10 am to 8 pm, which is the busiest period in the experimental hotel. For safety regulation, parents must accompany children less than three years old. For children over three, they were allowed to play under the supervision of playground staff but without parents, provided parents sign the consent form.
- c) Playground staff management: playground staffs were important for operating this new children's amenity. All the employees for children's park were trained to acquaint with the facilities, daily operations, and basic child care skills. Their responsibility includes operating and maintaining the facilities, supervising security, providing guidance, exploring the facilities available, leading activities, selling products and collecting questionnaires. Playground logo and customized staff uniform is also provided for playground staff. Staff in the children center played an important role in maintaining a smooth running of the visitors' sequential activities. They assisted children in their games and helped to draw their attention towards the principle behind using solar toys. They were also responsible for distributing the gifts (silver and gold toy cars and planes), which were designed in this study, as a token to motivate them.
- d) Safety management: remote surveillance integrated with other hotel facilities relieved parents from their supervision duties and they could peacefully enjoy other facilities in hotels. If for some reason the parents do not come to collect their kids at the specified time, the playground staff would call them. When parents use other hotel facilities, including dining, spa, or conference room, they can leave their children in the kids' playroom, and pick them up after they are done. As a safety precaution, CCTV was installed. This works as a monitoring device, fitted with a surveillance camera and is integrated with

other hotel amenities including spa center, fitness club, or restaurant. By filling in the consent form, parents were legally bound to follow conditions set by hotel management. Parents could check on their kids' activities through CCTV or through their personal mobile device. Program staffs were responsible for guiding the children, assisting them in making toys and do some experiments. They also took children's pictures with their parents' permission and sent interesting pictures to their mobile device.

- e) Involvement from different department: the restaurant provided an ideal place for family time, to share their experiences. Children can share their excitement and achievements. Spa and gym center could provide brochures to broadcast the children service. CCTV and long distance communication tools are also suggested to install for supervisors to monitor their children's activities when they are playing separately.

- f) Souvenir and co-creation: souvenirs co-creation is an effective way to encourage guests to involve into solar knowledge intensive activities and it is also designed a trigger for souvenir purchase behavior. Another key insight of souvenir is that to children who were playing in the playground, giving souvenirs or rewards to them could enable the solar games more playful interaction. In this designed prototype, the souvenir and co-creation toys were indoor solar toys such as DIY solar boat, DIY solar robot, DIY solar boat, DIY solar robot, DIY solar boat, and DIY solar robot, and outdoor solar oven as BBQ activity for guests to play.

4.2.4 Summary of section

In this section, outcome is achieved by completing the design process into two major approaches with real prototypes established, one is physical design, and the other is service design. Hotel staffs and researchers were engaged in the research in different ways at different times as 'partners' in co-producing design considerations and evaluation that followed.

The design of overall physical settings includes the following features, which are based on but not limited on the previous analysis of hotel children service in section 4.1.

The indoor venue is divided into three areas for the multi-functional design purpose, and two areas in the outdoor space. Each area has its specific functional purpose. There are separate areas for interaction, for placing exhibits, and traditional setting for indoors. For the outdoors, there is an area for BBQ and an area for games.

For the service design, this study adopts scenario design methods to simulate the real purchase flow, and six major factors were considered during the design including advertising methods, operation management, playground staff management, safety management, involvement from different department, and souvenir and co-creation.

4.3 Examine The Guests' Attribute Towards The Designed Prototype As Well As Customers' Willingness To Pay

In this section, the research presents the key findings focusing on two aspects: (i) The use and purchase of designed prototype behavior; and (ii) users' critical reflection on the designed prototype in the hotel.

4.3.1 Observation and overall performance

After a 10 months' trial run of designed prototype: solar children playground. The following paragraphs summarize visitor's behavior and activities. Through the analysis, it could help to understand the performance of designed prototype.

Participants of the designed solar playground were mainly children and their parents, grandparents, relatives or nursemaids who were called supervisors here for consistency.

Most of the participants came in the weekend, much more than those who came in the weekday. This phenomenon is mainly due to that in weekday, children have to go to school and seldom came to the hotel with their parents. On weekends, it was observed that more parents bring their children to the hotel for weekend and vacation. Besides, some parents spent the whole morning for morning tea or banquet with their children and thus there were more children in the playground for fun in the weekend morning. The business hours of SPA club are 3:00 P.M. to 12:00 A.M., but seldom customers come to SPA center with children.

Participants who enter into the designed playground can be divided into two kinds. One was the new guest who showed interest of the poster or brochures of the playground, then the staff came to them and introduce the playground and leading

them to the place. The other is the frequent visitors who came to the playground very often, and most of the frequent visitors are guests who came in the hotel for morning tea or dinner regularly.

The profile of the observational samples

Table 4.8 Descriptive analysis of subjects

Characteristic Variable		Subjects	
		Number	Proportion (%)
Parent Presence	0	209	55.0
	1	145	38.2
	2	14	3.7
	3	9	2.4
	4	3	.8
Zone 1 Traditional Zone	Dislike	113	29.7
	like	267	70.3
Zone 2 Display Zone	Dislike	353	92.9
	Like	27	7.1
Zone 3 DIY Interactive Zone	Dislike	225	59.2
	Like	155	40.8

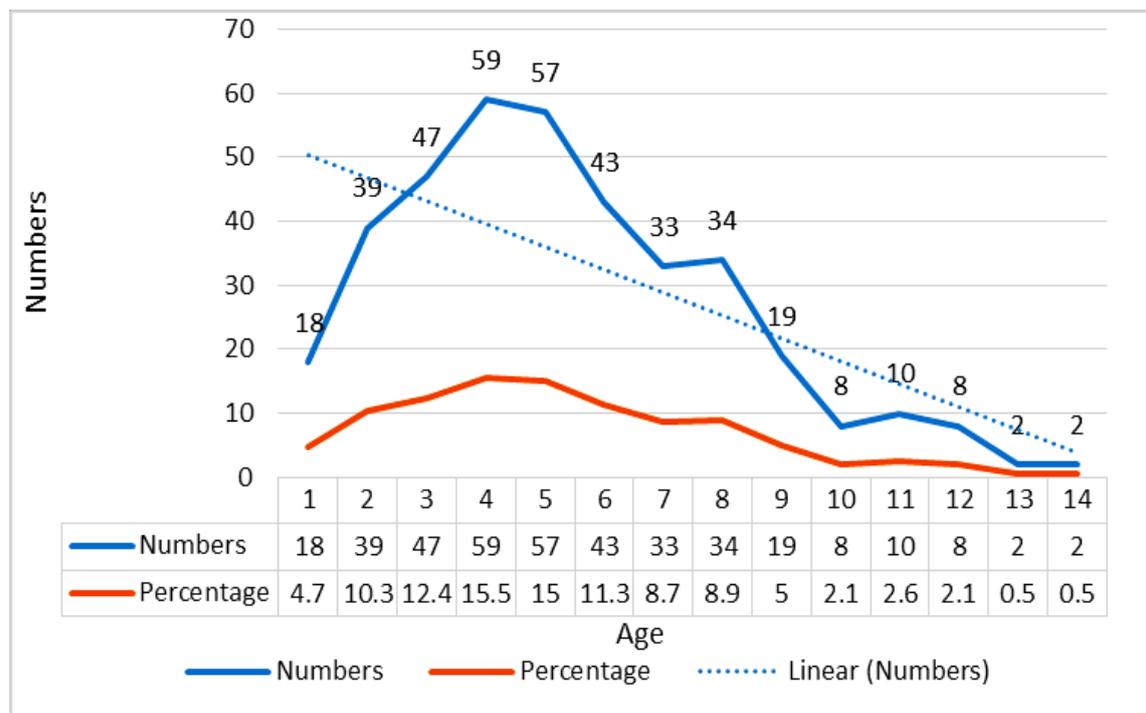
Basic information of subjects

According to above table, total 380 children were recorded of their visits in the designed playground. In the column played without companion's presence, which means that most children were not accompanied while they were playing on the

playground. 209 children among them had one supervisor as companion, occupying 55% of the total. The proportion of more than one accompany was all relatively low.

267 of them shows they like Zone 1 traditional zone, occupying 70.3% of the total; while 27 subjects play in Zone 2 Display Zone, occupying 7.1% of the total, and 155 subjects chose Zone 3 DIY interaction zone, occupying 40.8% of the total. It can be seen that Zone 1 is most popular, and then Zone 3 and Zone 2. Less than 8% subjects like Zone 2, which indicates a relatively low preference.

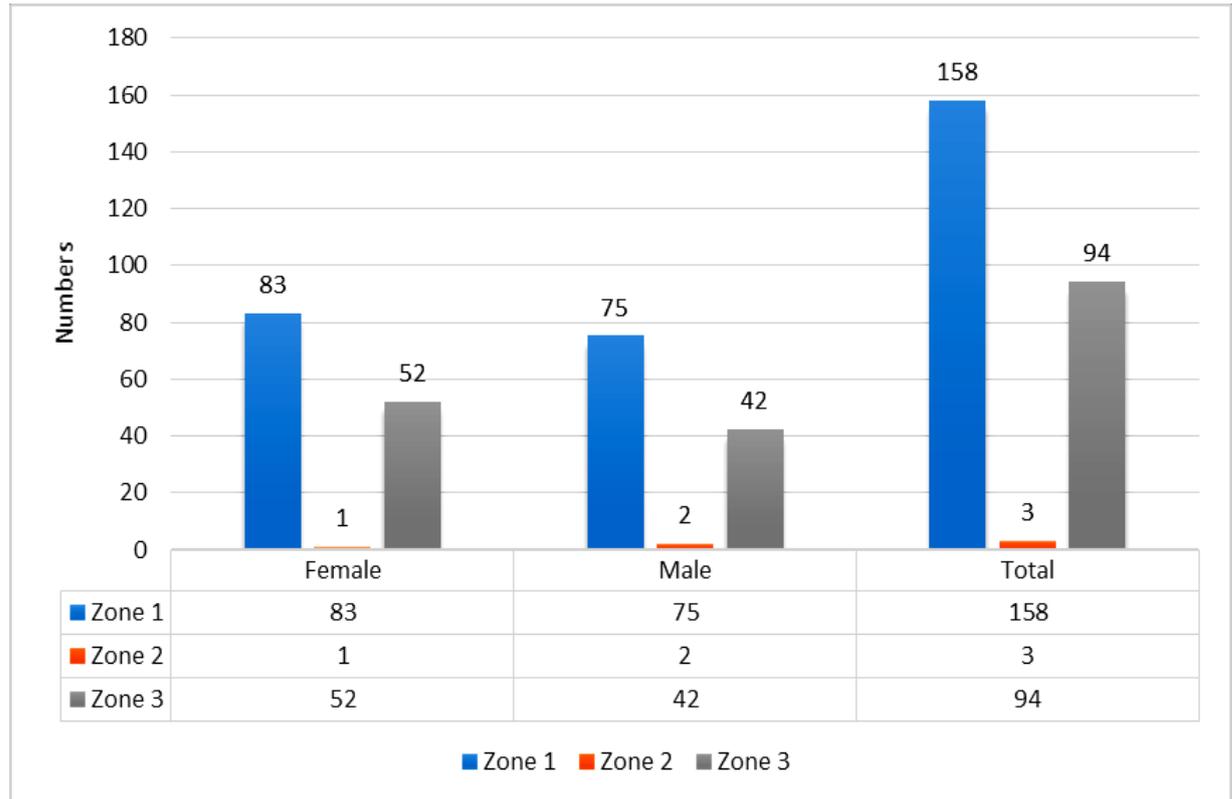
Figure 4.7 Age distribution



According to Figure 4.7 above, visitors of the designed solar mini-park were mainly children with the age of 2-6 years old, which occupied 68.44% of the total (calculating by the total number of 225), and then children with the age of 1 year old and 7-8 year-old. Children with the age over 12 year-old seldom chose to have a fun here.

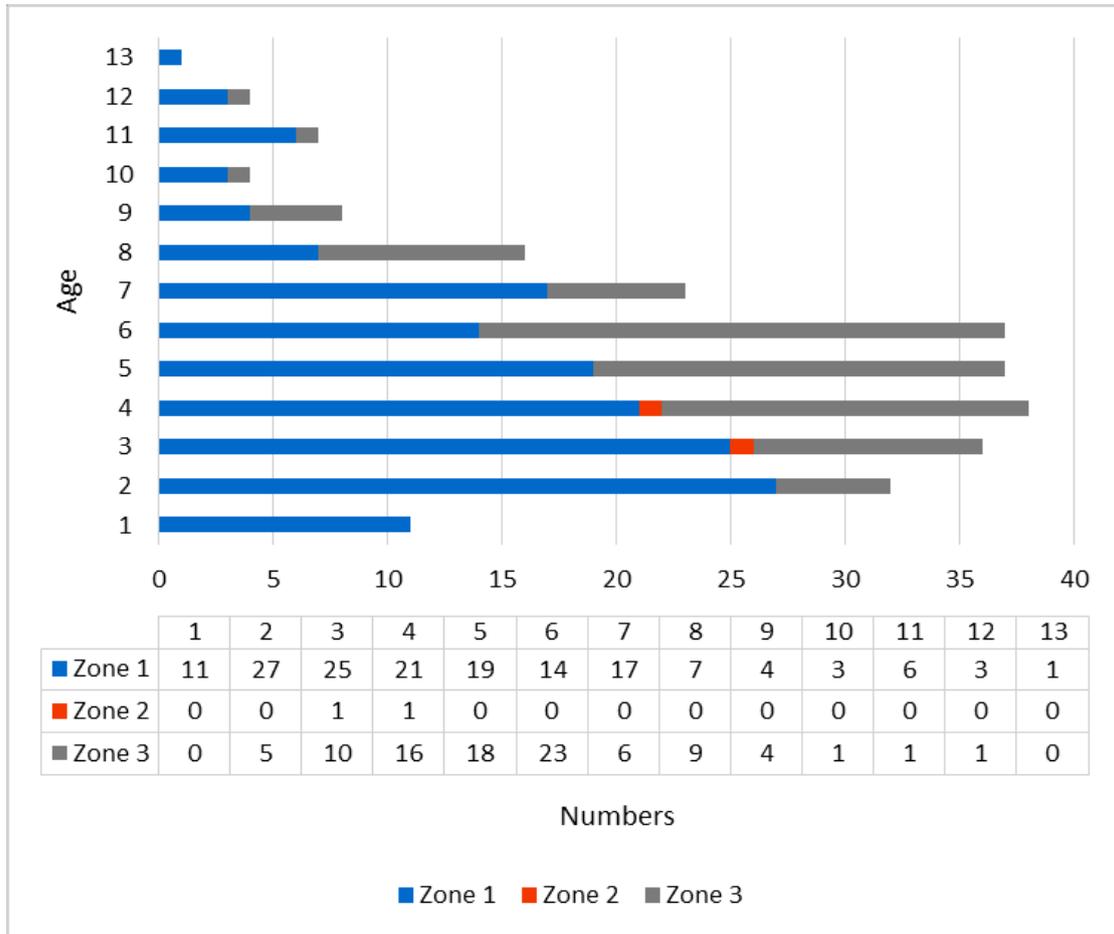
The average age of visitors was 5.08 year-old. As the trend line indicates, the possibility for children to come to the solar mini park decreases with the increase in the age of children.

Figure 4.8 Preference and gender



From Figure 4.8 above, it can be seen that over half of boys and girls preferred Zone 1 Traditional Zone and then Zone 3 Interactive Zone, but had little interest in Zone 2 the Display Zone. But boys were observed to show higher interest in the solar exhibits than girls. They tend to ask more questions and play more with the solar toys.

Figure 4.9 Preference and age



According to the Figure 4.9 above, children maintained high interests in Zone 1 Traditional Zone. Children with the age of 4-9 year-old preferred Zone 3 Interactive Zone, while children with the age of about 7 year-old were both interested in Interactive Zone and Traditional Zone. Only several children showed interests to Zone 2 the Display Zone, who was mainly 3-4 years old. Results show that the older children are, the more tendency they prefer Zone 3. This probably due children of school age and older are more capable of acquiring more complex product with acquiring do-it-yourself skills and knowledge (Watson & Shove, 2005), This results indicates older children tend to have more interests than younger children in DIY activities.

Difference Comparison

Table 4.9 Comparison of different variables between different genders

Variables	Gender	Sample (N)	Mean	Std. Deviation	T-value	P-value
Stay	Male	172	39.97	30.466	-1.334	0.183
	Female	208	43.86	26.371		
Parent Presence	Male	172	0.67	0.831	2.646	0.008**
	Female	208	0.47	0.659		
Zone 1	Male	172	0.77	0.42	2.759	0.006**
	Female	208	0.64	0.48		
Zone 2	Male	172	0.12	0.321	3.153	0.002**
	Female	208	0.03	0.181		
Zone 3	Male	172	0.29	0.455	-4.319	0.000**
	Female	208	0.5	0.501		

*means $P < 0.05$; ** means $P < 0.01$;

According to T-test in Table 4.9, T values for the stay, parental presence, Zone 1, Zone 2 and Zone 3 of different genders were -1.334, 2.646, 2.759, 3.153 and -4.319 respectively, while the related P values were 0.138, 0.008, 0.006, 0.002 and 0.000 respectively, which were all less than 0.05. This indicates that there were significant differences in the parental presence, Zone 1, Zone 2 and Zone 3 between different genders. From above results, it shows that boys preferred to Zone 1 and Zone 2, while girls preferred to Zone 3. It is also noted that, values of parental presence regarding to boys in Zone 1 and Zone 2 were higher than those of girls, but the value of girls in Zone 3 was higher than that of boys. It means that the proportion of parental presence was higher for boys than girls. This phenomenon is opposite to our

usual belief that girl tends to have closer association with parents. It is probably because the in traditional Chinese culture that people value the male child more than female, and give more protection and custody to male boys (Li et al, 2004).

Table 4.10 Comparison of different variables between preferring and no preferring to Zone 1 traditional zone

	Zone 1	Sample (N)	Mean	Std. Deviation	T-value	P-value
Gender	Preferring	267	1.5	0.501	-2.759	0.006**
	No Preferring	113	1.65	0.478		
Age	Preferring	267	5.05	2.84	-3.362	0.001**
	No Preferring	112	6.08	2.394		
Parent Presence	Preferring	267	0.55	0.725	-0.144	0.886
	No Preferring	113	0.57	0.8		

According to T-test in Table 4.10, T values of parental preference in Zone 1 for the gender and age were -2.759 and -3.362 respectively and its P values were 0.006 and 0.001 respectively, which were all less than 0.05. It means that there were significant differences in the gender and age between the preferring and not preferring to Zone 1. The results shows that gender and age plays important role in children's preference in Zone 1.

Table 4.11 Comparison of different variables between preferring and no preferring to Zone 2 Display Zone

	Zone 2	Sample (N)	Mean	Std. Deviation	T	P
Gender	Preferring	27	1.26	.447	-3.153	.002**
	No Preferring	353	1.57	.496		
Age	Preferring	26	5.69	3.210	.645	.520
	No Preferring	353	5.33	2.720		
Parent Presence	Preferring	27	.52	.753	-.284	.777
	No Preferring	353	.56	.748		

According to T-test in Table 4.11, T value of preference in Zone 2 for the gender was -3.153 and its P value was 0.002, which was less than 0.05. It means that there was significant difference in the gender between the preferring and not preferring to Zone 2. The results shows that gender plays and important role in children's preference in Zone 2.

Table 4.12 Comparison of different variables between preferring and no preferring to Zone 3 Interactive Zone

	Zone 3	Sample (N)	Mean	Std. Deviation	T-value	P-value
Gender	Preferring	155	1.68	.469	4.319	0.000**
	No Preferring	225	1.46	.499		
Age	Preferring	155	5.92	2.330	3.338	0.001**
	No Preferring	224	4.97	2.955		
Parent Presence	Preferring	155	.61	.886	1.191	0.234
	No Preferring	225	.52	.634		

According to T-test in Table 4.12, T values of preference in Zone 2 for the gender and age were 4.319 and 3.338 respectively and its P values were 0.000 and 0.001 respectively, which were all less than 0.05. It means that there were significant differences in the gender and age between the preferring and not preferring to Zone 3. The results shows that gender and age plays an important role in children's preference in Zone 2.

Table 4.13 Comparison of different variables between different number of parents

	Parent Presence	Sample (N)	Mean	Std. Deviation	T-value	P-value
Zone 1	0	209	0.69	0.464	2.069	0.084
	1	145	0.74	0.441		
	2	14	0.71	0.469		
	3	9	0.33	0.5		
	4	3	1	0		
Zone 2	0	209	0.08	0.267	0.178	0.950
	1	145	0.06	0.242		
	2	14	0.07	0.267		
	3	9	0.11	0.333		
	4	3	0	0		

Zone 3	0	209	0.42	0.494	2.020	0.091
	1	145	0.37	0.483		
	2	14	0.43	0.514		
	3	9	0.67	0.5		
	4	3	1	0		
Stay	0	209	42.58	29.193	6.153	0.000**
	1	145	37.72	25.694		
	2	14	50.57	25.967		
	3	9	73.44	23.141		

* means $P < 0.05$; ** means $P < 0.01$;

According to one-way ANOVA in Table 4.13, F values for the stay, Zone 1, Zone 2 and Zone 3 under different situations of parent presence were 2.069, 0.178, 2.020 and 6.153 respectively, and their P values were 0.084, 0.950, 0.091 and 0.000 respectively. P value for the stay was less than 0.05, which indicated the significant difference in the stay between different situations of parental presence. Where, the stay time was 42.58 minutes for children without parent presence, 37.73 minutes for children with one parent, and 37.72 for children with two parents, 73.44 minutes for children with three parents, and 87 minutes for children with four parents. It indicates that the stay time for children with one parent was shortest, but there was no difference in the number of parents between Zone 1, Zone 2 and Zone 3. Result shows that children with more supervisors' companion would prefer to stay longer. This provides implications for management design that if hotel could set time limitations to control the amount of people inside the playground, and estimate the appropriate service time, a better management and operation can be realized.

Other implications and suggestions of playground design

Some parents reflected that the ideal playground size, location, and the capacity.

The area of mini solar park is about 50 square meters. Though it is located in the first floor of hotel, is still not easy for customer to have a direct view when they came into

the hall. Most guests found the playground unintentionally by trying to take the lift or look for toilet.

The visibility of the children playground is important. It is suggested promotional brochures with guidance of playground location should be distributed to hotel guests in the reception desk and by the door of hotel. Hotel employees, especially the personnel at the reception desk or concierge, should introduce playground to hotel guests who has children around. Besides, guide board is also suggested to lead participants.

The capacity of the playground is about 10 kids playing inside at the same time. While on weekends or there is a banquet, children came to the playground in crowds. In such situation, it will be crowded and sometimes cause the dispute or conflict among children. Thus it requires the coordination and management by the playground supervisors. When parents found that the playground is crowded, they would not let their children get in. Since there is only one staffs in the playground, many interactive games were thus not able to provide for a group of children stay inside.

Location: It is observed that there were more visitors when the children playground was located near the hotel lobby and the restaurant than on the upper floor. The hotel provided two places for us to do the test. In the first six months, the children's playground was situated on the third floor of the hotel. The average number of visitors per day was about five families. In the next three months, the children's playground was moved to the first floor, at the end of hotel lobby, and very close to the hotel restaurant. The number then increased to 12 families per day in average. The research also received the comments from some repeat visitors who rated the location near the lobby as more useful than in other places. They thought the second

location was more convenient and parents were more at ease and willing to leave their children there while they were having their meals.

Activity design: The playground is divided into the traditional zone (Zone 1), exhibition zone (Zone 2), and Interactive Zone (Zone 3), while Interactive Zone and traditional zone were most popular ones. Parents also agreed that DIY activities are good for enhancing children's practical ability.

It was observed that children are much easier to influence each. When some of them leave, others will choose to leave one by one; once a kid plays a toy (especially DIY one), others will also want to join in. The younger children were easier to care about what others are doing. But the elder ones (mainly girls) are a bit self-controlled and prefer to independent games (such as reading books or playing jigsaw) or serve as a leader of a group of kids to play group game.

It's more frequent for younger children to change toys. They cannot stay and focus. Only several elder children will choose to read books (generally come with their younger brothers or sisters, but they will not come to the mini solar park alone).

According to the children's behavior activity described above, it is possible to attract elder children to more specific activities such as solar DIY activities as the influencers. When these elder children play the game, it is more possible to attract other children to come to play.

Toy design: Besides the ordinary toys of dolls and toy bricks in the traditional game zone, the popular ones in the mini solar park are solar DIY toys in Zone 3. Solar toys

are popular among young boys. But even children showed strong interests in solar toys, most parents were not willing to pay for them.

According to the interview results, parents also reflected that, compared to other children's parks, there were more DIY toys in the designed playground, which contribute to the knowledge and hands-on skills of their children.

Because of the material, toys in the traditional zone were not easy to broken, and thus parents and children favor them. For solar toys, some children are too young to assemble toys. Besides, these toys are easy to broken. Thus parents had some concern in letting their children to play. However, during the cloudy or raining days, some solar products do not work well for display, and participants felt disappointed and lose interests to buy them.

According to above analysis, it is suggested to introduce more solar DIY products. Besides, it is possible to adopt the payment method that is "free for playing in the playground, but paying for taking them home". Since the operation of solar DIY toys is completely dependent on the solar radiation as the power, it is suggested to use other power such as electricity or battery as a supplement for a consistent power supply.

For solar toys that are easily worn, it is possible to adopt the payment way that "paying for playing". The cost damage caused by the failure of toys during the playing can thus be compensated.

Theme design: During the interview, most parents reflected that the solar theme was novel and was good for the broadcasting of environmental protection knowledge.

Although it is meaningful, it is still difficult for younger children to understand it. Meanwhile, it is found that seldom children came to the Interactive Zone for solar toys initiatively, while staffs showed them how these solar toys run and help children step by step, and this assistant behavior was observed to enhance children's interest in it.

Though solar toys are attractive, such attraction cannot last for a long time. Children will lose interest very soon, unless they can assemble them independently. Besides, parents also worry about the compensation for the damage of toys and then have concerns when allowing children to play. In the exhibition zone, it's quite difficult for children to focus on the learning of solar knowledge for a long time, but they prefer to group games with others.

It is suggested to provide training to playground staffs, and emphasize the role of them in affecting children's behavior while playing.

Payment: Besides, parents cared about the payment. They asked if it charges before going into the mini park and they prefer to play only it is free. Parents who came to the hotel for morning tea or banquet were unwilling to pay for the ticket for entrance.

Guests who came for morning tea usually stay in the hotel just for a while and their children always had a fun in the small playground. If requiring for the ticket, they felt unpleasant for paying for just a short time of playing.

However, for the crowded problem on weekends, charging extra money is suggested during the peak time on weekends (9:00-10:30 A.M.) It could control the number of children in the playground.

For activity payment, it can follow the way as mentioned above, namely for DIY drawing toys, “free for playing in the mini solar park, but paying for taking them home”; for solar toys that are easily worn, “paying for playing”.

Service of playground staffs: Playground staffs play an important role in how children interact and participate during their play activities. They help children by guiding them and explaining to them how to operate the toys. This is especially true when children are exposed to unfamiliar toys like the solar DIY toys and solar card games. It is observed that children go through an “adaptive phase” before they fully relax and play freely. If playground staff encouraged them by being friendly, using smiles, nice and friendly tone of voice and show them how to play, those children would get familiar with the environment more quickly.

Playground staff of designed playground should manage and guide children, observe their responses, introduce activities. Meanwhile the staff should also avoid children’s dispute and accident during the game. Playground staffs were essential in encouraging children to play with more innovative games that make them learn new things. When children showed interest on playing with solar toys or some other toys that were exhibited, if there was no encouragement and instruction from the playground staff, they would have soon lost their interest. Instead, if playground staff explained and showed children how to play the games children would get more interested and would want to experiment.

Parent accompany: According to the data analysis, it can be found that, among 422 children, the rate of parent presence was 44.55%, where most of them might leave in advance, especially for parents who went here for the banquet or morning tea. Some children often went here for dinner with their parents and were familiar with the playground. Then their parents would not accompany them and only came to pick up them before leaving. It would be more possible for parents who came here for accommodation to accompany their children.

The degree of parental presence would be higher when the age of children was smaller. In case of many children in the playground, parents would generally did not join in the game. When there were less children and their parents, the degree of parental participation would be higher.

Number of Parent Presence	0	1	2	3	4	Total
Number of Children	234	160	16	9	3	422

Parents who came here for the banquet or morning tea might always have their own things to do and could not accompany their children all along (except there were many parents and then grandparents would accompany children). In-house guests would play with their children when they were free.

Father's presence: Fathers seldom bring their children to the mini solar park. Children were always attracted by the post of brochures of the playground at first and then push their fathers to come together. Usually, fathers left children in the playground alone and came to take them before leaving the hotel. In such case, the rate of parent presence is low.

Mother's presence: There were always mothers who were willing to accompany children to the mini solar park. Besides, after going into the playground, they played with children actively, taught them knowledge and led them around, took photos for children, and actively cooperated with playground staffs and asked questions about the playground and toys. The rates of mothers' parental presence and participation are all high.

Grandparent's presence:

It is common for children to be raised by their grandparents in China. Most grandparents have some kind of infantile psychology and prefer to be with children. As grandparents are not young anymore, they had less ambition of joining in family games that require the consumption of energy. At that time, they usually choose to linger near the arena and watch their grandchildren. The rate of grandma or grandpas' presence is high, but the rate of participation is low.

For these situations, it is possible add more family toys in the playground, especially for mother and children games. For the guide, when mothers bring children to the playground, staffs could introduce toys to adults first; when fathers bring children to the hotel, it is suggested to introduce toys to children directly. Meanwhile, the staffs should introduce parents about the safety and security of playground and with assurance. This may help to alleviate parental reservation on safety and security of the children playground.

4.3.2 Price strategy and Willingness to Pay (WTP)

Results are presented in two subsections. First, some descriptive statistics is presented about respondents' attitudes and perceptions on price strategy of designed prototype. Second, it provides the results from the conjoint experiment to show customers' preference on difference price settings.

Profile of interviewees and their children

Table 4.14 shows the demographic characteristics of interviewees. SPSS software was used with the "descriptive statistics" option for demography analysis. Result is obtained as the basis of demographic characteristics of the sample, which is shown in Table 4.14:

Table 4.14 Demographic data of interviews

Viabile	Choice	No. of Interviewee	%
Experiences in business traveling with children	Yes	68	38.86%
	No	107	61.14%
Experiences in leisure traveling with children	Yes	130	74.29%
	No	45	25.71%
Experiences of hotel children service	Yes	74	42.29%
	No	101	57.71%
Age of children (years)	1	14	8.00%
	10	1	0.57%
	11	2	1.14%
	12	10	5.71%
	13	2	1.14%
	15	1	0.57%
	17	2	1.14%
	2	22	12.57%
	3	36	20.57%
	4	34	19.43%
	5	16	9.14%
	6	13	7.43%
	7	3	1.71%
	8	10	5.71%
	9	9	5.14%

As mentioned earlier, for conjoint experiment of price settings, 8 profiles was evaluated by customers is presented in Table 4.15. They were asked to sort out the preference of the product portfolio. Results were collected and calculated. It shows that, the attribute Carried home product is the only significant factor in overall effect, while Entrance Fee, DIY activities, Donation are not.

Table 4.15 Group result of four price setting attributes

Set	Entrance Fee	DIY Activities	Carried Home Product	Donation	Result
1	Pay for entrance	Pay for interested DIY activities	Pay for carrying home self-made product	Donation is compulsory	24
2	Pay for entrance	Pay for interested DIY activities	Pay for carrying home self-made product	Donation to eco-funding in free will	29
3	Pay for entrance	All DIY activities are free	Free to carry self-made product	Donation is compulsory	24
4	Pay for entrance	All DIY activities are free	Free to carry self-made product	Donation to eco-funding in free will	19
5	Entrance for free	Pay for interested DIY activities	Free to carry self-made product	Donation is compulsory	13
6	Entrance for free	Pay for interested DIY activities	Free to carry self-made product	Donation to eco-funding in free will	14
7	Entrance for free	All DIY activities are free	Pay for carrying home self-made product	Donation is compulsory	14
8	Entrance for free	All DIY activities are free	Pay for carrying home self-made product	Donation to eco-funding in free will	33

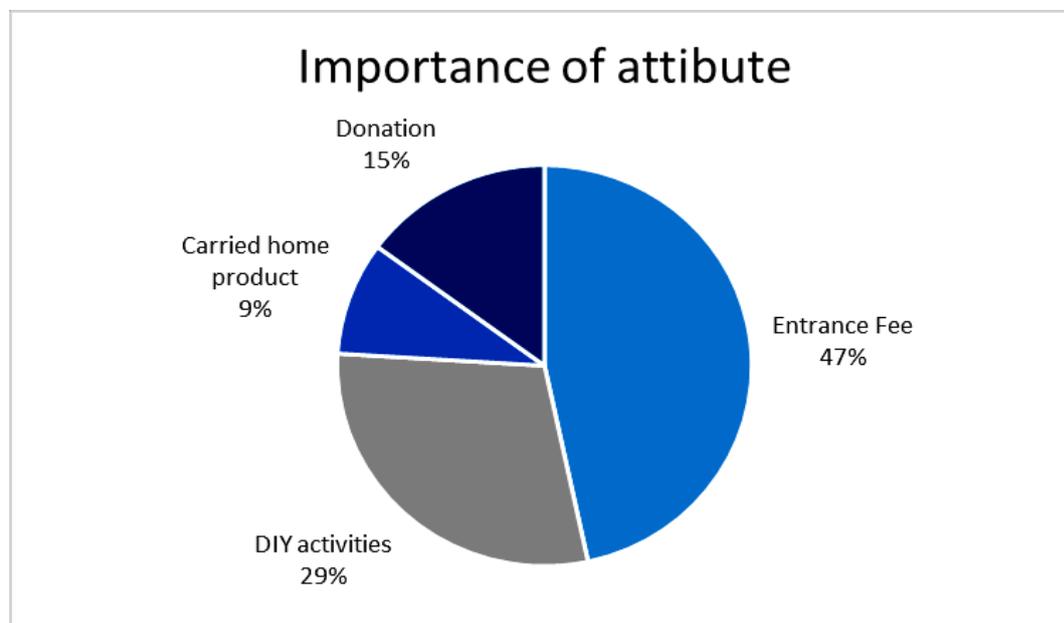
Conjoint analysis

Table 4.16 shows the relative importance of the evaluated attributes for consumers. Entrance fee and DIY activities had the most important factors, suggesting that they had the most impact on consumer choice of designed prototype. Carried home product was the least important attributes for hotel guests.

Table 4.16 Relative importance of each price settings

		Mean	Standard error	Utility	Utility range	Relative Importance
Entrance Fee	Pay for entrance	0.23784	-2.60414	-1.61374	3.22747	46.64%
	Entrance for free	0.76216	2.60414	1.61374		
DIY Activities	Pay for interested DIY activities	0.33514	-1.02987	-1.01482	2.02965	29.33%
	All DIY activities are free	0.66486	1.02987	1.01482		
Carried Home Product	Pay for carrying home self-made product	0.44865	-0.09991	-0.31609	0.63218	9.14%
	Free to carry self-made product	0.55135	0.09991	0.31609		
Donation	Donation is compulsory	0.41622	-0.26598	-0.51573	1.03146	14.91%
	Donation to eco-funding in free will	0.58378	0.26598	0.51573		
Total:					6.92076	100%

Figure 4.10 Relative importance of each price settings



As it can be seen from Figure 4.10, the ranking of levels is as follows: Entrance for free > All DIY activities are free > Donation to eco-funding in free will > Free to carry

self-made product > Pay for carrying home self-made product > donation is compulsory > Pay for interested DIY activities > Pay for Entrance. The ranking indicate the importance of perception of each level among customers.

4.3.3 Validation- quasi-experiment

Difference in attribute important ratings

In order to identify the difference of rating on the importance of the attribute, the Spearman rank order correlation was applied here. Spearman's Rank correlation coefficient is used to identify and test the strength of a relationship between two sets of data when the data is arranged in terms of ranks. It is also be called as correlation coefficient between the ranks (Ramsey, 1989). This is a method that has been long used in many tourism and hospitality research (MacGregor & Ormerod, 1996; Ng & Soutar, 2007; Diedrich & García-Buades, 2009)

The conventional formula for the Spearman rank-order correlation coefficient is as follows:

$$r_s = 1 - \frac{6\sum D^2}{N(N^2-1)}$$

r_s = correlation coefficient

N = the number of paired variables

D = difference between ranks

D^2 = difference squared

The Spearman correlation coefficient, r_s , can take values from +1 to -1. A r_s of +1 indicates a perfect association of ranks, a r_s of zero indicates no association between ranks and a r_s of -1 indicates a perfect negative association of ranks. The closer r_s is

to zero, the weaker the association between the ranks. In this study, the main importance ratings for the 18 attributes are given in Table 4.17 and the data was collected in two stages, ex-ante and ex-post.

Table 4.17 Difference in attribute important ratings

Domain	Attribute no.	Attribute name	Mean			
			Ex-ante		Ex-post	
			Attributes	Domain	Attributes	Domain
Family Activity Types	1	Family Interaction	6.25	7.5	6.1	6.93
	2	Individual Involvement	8.75		7.76	
Family Service Within Hotel Operation	3	Welcoming Gift In Front Desk	4.64	5.42	5.1	4.97
	4	Children Service In Restaurant	7.24		6.5	
	5	Children Service In Guest Rooms	4.38		3.3	
Safety Management	6	Insurance Policy	2.87	5	4.3	3.855
	7	Monitoring Method	7.13		3.41	
Price Strategy	8	Charging Mode	3.61	5	4.6	3.86
	9	The Payment For Use	6.39		3.12	
Playground Design	10	Playground Area	8.8	4.85	7.72	4.57
	11	The Size Of Children Playground	5.5		6.50	
	12	Staff Organized Children Activity	4.05		3.20	
	13	Activity Area	9.55		3.24	
	14	Activities Design	4.5		6.58	
	15	Toys Design	3.98		5.14	
	16	Music	1.25		3.15	
	17	Video	2.35		2.14	
	18	Theme	3.64		3.47	

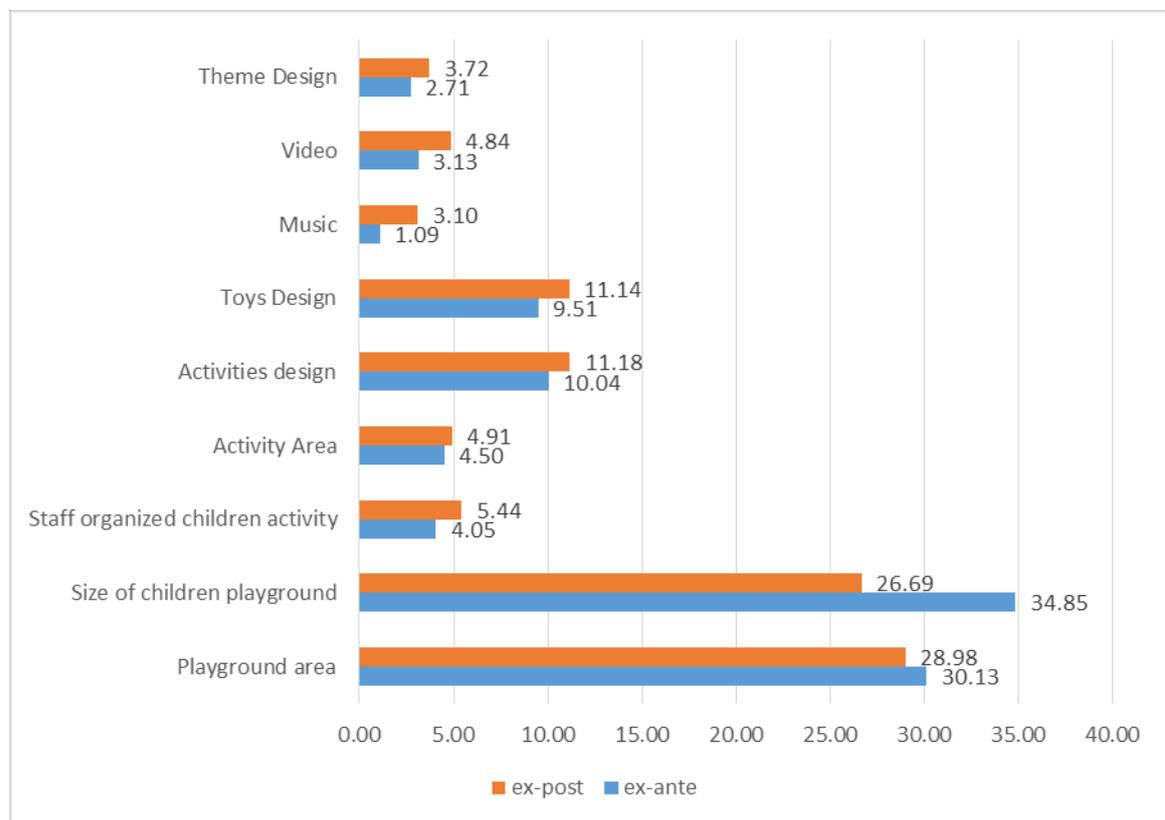
From the above table, the Spearman rank order correlation between stated importance in the ex-ante and the ex-post stage, obtained from the rating scale, was 0.633 and statistically significant. “Family Activity Types” was the most important domain in both stages. “Playground design”, “Individual Involvement”, “Activity Area”

and “Family Interaction” were among the most important attributes too. “Video”, “Music” were the least important features in both study settings.

Difference in conjoint analysis

Figure 4.3.5 presents the relative importance of attributes in percentage terms for both stages. The Spearman rank order correlation of the derived relative importance from the results in two stages was 0.967. This correlation is considerably higher than the corresponding correlation of 0.64 for the stated importance from the rating scale.

Figure 4.11 Difference in Willingness to Pay (WTP) and Payment to Use (PTU)



The figure shows that in both ex-ante and ex-post stage, the most difference exists in Size of children playground and Playground area. However, there is slight difference between the two stages. The size of children playground holds the most relative importance of attributes in percentage in ex-post stage while Playground area has the most relative importance in ex-ante stage.

T-test

Table 4.18 Willingness to pay in ex-ante and ex-post stage

Stage	Mean	Std. Deviation	T Value	P Value
Ex-Ante	49.73	28.660	-2.265	0.023*
Ex-Post	47.66	37.237		

* $P < 0.05$, ** $p < 0.01$;

From above result of T-test in Table 4.3.2, the T value is -2.265, and P is 0.023, all is less than 0.05, it indicates that there is significant difference of willingness to pay in ex-ante and ex-post stage. The amount of payment in ex-post is higher than in ex-ante that indicate that customers are willing to pay more after visit than they previous indicated. Therefore, the real visit of site has positive influence in customers' perception in payment.

Chi-square

Types Of Use	Ex-Ante(%)	Ex-Post(%)
Pay for Service	26	28
Pay for Souvenir	46	47
Pay for Donation and Charity	26	25
Total	100	100

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.018a	2	.991
Likelihood Ratio	.018	2	.991

As it can be observed from above table, the result is almost the same compared between ex-ante and ex-post stage. Most guests choose “Pay for souvenir”, while “pay for donation and charity” and “pay for service” almost the same. However, result of chi-square indicates that there is significant difference of the amount of willingness to pay in ex-ante and ex-post stage, and insignificant difference in payment to use.

Internal consistency

In the ex-ante stage, within playground design domain, the conjoint analysis measures derived importance and the stated importance. From the rating scale that represents a comparable internal measure for internal consistency. Because the two approaches were different measures of the same construct from the same respondent, and rank correlation can be applied. The rank correlation between derived importance and the stated importance in the ex-ante stage was 0.767. Similarly, in the ex-post stage, the rank correlation between the two measures in the ex-post stage was 0.833. Thus, the result shows that measures of attribute preference in the ex-post stage were more internally consistent than those in the ex-ante stage.

Summary of section

Considering two models were defined in order to identify factors affecting consumers' differences in their WTP for designed prototype before (ex-ante) and after (ex-post) the experimental test. Results show that the CBC does have an important role in defining respondents WTP in internal consistency.

Participants in ex-ante stage tend to rate higher on importance of attributes than participants in ex-post stage. In conjoint experiment, participants also reveal a different preference in attributes. This tendency suggests that responses were different over the choice experiment in these two stages. Since in the quasi-experiment, sample confounds have been minimized (participants were all parents or supervisors with experiences in hotel accommodation, and supervising children), alternative explanation for the observed differences that are rooted in the task environment. However, certain methods and techniques could reduce such bias (Landry and List, 2007; Mitani and Flores, 2010). It is left for future investigation. The results in this study suggest that revealed preference (RP) behavior data should have greater criterion validity than stated preference (SP) willingness to pay responses.

Moreover, the Spearman rank order correlation of the derived relative importance is considerably higher for conjoint experiment than from the rating scale. The results is consistent with the research conducted by List and Gallet's (2001) and Murphy et al (2005). They find that choice-ended value elicitation questions, which include dichotomous choice and conjoint choice, reduce the hypothetical bias.

For the amount of WTP, the results shows people in this study were willing to pay more after they visited the site. Previous studies on WTP shows an inconsistent result in the hypothetical bias in stated preference. However, some scholars

researchers' shows participants tend to pay more in hypothetical WTP situation relative to respondents actual WTP in both situations (List and Gallet, 2001; Murphy et al. 2005; Harrison, 2006). Some present there is no significant differences in the amount of WTP (Johannesson et al, 1998; Carlsson, F., & Martinsson, P. 2001). Furthermore, Homburg et al (2005) confirmed that the satisfied customers tend to pay more than their stated WTP. Homburg's result may explain the reason of the increased WTP in ex-post stage. Participants would like to pay more because they experienced and satisfied with the designed service provided on site. Another reason may be the conjoint experiment of price strategy carried at the same time for customers in the second stage, which in some certain extend influence the customers' perception on WTP.

Even there are many researchers observed the differences between the stated preferences and revealed preference, there is still a lack of explanation why people may give differential preference on a survey than they would be actually do in an experiment (LOOMIS, 2011; Mitani and Flores, 2010). Since this study is generally based on Utility Theory, and it is hoped the result of comparison between RP and SP generated here could provide more empirical evidence for a well-developed theory about respondents behavioral response in real and hypothetical situation in the future.

Tourism and hospitality with the technique of conjoint analysis have been growing in popularity, and particularly in the new product design arena. The findings reported in this investigation indicate that researcher can expect to observe different results depending on the interview stage. The findings also indicate that the data conducted in the ex-post stage may be actually more superior to the data in ex-ante stage in estimating attribute preferences using conjoint analysis.

4.3.4 Summary of section

In the first section 4.3.1, results of observation provide insights of the overall performance of designed solar children playground. Information and data were collected during 10 months trial run.

Then, in the section 4.3.2, it adopted five price settings based on observation and literature were designed. Price setting is designed based on the result of the previous observational methods to examine the preference of charging modes. Results of the ranking of levels indicate the importance of perception of each levels among customers.

In the section 4.3.3, it also conducted quasi-experiment by examining visitors' preference separated in ex-ante and ex-post stage for validity. The findings in this investigation indicate that researcher can expect to observe different results depending on the interview stage. The findings also indicate that the data conducted in the ex-post stage may be actually more superior to the data in ex-ante stage in estimating attribute preferences using conjoint analysis.

Chapter 5 Conclusion, Contribution and Implication

This chapter provides conclusions, contribution and implications of the research. It begins with the overall conclusion of findings regarding to three research objectives in Section 5.1. In Section 5.2, the study shows the theoretical, managerial and design contribution. Section 5.3 reveals the implications of finding from two aspects, one is the workability of solar concept embedded into souvenir co-creation activities, and the other is hotel as a hosting platform for a constructive hospitality service design method. Limitation and future work are also discussed. The last Section 5.4 is the summary of this chapter.

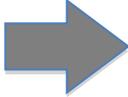
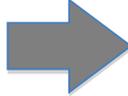
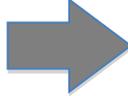
5.1 Review of Major Findings

This research provides a descriptive account of the creative and design-led inquiry of how to embed solar concept into children service in hotels, inspired by and grounded in the empirical experiences of hotel children service and solar related product. Thus it presents a designed prototype in practice, demonstrating its real-world efficacy and social value within the research endeavor at hand.

The study explores solar-themed design for children program in hotels. It is an attempt to investigate if the involvement of renewable energy concept can create a hospitality experience in practice. The research adopts social science theories and design orientations. Novel concepts and improvement scheme pump out. The empirical work aims to advance understanding of hotel practices in relation to solar technology.

The research began with an environmental analysis in marketing field to explore the existing children service design in hotels.

Table 5.1 Results and discussion – objective 1

Sub-objectives		Findings
a. To identify attitudes and levels of hotel children service		Full profile of features 5 domains 18 relevant attributes 53 levels
b. Examine the preference difference between business and leisure travelers		Insignificantly difference in preferences
c. To design a optimal attributes portfolio of hotel children service		Find the utility of each level within attributes; Rank the attributes by their relative importance

Then, in a sub-segment search for constructive paradigm, the study proceeds to discuss how should this study form the design and develop a prototype of “solar themed children service” called Mini Solar Park. The content of the park was based on the information gathered from the literature, documents for iterative design process, discussion and meetings under industrial- academia cooperation.

After installation a real prototype, the investigation proceeded to conduct ten months’ trial run. During the period, the study carried out an on-field measurement and evaluation of the prototype. Quasi-experiment was conducted to examine the validation and internal consistency of the results.

- a. Zone 1 is the most popular zone, and then Zone 3 Integrative Zone, and finally Zone 2 Display Zone
- b. Guests preferred interactive activity is more popular than display learning activities
- c. Solar energy can be introduced into prototype design through interactive games and experiment
- d. New ideas was generated during the design process
- e. Service staffs were important in stimulating behaviors
- f. The co-creation of solar toys was the most popular activities
- g. Hands-on solar experiment was a best way for learning solar energy principles

5.1.1 Environmental analysis: identify attributes of hotel children service for business and leisure family guests

Objective 1 is achieved by using environmental analysis to ascertain the determinant attributes of the proposed children service in hotels. Customers' perception on this attributes and levels was used to evaluate the rank and weight of each attribute. The finding of industrial practice of children service provides the foundation of design attributes. Although family service has been explored in the previous literature since the 1990s, it was discussed only at a primary level. The developed dimensions and attributes in this study provide a better understanding of the phenomenon.

The finding indicates that the current hotel family service needs to be improved and more features should be offered to customers. A suggested design of family service for hotel is the output derived from the data collected through analysis. The result provides detailed guidelines for features and services design of children service in hotels.

The findings obtained offer design teams and managers a clear idea of the characteristics of the specific segments that attract both business and leisure travelers alike. The findings also show that business and leisure travelers have no significantly different preferences with family services at hotels.

The study also found that, while some debates about the different demand between business customers and leisure customers, business and leisure customers' preference for children facility were found not to be valid in the design of hotel family service context. Therefore, there is no special need to distinguish business travelers and leisure traveling in designing children service. Also, the importance of some attributes and levels such as personal selection, safety management, health concern and security measures was emphasized in the previous literature for family experience in hotels are re-considered in this study, (Makens, 1992; Gaines et al,

2004; Belch & Belch, 2004). The finding provides more specific and valid examination of customers' preference for design profile.

5.1.2 Prototype design: design a new and experimental solar themed children service prototype in hotels.

The second section documents how to conduct the interactive design of prototype and reflects on strengths and weaknesses of the current design. This design stage constructs collaborative process that generates innovative feature with business value that is the core of this research project.

The nature of this process is user-centered design approach. It follows the classical design procedure from Plan, to Design, then Develop, and Deploy. The process in real application is a cyclic process and may repeat several times. Due to time limitation, this study only operates the whole process once.

In the planning part, research data were collected to understand customers' preference requirement and details, in order to generate a design plan. In the design phase, when the basic information of the application is ready, systematic method was used to design the conceptual layout and high fidelity prototypes. For development, it comes to resolve the implementation issue. In deployment phase, comprehensive usability tests on the designed prototype were conducted to provide recommendations for the refinement in the next version of the release.

In this section, the study outcome is achieved by completing the design process incorporating two major approaches to set up real prototype, one is physical design, and the other is service design. For physical settings, it includes the features, which are based on but not limited on the previous analysis of hotel children service in

section 4.1. The indoor venue is divided into three areas for the multi-functional design purpose, and two areas for the outdoor space. Each area has its specific functional purpose. There are separate areas for holding interaction displaying exhibits, and placing traditional setting for indoors. For the outdoors, there is an area for BBQ and an area for games.

For the service design, one of the innovative ideas generated. The research has considered a space for visitors to participate in solar souvenirs co-creation that leads to create solar toys by themselves. The empirical findings in environmental analysis revealed that there has been a proliferation of souvenirs amongst tourists. Previous findings also show that Do It Yourself (DIY) activities are prevalent nowadays in children's activities.

A major element of the designed prototype is that, beyond its original physical entity, solar concept has evolved and dominated the service and hospitality design in the way of design rationale in this research. This innovation is based on the interpretation of the concept of tourism product model by Smith (1994) who asserts that tourism product should set physical entity as the core, and then service. Tourism product of a firm is an integrated whole of five components, — physical plant, service, hospitality, freedom of choice, and involvement, instead of separate components by themselves. The study sought new perspectives on the social impact of introducing solar concept into the service encounter.

5.1.3 Prototype evaluation: examine the guests' attitude towards the designed prototype as well as customers' willingness to pay

In this part, the research is particularly interested in exploring charging issues accompany with this novel product. In presenting a creative price setting in product

operation, it demonstrates the potential contribution of design practice to an interdisciplinary research program delivering understanding on marketing strategy of product design concerned by the hospitality industry.

In this part, three types of tests were employed to evaluate the prototype outcome. One is the observational method, another is perception study of willingness to pay, and the last is the quasi-experiment for validation.

For perception study of willingness to pay, this research uses conjoint analysis to weight the importance of different price settings. In order to compare the stated preferences with the actual preference as well as the evaluation for designed prototype, the quasi-experiment method is adopted to find the bias between the two. The experimental set up enables different elements of the framework and different stages in the framework to be studied across two levels of contexts: ex-ante and ex-post. The two-context experiment ensures the validity of the study. The quasi-experiment also provides the evidence for verifying a contingency theory for understanding how realized tourists' behaviors varies systematically from that planned.

As findings in this section, observation provides insights of the overall performance of designed solar children playground. Most children played alone without supervisors in the playground. Zone 1 (traditional zone) is the most popular, and then Zone 3 (Interactive Zone) and Zone 2 (Display Zone). Results show that the more ages children have, the more tendency they prefer Zone 3.

Based on observation and literature was designed, price setting is designed based on the result of the previous observational methods to examine the preference of

charging modes. There are five price settings including Pay for Entrance, Facilities usage fee, Pay for interested DIY activities, Take-away souvenir, and Donation fee. The finding shows that the most important levels is Entrance for free and the least important level is Pay for Entrance.

The findings of quasi-experiment in this investigation indicate that researcher can expect to observe different results depending on the interview stage. The findings also indicate that the data conducted in the ex-post stage may be actually more superior to the data in ex-ante stage in estimating attribute preferences using conjoint analysis.

5.2 Significant of the Study

5.2.1 Contribution to the theoretical development

This study serves as a preliminary attempt to introduce tourism experience design dimensions into hotel service design process and link customer participation with environmental relationship.

The theoretical contributions of the study findings about customer behavior research in the service and hospitality industries can be divided into two major aspects. One is the further development of the theoretical and empirical model by combining the conceptual tourism product design and tourism experiences. And the other is the testing on difference between stated preference (SP) and revealed preference (RP) toward the developed mini solar park based on the Random Utility Theory (RUT).

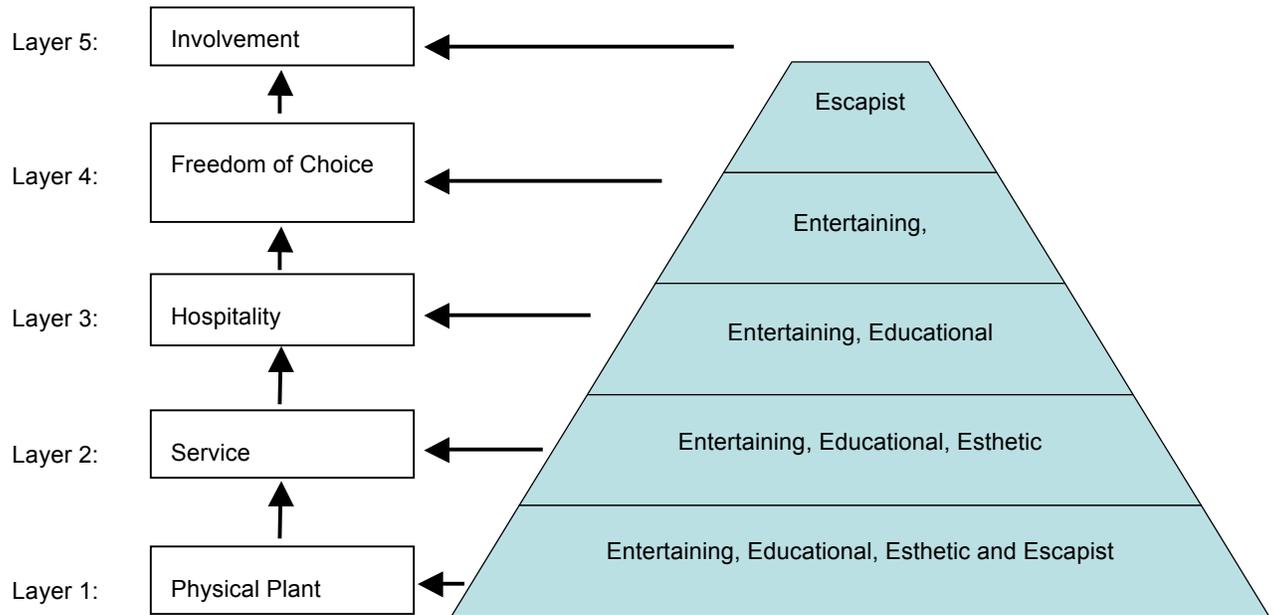
A. Combination of tourism product design and tourism experiences

Regarding to the former, Smith (1994) defines the nature of tourism products and develops the “components model” to break down the tourism product into five elements: physical plant, service, hospitality, freedom of choice, and involvement. Meanwhile, Pine and Gilmore (1998) originally suggest four design dimensions in tourism products: education, entertainment, escapist, and aesthetic. The four design dimensions of tourism experience are used in tourism product design in this study. By reviewing the concepts of product design and experiences, the current study combines Smith’s five tourism product elements model with Pine and Gilmore’s four realms of experiences model for the proposed prototype design as detailed in Section 2.2.3.

Figure 5.1 Experience-based tourism product design

Tourism Product design Process
(Smith, 1994)

Tourism Experience (Pine and Gilmore, 2011)



As shown in Figure 5.4, there are five layers of product design. The design process starts begins in layer 1 (i.e., physical plant design) and ends in layer 5 (i.e., involvement setup), with experiential elements added in each step. Value can be created through each step to reach a final desirable tourism experiential product. The first layer is the physical plant, which is the starting point of every tourism product design (Smith, 1994). The physical plant should be deliberately selected or designed to contain tangible facilities for entertainment, education, esthetics, and escapist purposes.

This study considered tourism experience in the design process from the early stages of the design process (Graefe and Vaske, 1987). Elements of tourism experiences are embedded into the tourism product design process.

First, the study took physical plant as the core of the entire prototype design as layer 1, and started with the consideration of its entertaining and educational or combined elements as major, features with esthetic and escapist elements as supplement. The designed prototype's physical attributes (i.e., dimensions, size, layout, composition, and features) is considered intensively with experiential quality (i.e., functionality, aesthetic, attractions, safety).

In layer 2, this research took service as the utilization of this physical plant for customers/visitors to enjoy the product. Service is organized by operators instead of being controlled by visitors. Three elements are combined into service: entertainment, education, and esthetic (i.e., co-creation games, activity organization, safety management, staff management, other departments' involvement).

Layer 3 is hospitality, which is the attribute or atmosphere operators can bring to customers. Tourism operators can present a friendly and relaxing atmosphere to customers while showing their social responsibility at the same time.

In layer 4, visitors can select education and entertainment; they can decide whether they want to be educated (e.g., follow the appeal to save energy) or entertained (e.g. use the entertainment service or facility).

The last layer is involvement, which is much similar to the escapist element. Tourism product or destinations can ultimately create an environment for people to indulge in the activities by using music, video, interactive games,

Concepts define the strategic goals of the product launch. Thus, product design and experience design is created at the outset. The process confirms that the tourist product is fundamentally a complex human experience, which is an output of a production process where tourists utilize the facilities and services to generate the final output: tourism experience.

B. Another contribution of the study is the establishment of a real prototype in three stages.

The first one is a synergy of two existing primitive models –Smith’s tourism product design model and Pine and Gilmore’s tourism experience design model to form a hybrid model which is filled with substantial explanation.

The second is to the establishment of a tourism product prototype (mini-solar park in hotel) based on the above developed hybrid model for tourism facility design. This work represents a test on whether theoretical (hybrid) design model can lead to the realization of the conceptual product and progress to the prototype stage. That is a research effort driven evolution in the theoretical development process.

Thirdly, the successfully built up prototype based on the development design model is further served as a platform for testing on customers’ willingness to pay, customers’ preferred attributes and the difference in behavioral response before and after the establishment of the prototype. The testing is all based on academic and theoretical methods (RUT, conjoint analysis, quasi-experiment). These empirical tests represent, to a large extent, an optimization of the developed hybrid design model and its prototype.

In sum, the research is a progression of existing tourism product design models by advancing relevant models in the three different stages of theoretical development.

C. Creation of knowledge about preference and revealed preference for the prototype using the random utility theory

This research also provides future knowledge in the tourism and hospitality field by comparing the stated preference (SP) and revealed preference (RP) for the prototype based on the Random Utility Theory (RUT).

In this research, the Spearman rank order correlation of the derived relative importance in ex-ante and ex-post stage is considerably higher for conjoint experiment than the rating scale. The result is consistent with the research conducted by List and Gallet's (2001) and Murphy et al (2005). They find that choice elicitation questions reduce the hypothetical bias.

For the amount of WTP, the results shows people in this study were willing to pay more after they visited the site. Previous studies on WTP shows an inconsistent result in the hypothetical bias in stated preference. However, some scholars' research shows that participants tend to pay more in hypothetical WTP situation relative to actual WTP in both situations (List and Gallet, 2001; Murphy et al. 2005; Harrison, 2006). Some other work shows that there is no significant difference in the amount of WTP (Johannesson et al, 1998; Carlsson, F., & Martinsson, P. 2001). Furthermore, Homburg et al (2005) confirmed that the satisfied customers tend to pay more than their stated WTP. Homburg's result may explain the reason of the increased WTP in ex-post stage in this study. Participants would like to pay more because they experienced and satisfied with the designed service provided on site.

The finding may also be ascribed to the conjoint experiment of price strategy being carried out at the same time for customers in the second stage, which influence the customers' perception on WTP to certain extent.

While there are many researchers noting the differences between the stated preferences and revealed preference, there is still a lack of explanation why people may give differential preference in a survey and in an experiment (LOOMIS, 2011; Mitani and Flores, 2010). Since this study generally follows Utility Theory, the result of comparison between RP and SP generated here could provide more additional empirical evidence for a preference and WTP theory particularly about respondents' behavioral response in real and hypothetical situation in the future.

5.2.2 Contribution to the managerial practice

Hotel staffs and researchers were engaged in the research in different ways at different times as 'partners' in co-producing design considerations and evaluation that followed.

a. Provide future insight for hotel valued added service

Tourism is facing great challenges, namely the need to adapt to climate change and the need for new product development to gain competitive advantage in the market. The declining number of resources for attractions and the shortage of new tourism products hinder the continuing development of the tourism industry (Weiermair, 2004). This research designs a novel solar-concept children service as a new form of value added service for hotels. The developed prototype provides insight for hotel innovation to increase their competitiveness to achieve improved services and products in future.

On the other hand, using solar as the eco-concept in hotel service design can help hotel to increase their competitive advantage (Manaktola and Jauhari, 2007). By announcing their eco-friendly initiatives hotels can gain positive preferences from the customers who are environmental supporters. Most of the common finding is that a customer's eco-friendly attitude has a positive effect on green hotels' business (Gelter, 2009). Their studies confirm that the customers who favor eco-friendly activities in their daily life are willing to stay at environment-friendly hotels. Such hotels with effective strategies of advertising their eco-friendly practices will improve their customers' overall perception of their establishment (Holleran, 2008; Han et al., 2009).

b. Advanced design concept

This research provide a detailed design process of novel solar-concept children service from concept formation, installation, design price setting, to evaluation. This experimental design process provides a complete answer to the complex question of how to design innovative hotel service with scientific approach. It also provides grounded advice on how to embed solar concept into hotel service, and make this as an attempt for further eco-service design in hotels. Hotel owners and designers in the related field can take this as a reference for future design attempt.

The other wide variety of ways such as pictures, exhibits, and chess game can inspire customers to arouse interest in solar-concept products. Interactive behavior including hotel staffs with children, parents with children, and hotel staffs with parents is encouraged. Other attempts relating to study behavior such as rewards (toys, candy, and medals) to stimulate the interest for in-depth study of behavior are also useful.

c. Provide social benefits

The testing prototype has a generated beneficial or favorable impact on the hotel industry, hotel guests, and nearby community. It provide future insight for hotel valued added service

This research designed a novel children service based on soar concept as a new form of value added service for hotels. The studied hotel has established solar energy driven facilities – hot water and lighting provision for its SPA center. The developed prototype provides insight for hotel innovation to increase their competitiveness to achieve improved services and products in future.

On the other hand, using solar as the eco-concept in hotel service design can help hotel to increase their competitive advantage (Manaktola and Jauhari, 2007). By announcing their eco-friendly initiatives hotels can gain positive preferences from the customers who are environmental supporters. Most of the common finding is that a customer's eco-friendly attitude has a positive effect on green hotels' business(Gelter, 2009). Their studies confirm that the customers who favor eco-friendly activities in their daily life are willing to stay at environment-friendly hotels. Such hotels with effective strategies of advertising their eco-friendly practices will improve their customers' overall perception of their establishment (Holleran, 2008; Han et al., 2009).

The designed solar prototype also provides a good venue for hotels guests, especially children guests with a pleasant place to stay when they accommodate in the hotel. Furthermore, children guests could also learn the solar knowledge when they enjoy they stay.

The prototype service also creates attractions to nearby residents and communities as leisure activities. As Cantonese has a "multi-meal" habit- morning tea, lunch, afternoon tea, dinner and super, they appear to prefer trails in the new experience associated with services for their teenagers and kids.

d. Provide financial benefits

During the 10 months trial run, the financial benefit of the testing prototype can be classified into visible benefits and potential benefits.

Visible benefit is reflected by selling solar toys to customers. There were totally 10 solar cars being sold to customers, the total revenue were 250RMB. All receipt ploughed back to purchase more solar toys for research purpose.

The potential benefit of this prototype is more obvious, and provides implications in future research. From records of daily operation, it can be seen that guests are interested in this prototype and there are inquiries of different types of solar products.

Besides, it is noted that parents care about the payment. They will ask if it charges for playing before going into the small playground and they prefer to play it unless it's free. Parents who come to the hotel for morning tea or banquet were unwilling to accept the ticket for entrance.

Guests who come for morning tea usually stay in the hotel just for a while and their children always have a fun in the small playground. If requiring for the ticket, they will feel unpleasant for the high payment just for short time of fun.

However, for the crowded problem on weekends, charging extra money is suggested during the peak time on weekends (9:00-10:30 A.M.) It could control the number of children in the playground.

For activity payment, it can follow the way as mentioned above, namely for DIY drawing toys, "free for playing in the small playground, but paying for taking them home"; for solar toys that are easily worn, "paying for playing".

The potential financial benefits could be revealed when the prototype become a real product installed in hotels

5.2.3 Contribution to the design practice

First, the study has provided a reference for design practice in the areas of physical and service design specifics for children. Secondly, these referable designs are supported by research experiments and collected data which demonstrates the workability of combining research and design.

The current study agrees that physical elements make up the core of the environmental effect on tourists and that travel experience should describe as how tourists desire particular experiences from the physical setting itself as well as from the service infrastructure that supports their visit (Oddou et al., 2000; Joppe et al., 2001; Kim and Prideaux, 2005). The designing process contains physical component as the core in the design process. As an important carrier of a service, the physical component provides an entity for hospitality service on the fore ground. The designed prototype can also be considered as a product service system, shifting the focus from designing physical product only, to designing a system combining tangible and intangible components that are jointly capable of fulfilling specific customers' demand. On the other hand, this study focuses on the concept of physical components and specific activities within the scope of children's amenities. The study also extends to the entire hotel with the children play area as the core. Other amenities including restaurant, front desk, and other technical departments, constitute a generalized physical definition of the product. Given that most hotel amenity design papers focus merely on the designed amenity, this study has provided another type of experimental design via empirical data collection and reiterative processes.

The third contribution is the realization and enrichment of the four conceptual academic dimensions (entertainment, education, esthetics and escapist) of the tourism experience model in tourism product design. The ways to design the children

facility and service in this study following the four dimensions provide a guidance for designers in future design in this area.

However, Smith's tourism product model lacks the role of human experience. Komppula (2005) suggested that tourism experiences from the demand side should be incorporated into the tourism product design. In addition, considering that the tourism product is an output of a production process where the tourists utilize the facilities and services to generate the final output: (tourism experiences). The designed attributes should be filled intensively with experiential four dimensions.

In these regards, the study experience suggests that design should consider the relationship of hotel guests' entertainment activities with family as the unit. Children's recreational activities should not be planned as alone system. Whether members are family interaction or individual involvement, the most prominent features in the design for the entertainment of the solar concept should emphasize on its participation, diversity and familiarity in recreational activities. Thus, future design of similar kinds of park should take use of this aspect.

The second dimension is education. Due to the limitation of physical condition, it is not expected to establish a perfect comprehensive educational environment through the designed prototype, rather as a platform providing educational products as part of the service. One of the design purposes is to enable children and other participants to learn solar knowledge by involving them into solar related activities.

Unlike entertainment, the education process is an active process, the educational dimension of an experience involves an active participation in the event from which the customer acquires or increases skills and/or knowledge. In order to stimulate the

initiative, a stimulus is needed to arouse fun, which is one of the main points of design, but it is also where the difficulty is.

The above experience in initial stage drives investigator to consider a more complex design space that embraces wider playground ecology. That is the cartoon characters in animations are used to foster playfulness of newly designed solar games, encourage different forms of participation and enhance attraction for the shared consumption of solar-souvenirs. A key insight gained is that having a goal-oriented component to the solar games is able to confound more playful interaction than just by giving souvenirs or rewards.

According to the situational theory developed by Professor James E (Grinig, J.E. 1966), the level of involvement determines the extent that people are interested in the issues. Therefore, interactive solar related activities were developed to encourage participants to involve in DIY activities. Solar car, solar aircraft and solar related experiment were taken as stimuli. There are also other varieties of ways such as pictures, exhibits, and chess games to inspire customers to arouse their interest in products. At the same time, interactive behavior was also encouraged. The interaction may include hotel staffs with children, parents with children, and hotel staffs with parents. Moreover, other attempts relating to study behavior is encouraged, for instance, by rewarding candy and medals to the children. The reward may stimulate the interest of participants to take part if the in-depth study of behavior too.

Some of the children in designed playground struggled to complete tasks and took time to establish their personal solar plane or solar car within the game and obtain medals as a reward. It is also noted that, during the trial, players play with the solar souvenir and try it with solar radiation without thinking about its educational purpose.

This indicates that future design should avoid this problem, — over participation “submerge” in learning.

The evaluation thus highlighted a tension in the design space, that is the tension between providing a task and providing a playful interaction. It is found that many participants were interested in self-made solar toys. But, participants also struggled to start to use it at the beginning. It is observed when hotel staff intervene by encouraging them and showing the users the procedures, the users are more willing to play with it. When one user find the playfulness of the toys, he/she would introduce the “new” stuffs to other children, and more children will participate and play together.

For design of esthetics, it is thought design and physical setting appearance are closely related. Because according to the Pine and Gilmore (2011), the esthetic dimension refers to consumers’ interpretation of the physical environment around them. Aesthetics is critical because it serves as the atmosphere that consumers used to measure the quality of a hotel and resort. Atmosphere in previous studies on hotel environment and entertainment has identified the inclusion of the effects of music, color, lighting, and style on producing the desired atmosphere (Countryman and Jang, 2006).

Another essential issue in designing an adjunctive product is the cooperation with the existing atmosphere and being “not offensive” to aesthetic tastes. In his design thesis, Blunt (2006) provides a typical example of a Canadian hotel room design, which consists of varying shades of beige, avoiding too colorful or too achromatic shades. He mentions, “In a way, I have adopted this notion of 'balanced' coloration. The conservative approach is not too much or not too little, but rather a balance of both in order to avoid any extremes which might be offensive to some.”

However, in the given solar park context, participants wanted the place to offer a more exciting and immersive experience, including background music, food, snack and other service such as restroom as service supplement. On reflection, it is subsequently identified as a key design challenge. The supplement service must be collaborative and in harmony with design of with the children playground.

The above analysis indicates that this design opens up many opportunities in the form of customized hospitality services to visitors and caters a wide variety of individual tastes. However, customization is not easy to be implemented due to the diversity of options to accommodate individual guest preferences. Customization may also meet difficulties at an operational level.

Therefore, this research helps hotels in conducting research, investigating product marketing and operational activities. The data obtained highlight areas which can help maintain the designed service, within the operational capabilities of the firm. It is suggested that the design considerations emerging from this case may have wider applicability in related learning or settings where novel concept may be used in conjunction with hotel service with more innovative and ecological concept.

5.3 Implications, Limitation and Future Work

In this section, the research first describes the implication of the findings on the designed solar-themed children's service prototype, in particular, the embedded designing concept in this novel form of service encounter. The prototype design reflects the infrastructural challenges and innovative aspects present in the hospitality and tourism industry. The discussion also provides higher-level design

considerations and socio-technical insights that have been refined through the design content that provides insight for the future study.

The deployment aimed to explore the technical possibility of solar energy as the theme in children service design. Thus, this is a novel product in the hospitality service. In addition, the study also investigated the social aspects of the designed product in enhancing the overall accommodation experiences for family visitors and the implication of the proposed product in future hospitality and tourism product design.

5.3.1 Embedded solar concept in souvenir co-creation activities

The research has explored the notion that souvenirs co-creation is an effective way to encourage guests to involve into intensive activities about solar knowledge. To recap, the empirical findings in environmental analysis revealed the proliferation of souvenirs amongst tourists. Set against this, the research observed souvenir co-creation activities is a trigger for souvenir purchase behavior. Therefore how to cultivate and sustain children and guests' interest in souvenir co-creation activities is one of the major issues in the designing process.

In this design response, the research embraced the idea of configuring the characteristics of designed prototype to retrofit the original hotel children's service encounter using novel ways. These systems and their associated services could afford hotel guests greater flexibility in managing their time and activities. Further, these systems also allow them to experience souvenir co-creation, an activity that they apparently enjoyed. The data from the on-site monitoring results also indicate positive response that the establishment of this novel arrangement benefits all members in the family. The value of this designing notion lies in the combination of

the characteristics of practicability, playability and participatory nature of the solar energy application.

Again, interesting experience-economic implications are derived from this study too. First, the designed children service may afford visitors a personalized experience. Then, the operation of the service system would enhance guests' autonomy in terms of accommodation. The park may also promote a sense of 'value for money' by offering visitors flexibility in the extent to which its experiences is something they could create by themselves.

5.3.2 Hotel as a hosting platform for a constructive hospitality service design method

This section discusses the role of experimental hotel in the research design process. As a hosting platform, it is the place where service providers could deploy and operate their service, and where customers can access and invoke the service. The experimental hotel also acts as a platform demonstrating various children services and enabling personalization of visitor experience with one designed service system. It is also a place that offers a blended experience to hotel guests. The experience is unique and distinct from the environment of most hotels in the market.

Furthermore, the hotel is an inter-dependent system that contains different kinds of services, with each part of the service system as not being independent, but through hotels, as a service platform. This inter-dependent characteristic is demonstrated in the scenarios when family checks into the hotel front desk, the family is given information about the children's activities, the children's playground, dining in the restaurant and relaxing in the spa center. Furthermore, the hotel offers a breakthrough i.e. a new form of distributed service design, which caters for family interactive activities. The established mini-solar park encourages family sharing, by

using solar toys or other gifts such as candy and medals as stimuli, and organizes family activities for parents and children. It also provides a constant connection by using technical devices even when family members were apart. Thus, the research embraced the fact that the hotel is a hosting platform rather than just a playground for children.

The research also considers that the hotel is a place where visitors feel more secure by trusting the management. The research beholds the notion that guests perception of safety is influenced by the environment they are in. This is demonstrated by the comparisons made between previous studies and the prototype evaluation. People emphasized a lot on safety management in the design of optimal setting of children service in the hotel. However, in the evaluation part, only a few of them mentioned their concern over the safety issue. The environment might also have influenced their behavior in the hotel. Parents would leave their children with the playground staff, only if they feel their children are safe in there. Parents can enjoy their private time, only when they know that no harm would come to their children. The findings imply that more consideration of safety design is necessary.

5.3.3 Limitation of the study

Several methodological limitations have been related to the current studies about the proposed solar attraction prototype design. The first limitation of existing studies is linked with the evaluation of the weights of identified product attributes in the CBC. First, a CBC survey should only consider a selection of up to seven product attributes, otherwise the survey will get to extensive for the responding consumer (Scholz et al. 2010).

Secondly, a CBC can only estimate the preferences and utilities for product attributes and cannot provide conclusion of the general attitude and adoption intention towards the entire technology. But these latent variables may also have a distinct impact on choice decision and the purchase intention of an individual (Ben-Akiva et al. 2002; Walker and Ben-Akiva 2002).

The third limitation exists in the experiments. This study conducts an on-site experiment and establishes a prototype in hotel. There are a lot of uncertainties during the entire installation process. For examples, communication with hotel managers, implementation problems, safety concerns, hotel policy issues, and some unexpected incidences are the varying experimental conditions that have to be addressed by investigators. Thus, adjustment on plan is required. The study is not a strictly controlled experiment as found in laboratory or physical test. The research is just a quasi-experiment.

The fourth limitation is that since the physical entity of designed children playground is strictly restricted to the situation of experimental hotel and financial limits, so the design outcome of this study may vary with service levels, size of the hotel, and financial situation. However, the service concept generated in this study can be applied into many similar settings, for instances, interactive solar related activities and solar related experiment.

5.3.4 Recommendation for future studies

- Investigations of children's preferences regarding designed prototype are needed to determine for a more customer centered product design in the future

- Other renewable energy such as wind, biofuel, and hybrid power systems or geothermal could take into consideration for designing eco-themed children facilities in hotels.
- The designed proposal could be installed and applied in other hospitality destination to examine its feasibility such as theme park, Community Park, resorts.
- The role of staffs in designed solar park for interactive games deserves additional evaluation in the context of novel product design with customers' involvement.
- Solar-related toys with combination of entertainment and education for children and suitable for hotel environment is also necessary for future development.
- The development of methods to investigate long-term outcomes especially the Return on Investment (ROI) is required.

5.3.5 Summary of section

In this section, the research discusses the findings with a focus on following aspects.

It summarized conclusion of major findings of the study regarding to the three major research objectives. The theoretical and managerial, and design contribution shows the significance of this study. The implication of the findings from the designed solar themed children service prototype and findings reflecting upon some of the issues raised relating to a wider product design concerns outlined in the Introduction. The limitations of the study and future research directions are also provided insight of the future work.

Appendix

Appendix 1 Questionnaire of hotel guests' preference for hotel children program (ex-ante and ex-post stage)

Hotel guests' preference for hotel children program

We are carrying out an evaluation of Hotel guests' preference for hotel children program, to see if we can improve facilities and make them more relevant for our customers. Thank you for taking the time to fill in this questionnaire; it should only take 10 minutes. Please help us to fill the questionnaire with our staffs' assistant.

Your answers will be treated with complete confidentiality and just for academia purpose.

Section A (Demographic Profile):

✧ In the past two years, which types of traveling you have more experiences in?

(Please tick one): Business traveling

Leisure traveling

✧ In the past two years, have you brought your children in your business travelling?

(Please tick one):

Yes

No

✧ In the past two years, have you brought your children in your leisure travelling?

(Please tick one):

Yes

No

✧ Do you have any experience in hotel children service? (Please tick one):

Yes

No

✧ Please indicate your children's age. _____

Section B (the rating of hotel children service)

For each attribute, you are asked to state how important the feature would be in their purchase decision on a 0- 10-interval scale (0 = not all important, 10= very important).

❖ **Family Activity Types**

Family Interaction (eg. Family sport, Family dining, Family recreation)

()

Individual Involvement (eg. Children custody, Camping and Club)

()

❖ **Family service within hotel operation**

Welcoming gift in Front Desk (eg. Toys Cookies, candy and drinks T-shirt, caps with hotel logo)

()

Children Service in Restaurant (eg. children's menu, special discount for families, Dine package with toys)

()

Children Service in Guest Rooms (eg. children's television program, Toys in room children lavatory kit)

()

❖ **Safety Management**

Insurance Policy (insurance for safety concerns)

()

Monitoring Method (eg. safety notice call, remote CCTV monitoring)

()

❖ **Price Strategy**

Charging Mode (eg. pay for days, pay for hours, pay for activities)

()

The payment for use (eg. pay for service, Pay for souvenir, Pay for donation and charity)

()

✧ **Kids' Club design**

Playground area (eg. Separated indoor playground, Separated outdoor playground, No separated place)

()

The size of children playground (eg. Below 30m², Between 30- 100 m², Over 100m²)

()

Staff organized children activity (eg. Reading books for children, Teach skills and knowledge, Leading children with a tour)

()

Activity Area (eg. Indoor activity within hotel area, Outdoor activity within hotel area, Activity outside hotel area)

()

Activities design (eg. Entertainment dominated, Education dominated, enjoyment of art)

()

Toys Design (eg. Traditional toys, novel designed toys, self-handmade toys)

()

Music (eg. Light music, Classic music, Children's music)

()

Video (eg. Cartoon movie, children educational program, Children art program) ()

Theme (eg. Region-Specific Activities, Fairy World and Cartoon Character, Eco-theme) ()

Section C (Hotel children playground design):

Question: If a hotel provides a new attraction for you to visit, and the following alternatives are available, please fill“√” in your most preferred product from each choice set.

Alternative 1

Playground area;		Separated indoor playground
The size:		Below 30m ²
Staff organized activity:	children	Reading books for children
Activity Area:		Indoor activity within hotel area
Activities design:		Entertainment dominated
Toys Design:		Traditional toys
Music:		Light music
Video:		Cartoon movie
Theme:		Region-specific activities

Alternative 2

Playground area:		Separated indoor playground
The size:		Below 30m ²
Staff organized activity:	children	Reading books for children
Activity Area:		Indoor activity within hotel area
Activities design:		Education dominated
Toys Design:		Novel designed toys
Music:		Classic music
Video:		Children educational program
Theme:		Fairy world and cartoon character

Alternative 3

Playground area:		Separated indoor playground
The size:		Below 30m ²
Staff organized activity:	children	Reading books for children

activity:	
Activity Area:	Indoor activity within hotel area
Activities design:	Enjoyment of art
Toys Design:	Self-handmade toys
Music:	Children's music
Video:	Children art program
Theme:	Eco-theme

1. Please tick “√” one with is most preferred; and “X” the least preferred

- d) Alternative 1
- e) Alternative 2
- f) Alternative 3

2. For the alternative you have chosen, how much are you willing to pay for it?

— —

3. If you pay, which purpose you would like the payment to use?

- a) Pay for service
- b) Pay for souvenir
- c) Pay for donation and charity

Thank you very much for taking the time to answer the questionnaire.

Appendix 2 Observation Protocol

Title of Thesis

Solar Energy Technology as an Attraction in Hotel Children Service Program
– Quasi Experiment Approach

Objectives and Purposes

Research Objectives: III. Examine the guests' attribute towards the designed prototype as well as customers' willingness to pay qualitatively.

Purpose of Observation Study:

1. To keep operation records of the designed prototype
2. To observe children on a playground and record the number and types of actions
3. To examine the guests' attribute towards the designed prototype by in depth interview

Registration form

When visitors enter the mini solar playground, they need to fill the form as records.

Observations

During each shift, the observer managed the daily operation of the designed prototype, collected information, make records, and conduct interview. The observations were performed in both the children playground area and hotel

area nearby. During the observation period, the observers kept basic operating information as well as children physical activities which includes:

Demography Information	Physical Activities	Other information
How old the children are	How long they stayed there.	How they found the service
What the gender they are	Among designed three zones, which they stayed the most time, which they stayed the least.	What their overall opinion about the service
How many parents or supervisors they have, what their relationships were	What types of activities they like the most	
How many accompanies they have, what their relationships were	Duration of each activities	
Whether they are frequent visitors or not	The reaction of DIY solar toys	

In-depth Interviews

Questions for all interviewees:

Q1: What about this mini solar park?

Q2: what do you think of this theme of solar energy?

Q3: what do you think of the solar co-creation (DIY) toys?

Q4: What charging method is reasonable?

Additional questions if time allows:

Q5: From your point of view, how to improve this mini solar park?

Q6: Do you think the children's Park is feasible to set up in the hotel?

Q7: Do you usually take the children to the hotel (for accommodation /recreation)?

Q8: What is your purpose of staying in this hotel?

Appendix 3 Registration Form

Registration Form of Mini Solar Park

Please complete this form and return it to our staffs for registration. All information given will be treated with the strictest confidence and just used for academia purpose.

1. Personal Information

Please fill the required fields:

Your Name:	Contact number:
Occupation:	Your age:
Your child's name:	Your child's age:
Relations with the child:	

2. Information

1. What is your purpose of staying the hotel?	a. Accommodation	Dining	Recreation	Meetings	Others
2. Have you visited the mini solar park before?	Yes	No			
3. Will you stay with your children during their play?	Yes	No			
4. How long the stay do you estimate?	Less than 1 hour	1 to 3 hours	Over 3 hours		

Appendix 5 Transcripts of In-depth Interview

Interview 1: Time 2013-06-11					
Name	Hu Yuxian	Occupation	Worker	Age	40
Child Gender	Female		Child Age	2 and half	
Relationship		Mother			
Questions:					Attitude and tone
Q1: Do you think it is feasible to establishing children's playground in the hotel?					Positive
Very good, this is the first we enjoy this service, I had never seen it before.					
Q2: How about this mini solar park?					
..... Well, it seems too little, but just it is enough for a few children to play around, not too many people.					
Q3: How do you think about the solar energy as the design theme?					
It is novel and interesting. I have heard of solar energy before, but not familiar with it. I think it is beneficial for my children to acknowledge it.					
Q4: How do you think about these DIY solar toys?					
My child plays it the first time. It seems interesting, but is it very expensive?					
Q5: What price you would accept if we charge for playing this?					
Hm.... maybe free? If the price of solar toys is reasonable I might be willing to buy one.					

Interview 2: Time 2013-06-22					
Name	Ms. Liu	Occupation		Age	30
Child Gender	Female		Child Age	2	
Relationship		Mother			
Questions:				Attitude and tone	
Q1: Do you think it is feasible to establishing children's playground in the hotel?				Positive with some complain about the space	
Too small, too many children, not enough space					
Q2: How about this mini solar park?					
It should have larger space, so parents can stay in it as well.					
Q3: How do you think about the solar energy as the design theme?					
The theme is great, and place is combining education with entertainment. However, my child is too small, it might takes years for her to really understand the principle of it.					
Q4: How do you think about these DIY solar toys?					
They look nice. It is environmental friendly without electricity. My concern is it might be easy broken by my child.					
Q5: What price you would accept if we charge for playing this?					
I come to the hotel to eat, only play in here a little while. I don't think it is worth to buy tickets to play in it for a short period of time. However, if I live in the hotel and let my child play a longer time, tickets are relatively reasonable. But I prefer to pay for the DIY solar toy that is made by my child.					

Appendix 3 Questionnaire of Price Settings

We are carrying out an evaluation of Hotel guests' preference for hotel children program, to see if we can improve facilities and make them more relevant for our customers. Thank you for taking the time to fill in this questionnaire; it should only take 10 minutes. Please help us to fill the questionnaire with our staffs' assistant. Your answers will be treated with complete confidentiality and just for academia purpose.

Section A (Demographic Profile):

- ✧ In the past two years, which types of traveling you have more experiences in?
(please tick one): Business traveling
Leisure traveling
- ✧ In the past two years, have you brought your children in your business travelling?
(please tick one):
Yes
No
- ✧ In the past two years, have you brought your children in your leisure travelling?
(please tick one):
Yes
No
- ✧ Do you have any experience in hotel children service? (please tick one):
Yes
No
- ✧ Please indicate your children's age. _____

Section B

Question: If a hotel provides a new attraction for you to visit, and the following alternatives are available, please fill “√” in your most preferred price setting from each choice set.

Attributes	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Entrance fee	Pay for entrance	Pay for entrance	Entrance for free	Entrance for free
DIY activities	Pay for interested DIY activities	All DIY activities are free	Pay for interested DIY activities	All DIY activities are free
Carried home product	Pay for carrying home self-made product	Free to carry self-made product	Free to carry self-made product	Pay for carrying home self-made product
Donation	Donation is compulsory	Donation is compulsory	Donation is compulsory	Donation is compulsory

Please tick “√” one with is most preferred; and “X” the least preferred

- a) Alternative 1
- b) Alternative 2
- c) Alternative 3
- d) Alternative 4

Appendix 6 Project Proposal

**A Preliminary Proposal For
The Installation of Recreational Facilities In Mini
Solar Park Of Guangzhou Mount River Resort
Hotel**

**Guangzhou Mount River Resort Hotel Limited Company
School of hotel and tourism management of the Hong Kong
Polytechnic University
From June, 2012 to August, 2013**

Hereby declare

This proposal describes some preliminary ideas put forward by the Hong Kong Polytechnic University after its first investigation into Mount River Resort Hotel Guangzhou. These ideas are based on our awareness of the hotel's location, architecture, style, room types and needs.

With the purpose of meeting the hotel's demand, we will consult and communicate with the hotel and will adjust the project according to the actual progress in the process of installation. At the same time, we will implement the project carefully and responsibly so as to gain the final project results which are practical and effective.

Introduction

1. Project Objectives

There is no doubt that innovative and attractive tourism products are enhancing the competitiveness of tourism enterprises (Smith, 1994). However, the risk of the regional recession, environment pollutions, and the running out of tourist attractions has threatened to undermine its future growth. Within these concerns, promoting actions for sustainable and innovative tourism products held a core-role in maintaining the competitive advantage in Hong Kong tourism development (Travel & Tourism in Hong Kong: A Market Analysis, 2001). In order to plan for such tourism products, this document proposes a project with the innovative concept to develop a new solar collector system embracing a combination of functions: entertainment, education, and energy-saving (3E), as an attraction for tourists. This proposal includes the system description, the methods for installation, the 3E function development process, and a schedule for completing the projects.

Specially, this project has the following four purposes for the hotels:

1. Design a new and experimental solar system providing the combination of 3E functions for a new attraction for hotels.
2. By developing a multi-function solar system as an attraction in resort, this project will explore the new trend of solar energy development and also for better understand the tourists' attitude and acceptance to new industry technology applied in the traditional attraction place.
3. The innovative functions in this prototype tourism product will increase the attraction of the resort, provide a vivid education on solar energy, and disseminate more practical knowledge about the solar panel to the public and resort stakeholders.

4. Save energy and reduce the CO₂ emissions to enable a sustainable development in tourism. Enhance the hotels' reputation and the social influence to be the environment friendly tourism destination,
5. Promote the development of the innovation products, and build close relationship with the academics with the industry.

2. Scope and Background of the Project

Hong Kong is rich in its cultural heritage, innovation industry and geographic advantage. Benefiting from these features, it attracts the interest of tourists from all over the world (Hong Kong Tourism Board, 2008-2009). However, the risk of the regional recession, environment pollutions, and the running out of tourist attractions also threaten to undermine its future growth. Within these concerns, promoting actions for sustainable and innovative tourism products held a core-role in maintaining the competitive advantage in Hong Kong tourism development (Travel & Tourism in Hong Kong: A Market Analysis, 2001).

Hong Kong has three main potential competitive advantages to develop this solar-based tourism product. First, Hong Kong locates in the subtropical regions with abundant solar energy recourses where the annual mean daily global solar radiation is up to 14 MJ/m², when compared with 12 MJ/m² and 9 MJ/m² in Shanghai and London, respectively (Hui, 2000; HKO, 1999), Second, Hong Kong local travel industry leaders have a strong voice in the need for new tourism products as key drivers for competitive advantages cross the border to Southeast Asia. Local tourism commission has set one of its strategies as "A kaleidoscope attractive, a variety of sights and sounds with something for everyone." (Hong Kong Tourism Commission, 2006). The consultancy report also raised the establishment of the standard training

centers, ecological parks and exhibition centre in the hotels as an idea for development (Environment Protection Department, 2008). And third, Hong Kong attracted great attention on innovation products development in recent years. The government and public support make efforts continually to transform Hong Kong into an innovation hub with global links to China (Innovation and Technology Commission, 2009). Of course, there are other advantages such as, the establishment of sustainable development fund (the Fund), the enforcement of environment laws, but the first three make this conceptual solar-based tourism product an attractive option for Hong Kong tourism development.

Scholars supported the concept of applying renewable energy as an attraction in tourism (Dalton et al, 2007). Orams (1996 and 1997) identified several key factors that affect the acceptance of renewable energy facilities applied in hotels, besides the technical performance, others include the tourist preference, the public response, the aesthetic appearance and the educational meanings. Michalena and Tripanagnostopoulos (2010) examined specific features of thermal and photovoltaic solar systems and their contribution to the sustainable tourism development. They also suggested the combination of efficient solar system operation with aesthetic integration for tourism attraction, and concluded that solar energy could constitute a driver for the development of sustainable tourism by innovative methods.

3. Project Description

1. On-site installation: The solar energy system will be positioned on the chosen areas with the solar energy meters installed. The energy meters are connected to a computer in the demonstration area, so that all visitors who are interested can follow the system's energy production status on the

computer. Besides, this project will elaborate and deploy a simulator with instructions of usage for visitors. In addition, the energy modules with output measuring tools will be connected to the computer to see the working parameters of different energy modules for energy-saving evaluation. The wireless data transmission is also necessary because usually the solar collectors and the demonstrated area are not at the same place.

2. Developing 3E Functions:

a. This project will design an attractive appearance of solar collectors. There are different combinations of physical design of solar collectors in different colors, shape, panel combinations, dimensions, and the locations. Interview will be conducted to evaluate the effects of visual appearance of these combinations by tourists and their preferences.

b. Based on the researches on effective learning, this project will conduct an integrated approach to introduce and demonstrate this solar system through multiple media facilities. Interviews will be used to recognize the tourists' cognition domain and affective domain of this new system (Festinger L, 1957; Orams MB, 1995). The form and content will be designed for the distributed learning of tourists of different ages (McGowan and Sauter, 2003; Eagles, 1994). Other factors such as music, songs, comics, cartoon, computer/physical games, and toys will also be considered to enhance its appeal to visitors (Rossler, 1998).

c. To heighten the effect of the outcome, promotion measures and following up activities is suggested such as advertisement, brochures, and related websites providing information and knowledge of solar energy technology and updated solar products for visitors.

d. This project will conduct a comprehensive review to report the energy performance and economic feasibility of this 3E solar collector for its energy-saving functions.

Solar Energy Demonstration Area

Solar energy demonstration area consists of two parts: solar energy product demonstration area and multimedia demonstration area.

1. Solar energy product demonstration area includes:

- Some cartoon images are used to demonstrate solar panel products. It is hoped that a clear and vivid description of solar energy and principle of solar technology: including solar thermal and solar photoelectric effect can be accomplished
- The demonstration also includes solar fan, solar lighting, solar sculpture, solar energy car, etc, to inspire the thinking by participants on solar technology.

2. Multi-media demonstration area includes:

- Playing video and music, to create a pleasant environment, attract participants' attention and arouse their interest in learning solar technology.
- Interactive games: use computer animation to introduce the solar energy principles and environmental protection knowledge, participants can play designed computer games to have fun and also gain relative knowledge at the same time.

- Exhibition board is also used to display the current state and the future trends of solar technology. The layout chart and the effect picture of the interior design.

The Hong Kong Polytechnic University should take the following responsibility:

1 The costs of interior renovation, including carpets, walls, gypsum wallboard, part of the furniture, wiring and plumbing.

2 Design of the game

3 Purchase and exhibition of solar entertainment equipment, including TV screen, projector, and furniture

4 Solar products exhibition

5 Design of multimedia game

6 Installation of facilities and recreation equipment in the display area

7 Graduate students will work in the hotel for a year (half a year for the Hong Kong Polytech University and half for Harbin Institute of Technology). In addition to showing guests around, they also assist in installation, design of experiment, measurement, collecting relevant information (the weather, the quantity of hot water for measurement), analysis, writing report, consolidating and maintaining the facilities in exhibition area.

Before the implementation of each project, the Hong Kong Polytech University will provide a specific list of products (please refer to the appendix), installation plan, and site layout for the hotel.

Once the scheme is determined, the Hong Kong Polytech University will begin to buy equipment, contact the decoration company, and launch a series of renovation work. The project will be carried out in several stages, each stage consisting of about 2 weeks. The Hong Kong Polytech University will consult and communicate with the hotel before the start of each new stage and at any key point, keeping the hotel well informed of the progress of the project.

The hotel should assume the following responsibility:

The cost of all indoor decoration, furniture, equipment, and equipment which are directly associated with the project and the expense of the roof renovation is paid by the Hong Kong Polytech University. But because of financial constraints, it is expected that the hotel can provide appropriate resources, such as extra furniture or redundant equipment, to reduce cost and improve efficiency. In addition, if the hotel has additional requirements in the process of renovation, which should be discussed with the school.

The hotel gives to the student on site with expatriate subsidies of total 1000 R&B on a monthly basis.

This project lasts for 1 year, from the beginning of June, 2012 to the end of August, 2013. The preparation including installation, construction, and putting the facilities into use can be completed in 1-2 months. After the completion of the project, the hotel can take into consideration buying the whole research system at a reasonable price. The amount of the money paid by the hotel will be used as university research grantor or donations to charity. It is roughly estimated that capital cost (capital expenses, such as video or solar energy facilities, desk chair etc.) is close to HK20 million (not including the compensation and communication expense of researchers, interns, and teachers, which is paid by the Hong Kong Polytechnic University). Therefore, the total cost is estimated to be more than 250,000HKD.

Brianda JIANG will be the person in charge of the project on site. Project interns will probably begin their work in middle or late September. Before the interns start their work and the park is put into use, another assistant from the Hong Kong Polytechnic University will help Brianda with her work.

Generally, there are two resident individuals in the initial stage. When the project is on track, there will always one person stay in the site. Therefore, the hotel is expected to assign 1 or 2 employees who can assist them during the whole process.

IV Schedule

The project will last one year, from June, 2012 to August, 2013 and will be divided into five stages.

June, 2012	July, 2012	August, 2012	Sep to Nov, 2012	December, 2012	January, 2013	February, 2013	March to August, 2013
Stage1							
	Stage2						
			Stage3				
				Stage4			
							Stage5

	Description
Stage1	Preparation
	Discussion and primary design
	Material purchase
Stage2	Construction and installation
Stage 3	Operation and conduct experiment
	Interview and collect data
Stage 4	Analyze the data
Stage 5	Conclude, and summarize
	Report

Appendix 5 List of all Facilities of Mini Solar Park

Zone	Category	Name
Traditional zone	Layout of the scene	Small house
		Big leave
		Ball
		"Sun"
		Bench
	Dolls	Ring
		Small bear
		Banana
		Strawberry
		Carrot
		Cabbage
	Sports	DIY toys
		Plastic hammer
		Cushion
		Building block
		Basketball hoop
		Basketball
		Aero-plane Chess
Displaying zone	Photo and picture display	The pictures of the application of solar power
		DIY pictures by teenagers
	LED display	
	Object display	Small car
		Plane
		Boat
		Charger
		Robot
		Solar cap
Train		
DIY zone	Pictures DIY	Polar bear jigsaw puzzle
		Children's book
		Sand paper
		Sand bottle
		Coloring pen
		Coloring book
		Musk stickers
		Creative sticker book
		Brush
		Big blackboard
		Small blackboard

		Drawing board (repeated use)	
		Chalk	
		Crayon	
		DIY solar toys	Small car
		Plane	
		Boat	
		Robot	
		Train	
		DIY basic objects	Desk lamp
	Desk		
	Chair		
	Other zones	Sanitary	Shoe cover
Shoebox			
Hand sanitizer			
Products		Small car	
		Plane	
		Boat	
		Charger	
		Robot	
		Solar cap	
		Train	
Security		Shelter above the desk	
		Carpet and cushion	

Appendix 7 List and introduction of solar toys

Name of the Solar Toys	Pictures and description
DIY Solar Toys	 <p>It absorbs solar energy through its solar panels, power is obtained to engine the movement. It can be used as a key ring, also can be hang in the bag as ornaments</p>
Solar Plane	

It absorbs energy through its solar panels, power is obtained to rotate the propeller to fly

DIY toys, assembled the pieces according to the instructions

Solar Boat



It absorbs energy through solar panels, power is obtained to row in the water provides solar power for ships is the trend of the future of the shipping manufacturing industry

Solar Charger



Portable stand-by battery for outdoor activities, is used to charge mobile phone, digital camera, MP4 and other digital products

In direct solar radiation with charging for about 1 hours, it can provide about 1 days of standby time for normal mobile phone.

It has 5 conversion head in total, and can be applied to various types of charging socket.

It can be filled by putting it under direct sunlight for 8-12 hours, or access the power to charge 6-8 hours.

Indicator: Green -- is charging, out -- no charge or the battery is full

Red -- is providing power to digital products.

Solar Robot



It absorbs energy through solar panels, and it can power the robot to walk. Not only can it be assembled into a robot, but it can also be assembled into the tank, the Scorpion. As a popular solar toy, it is used to help understand solar energy and how it provides power to similar devices, and it also helps to exercise the hand-on ability by assembling.

Solar Cap



After absorbing solar energy, small fan can rotate and give a blow
not only the cap can block the sun, but also the fan can provide wind

Solar Train



It absorb solar energy though its solar panels, power is obtained to engine the movement

High simulation model, and like the real train.

**Solar
Ovens**

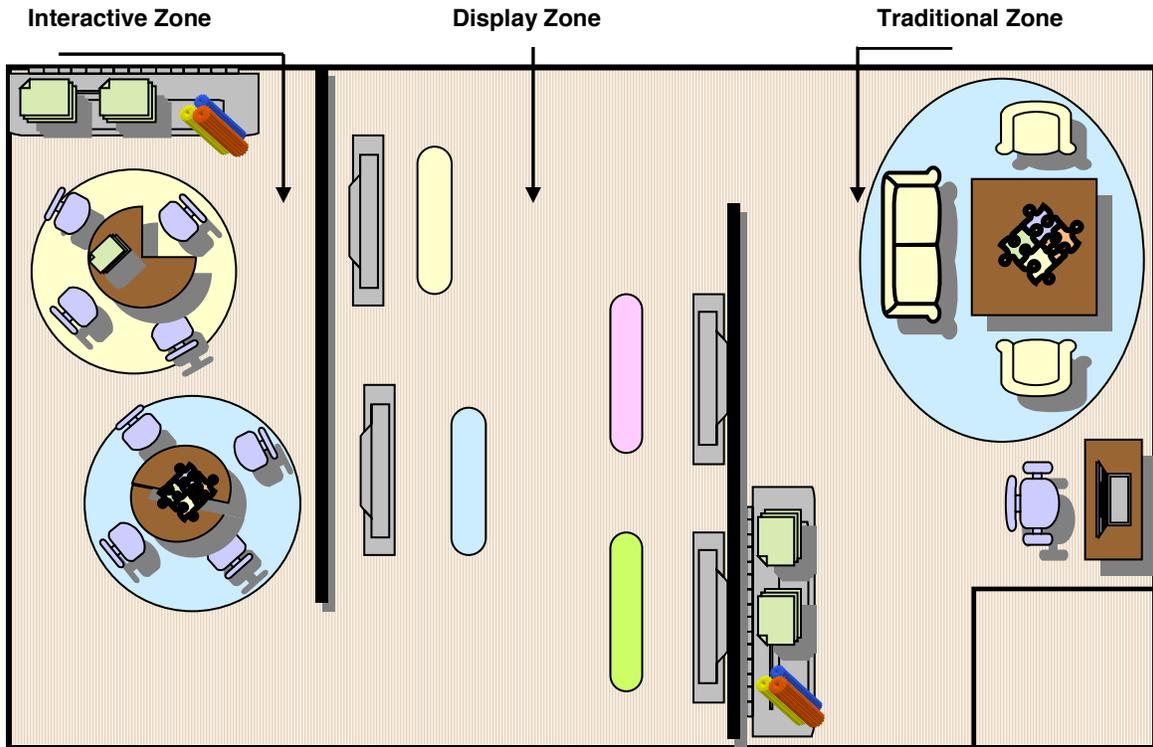


Food can be heated by putting it under the sun.

It is used as outdoor oven, easy to fold, and convenient to carry.

No smoke or waster, very clean and space saved.

Appendix 8 Layout and Pictures of Mini Solar Park





Display Zone



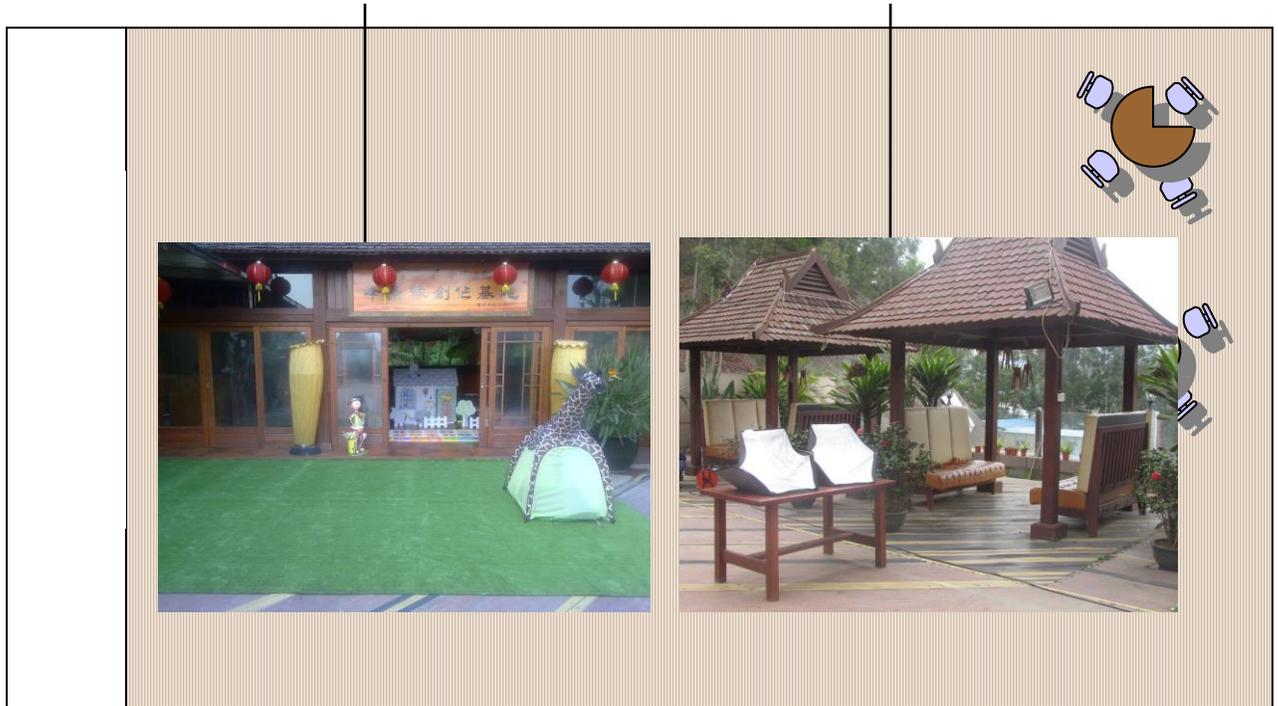
Traditional Zone



Outdoor Area Layout Design

Activity Zone

BBQ Zone



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