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Wen-Chi Lai
National Chengchi University, Taiwan, carly.lai@msa.hinet.net

Wei-Hsi Hung
National Chengchi University, Taiwan, fhung@nccu.edu.tw

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ABATRACT

A smart hotel is an intelligent hotel with a range of information technologies working together to let the customers have an honorable and convenient vacation environment. It allows customers to have a profound image about not only the hotel, but also the city and the country. Furthermore, it can increase the customer loyalty and repurchase rate as well. Thus, developing a smart hotel is critical for the hospitality industry in practice. This research presents a case study of a new five star intelligent hotel- Fleur de Chine Hotel at Sun Moon Lake in Taiwan. It describes how they built their digital hotel and virtual housekeeper service platform. Through the networked facilities and integrated information systems, people could get relevant information easily and efficiently. In addition, this smart system could provide hotel customers with the housekeeper service similar to a very important person (VIP) room or a presidential suite.

Keywords: Smart Hotel, Hotel Management, Service Innovation, Customer Satisfaction

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*Corresponding author

INTRODUCTION

In the hospitality industry market where the competition is becoming more intensified every day, to retain regular customers while attracting new ones is the major challenge for the hotel operators. Therefore, service innovation is the key to increase customer value and simultaneously help the hotel maintain its competitive advantages. In spite of the importance of service innovation to the hospitality industry, there is barely any research on the smart hotels. This study focuses on the system architecture of the smart hotel not merely based on price competition for the hospitality industry, using a case study on a pre-chosen establishment in Taiwan, FLEUR DE CHINE HOTEL. Thus, this paper aims to look deeper into this topic, and using the service innovation model of Bilderbeek & Hertog as the basis for this study. The objectives of current research include the following: 1) to understand the fundamentals of a smart hotel; 2) to construct the architecture for a smart hotel; and 3) to introduce the technology usage models of the smart hotel. Being assisted by the secondary data, the study analyzes the service innovation development process of the target hotel and also determine how the various related activities influenced the final innovation results.   Further improvements for the hospitality industry are identified.

LITERATURE REVIEW

Hotel Management

The term "Hotel" takes after the French word "Hôtel", that is derived from the Latin "Hospitãle". By the time of French Revolution, a private guest house where ordinary aristocrats entertained important guests in the country was referred to as hotel. Later, the European and American hoteliers extended the term by referring to the business premise that provide guest accommodation as hotel. The hotel business is a highly intensive service-oriented industry. Regardless of the size of the service, their common goal is to provide food, clothing, housing, transportation, training, and entertainment for guests and tourists. Various hotel services that are tailored to meet the needs of travelers.

Hospitality management refers to the management on hotels, restaurants, travel agencies, and tourism-related entities. Hotel and tourism management generally have the following five professional subjects: (1) *Food Operations*: Food Science, Food Matching, Alcohol Studies, Cooking; (2) *Accommodation Operations*: Housekeeping, Resort, Financial Control, Booking Sales/Retail, Marketing, Hotel Construction Planning, Cruise Operations; (3) *International Tourism*: Outing/Hiking Management, Aviation Services, Tourism and Social Responsibility, Ecotourism, Tourism and Environmental Protection, Related Laws; (4) *Tourism Management*: Sightseeing, Monuments & Heritage Sightseeing, Cultural Arts & Tourism, Industrial Sightseeing, Urban Sightseeing, Retail Tourism, Natural Tourism; (5) *Entertainment Management*: Festival Gala, Theme Park Management, Theater/Theater/Cinema Management, Concert Hall/Concert/Festival Management, Conference/ Exhibition Management (Wikipedia, 2016).

Hotels are the key player in the modern economy and leisure industry and occupy a place which should not be ignored (Benbasat, Goldstein & Mead, 1987; Hill & Jones, 2005). Thus, hotel management is importance and valuable. However, hotel industry is continuously changing; modern hotel management techniques must be adapted to the changing environment (Berry, Shankar, Parish, Cadwallader & Dotzel, 2006; Dorner, Gassmann & Gebauer, 2011). In the past, most studies on hotel management focused on issues such as traditional business performance and service quality. However, the analysis of digital innovation services and modern management provided by the technologies is lacking (Orwskiliko, 2000; Lamb & Kling, 2003). The following parts of this study are designed to help us find methods and techniques to deal with changing issues in the industry.

Service Innovation

Hospitality industries have been the important engine for economic growth in Taiwan. How to create service innovation is the first priority for the hotel industry. den Hertog and Bliderbeek (Hertog & Bilderbeek, 1999) proposed the service innovation model which points out the *technological options*, *new service concept*, *new customer interface*, and *new delivery system* for delivering services, as shown in Figure 1.
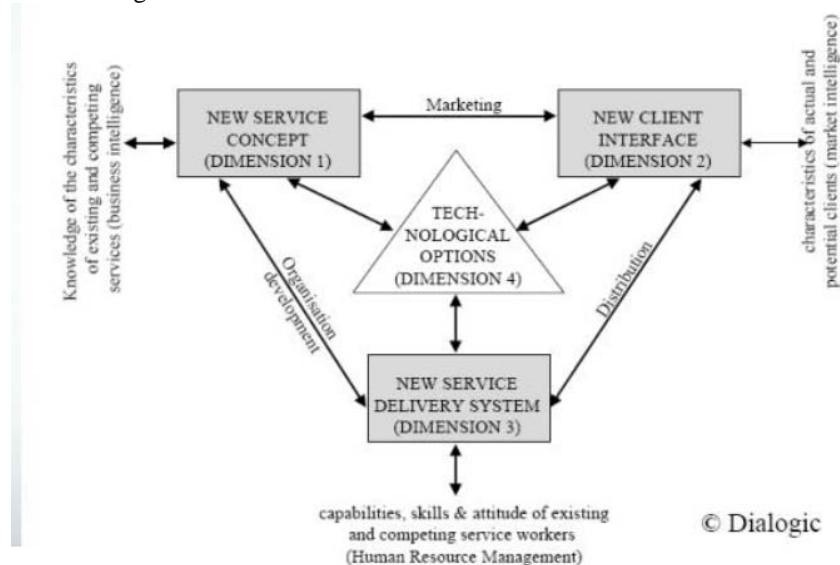

Figure 1: Four Dimension Model of Service Innovation (Hertog & Bilderbeek, 1999)

Smart Hotels

With the continuous development of information technology (IT) and communication network technology, Luftman (Johnson, Menor & Chase, 2000) and the other scholar thought that the so-called IT refers to "the equipment for enterprises to transferring the data, information and knowledge, such as computers, data repositories, networks and communications devices." The IT here is about using the information system with computers including the hardware, software, telecommunication network, database management to process data (Sundbo, 1998; Tatikonda & Valarie, 2002; Voss, 1992; Beaver, 1992).

For the hospitality industry, IT is also widely used. Besides the investment in IT hardware, relevant information systems inside and outside the organization are becoming more and more important. In the organizations, many hotels use advanced systems to increase efficiency and effectiveness. In terms of organizing governance groups, the first applications of web-based systems also appeared in the aviation and hospitality industries. The most obvious examples are computerized reservations and central reservation systems (Chervenak, 1993; Farrell, 1975; McGuffie, 1994).

A strong Global Distribution System can ensure global marketing effectiveness. The key advantages of these systems can provide better quality of service improvements, and ensuring and providing each customer with the information they need. Furthermore, these systems provide better administrative efficiencies and create differentiation or low-cost competitive advantages among others (Gamble, 1990; Go, 1992; Schertler, 1994). Tarrow and Muehsam (1992) pointed out that the operation of hotels in the 21st century will have to rely on more and more information technologies to improve personalized service quality. The housekeeping managers faced the quality and service challenge, also, they need to identify and implement the IT that give organizations with the competitive advantage (Hubert *et al*., 1995). Conner (1995) also indicated that IT becomes a necessary tool to provide customers with the facilities in the room, increase concierge services, and private messages, check-out, provide wake-up calls and room service, on-demand movies or personal television programs.

In many cases over the past decade, the business community or academics have appreciated the benefits of using IT in the hospitality industry, including improved service quality, design of long-term development of the enterprise, enhancement of benefits and efficiency, departmental integration, specialization in human resources management, faster communication, lower cost generation, differentiation and cooperation and improvement of business performance (Reid & Sandler, 1992; Moutinho, 1990; Ritchie & Crouch, 1993; Peacock, 1994; da Silva, 2015).

Hospitality industry is being reshaped by the IT revolution, creating an inevitable trend that international tourists take good advantage of IT. While investing in the application of IT, the international tourist industry is mostly concerned about whether IT will increase their operation performance (He, Hyo-Kyung & Jae-Young, 2015; Guerra, 2012; Lusch & Nambisan, 2015). Thus, the development of intellectualized hotel can help resolve the limitations and problems that encountered in this industry. Intellectualized system can primarily take effective control of hotel operation and optimize service patterns. There have been lots of relevant studies on intellectualized hotel until now, which are mainly elaborated on the basis of technology application,

resource management and peripheral business (Murphy, Chen & & Cossutta, 2016; Wang, Li & Zhang, 2016; Tang, Wang & Tang, 2015). Yet, there is still relatively few researches regarding the technical architecture for total solution of service innovation in hospitality industry.

METHODOLOGY

This research deals with two main topics: 1) Intelligent Room Control Service; and 2) Virtual Housekeeper Service, and three major changes of the case: "innovation in service mode and improvement in operational efficiency as well as shaping the digital features." Why did this study focus on these two themes? In addition to the dual branding strategy of the study case company, the company also creates the future business blueprint and objectives for the group by aiming at: 1) group development and brand management; 2) highly market segmentation and diversified marketing strategy; 3) creating green hotels and promoting green consumption; 4) minimizing and flattening the organizational structure; 5) improving the hotel's intelligence; 6) employee first, insisting on people-oriented management; and 7) customer satisfaction commitment.

Based on the data reports generated by the system platform and based on the business operating reports of the relevant annual, monthly, weekly and daily time series, this research presents 'key performance indicator' for measuring the case's management practices. Moreover, it is based on relevant data such as financial, marketing, operational performance and customer satisfaction as the pilot project for the final system.

RESULTS AND DISCUSSIONS

In the current case study, we found that a smart hotel can be built upon an integrated architecture with the following pillars. First, innovation of service model –using the virtual housekeeper service to create the differentiation of competitive advantage, and utilizing the IT to offer the new model of the housekeeper service. Second, the devoting of operation efficiency –upgrading the operation efficiency could let hotel employees have more time to provide a better service. Third, adopting and providing digital features continuously –the hotel related IT devices could provide more useful information proactively, and creates more intimate service to customers. Using the Radio Frequency Identification (RFID) and intelligent networking television, could raise the capabilities of quick response time, and store the valuable service records, also, reducing the unnecessary waste of resources, and heightening the customer housing relevant consumption. The architecture of the smart hotel as studied in the case is shown in Table 2.

Table 2: A Proposed Smart Hotel Architecture

Dimension 1	(1) Intelligent Room Control Service
Technology Usage	Including the RFID technology and "Room Master" – the RFID mainly applied to the access control and action payment, also, to manage the housing fees, public equipment related personnel access record, and the fees of meal order or the amount of consumption. It could provide the hotel customer convenience to do the unified payment when he needs to do the check-out. The main functions of the "Room Master" are to control the room equipment of the electric lights, door, curtain and air conditioning. Via the situation models which being set up in advance, the occupier could just press the button gently. It could then immediately change the lighting device and air conditioning in the room. Moreover, the hotel managers could predominate the real-time housing services. In addition, it can help hotels reserve the energy by automatically controlling the environment temperature, as well as enhancing the customer comfortable sensation and satisfaction.
Dimension 2	(2) Virtual Housekeeper Service
Technology Usage	To integrate and aggregate the hotel information including the leisure service, value-added service, VIP identification, room service, business service, …etc. By way of personification multimedia relevant technique, the hotel guest could get the related information very easily via the roles of personal tour guide, business secretary and almighty housekeeper. Furthermore, all the hotel service staff shall have the housekeeper system to integrate and track their service items, let every service member could transform into a change of the most professional receptionist.

Customer Satisfaction

The study conducted a series of surveys to measure the performance of the smart hotel by the dimensions: 1) integrating information system databases; 2) employee operation and financial earnings data, and 3) customer service satisfaction related questionnaire, and to collect and analyze as project performance measurement information. The results show that the smart hotel architecture can provide customers satisfied hotel services. The results are shown in Table 3.

Table 3: Satisfaction Survey and Results (N=220)

Scoring index	Score
Strongly agreed	5
Agreed	4
No comments	3
Disagreed	2
Strongly disagreed	1
Virtual housekeeper system information quality survey	**Average score**
I think the information provided by the virtual housekeeper system is very important.	3.48
I think the information provided by the virtual housekeeper system is what I need.	3.55
I think the information provided by the virtual housekeeper system is highly accurate.	3.58
I think the information provided by the virtual housekeeper system is immediacy.	3.34
I think the information provided by the virtual housekeeper system is very complete.	3.02
I think the information provided by the virtual housekeeper system is useful.	3.38
I think the information provided by the virtual housekeeper system is trustworthy.	3.41
Virtual housekeeper system quality survey	**Average score**
I think the system is stable when I'm working on a virtual housekeeping system.	4.46
I find it easy to use while operating a virtual housekeeper system.	4.29
Its response time is very fast when I'm working on a virtual housekeeper system.	4.42
I think the message displayed by the virtual housekeeper system is usually correct.	4.14
I think the information provided by the virtual housekeeper system is easy to understand.	3.89
I think the functionality provided by the virtual housekeeper system is complete.	3.91
I think the virtual housekeeper system provides the data access is easy.	4.53
I think the interface of virtual housekeeper system is very user-friendly.	4.01
I think the virtual housekeeper system connection is stable.	4.27
Virtual housekeeper system satisfaction survey	**Average score**
Overall, I am very satisfied with the virtual housekeeper system.	3.85
Overall, I am happy about using a virtual housekeeper system.	3.77
Overall, I greatly agree with the virtual housekeeper system.	3.80

CONCLUSION

In conclusion, a smart hotel should have the integration and innovation that are differentiate from technology innovation. They should be the customer oriented as the driving force, and not simply focus on the technique themselves. The technology diffusion is an ongoing process in the world, and it is with no exception to the hotel industry. Thus, the traditional hotels need to transform themselves into the smart hotels. This case study introduced the Fleur de Chine hotel of L'Hotel de Chine Group, also described how they build up their smart hotel via integration and innovation in terms of technology architecture and service model as well. Besides, the five-star luxurious resort hotel could be classified into the differentiation strategy of niche innovation service. Also, the Fleur de Chine hotel had strong coordination for developing the interactive creative system to make sure the service quality is high to sustain its core competitiveness. Through the use of IT, physical and virtual channels, service, operation and marketing activities, they integrated them well to create a differentiation effect, a smart hotel. We also found that the integrated innovation architecture including dimensions, techniques, operation and service models are working together to attract potential customers, increasing the business operation performance, and enhancing the customer satisfaction, which are the keys to build a smart hotel.

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