

# 科技部補助專題研究計畫報告

## 服務創新與顧客滿意、顧客感動之研究

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中文摘要：近一世紀以來，由於市場競爭越趨激烈，消費者需求越趨多元，服務產業經營者越加意識到服務創新的重要性。若要保持競爭優勢，企業必須不斷提供創新的產品與服務，以滿足顧客不斷改變的需求。服務創新因此在學術界與產業界都受到相當的重視。然而，之前服務創新的研究多著重在科技相關的服務機制上，人員相關的服務創新作法則未受重視，且服務創新機制在顧客感動上之效果，依本研究之了解，尚未被研究過。因此，本研究運用PLS-SEM統計方法驗證了概念模型與假設。研究結果顯示，科技相關與人員相關的創新機制與顧客滿意與顧客感動均有正向且重要的關係，然而，相較於科技相關之創新機制，人員相關之創新機制在顧客感動上有更明顯的效果，再者，除了直接關係外，科技相關的創新機制在人員相關創新機制與顧客感動之關係中也扮演著調節的角色。本研究在服務創新之學術研究領域上提供新的資訊，以釐清科技相關與人員相關之服務創新機制的角色，另外，本研究也提供服務產業經營者清楚的指導方針，引導業者將有限的企業資源投資在最有效果的服務創新機制上，以有效率的達到顧客滿意與顧客感動。

中文關鍵詞：服務創新，科技相關服務創新機制，人員相關服務創新機制，顧客滿意，顧客感動，SmartPLS

英文摘要：Purpose. The service industry increasingly recognizes that to achieve and sustain competitive advantage, they must provide new and innovative products or services to satisfy customers' continually changing needs. Service innovation, as a result, attracts much attention from both industry and academia. Extant studies suggest that technology-related innovation mechanisms, such as customer self-service technology, have a positive effect on satisfaction. However, the relationship between technology-related service innovation (TRSI) versus human-related service innovation (HRSI) and customer delight has, to the researchers' understanding, never been studied. Design/methodology/approach. We applied the PLS-SEM method to examine a conceptual model and related hypotheses. Findings. Our results indicate that while both TRSI and HRSI applications have positive and significant relationships with satisfaction and delight, HRSI applications have a stronger effect. In addition to the direct effect, TRSI mechanisms also moderate the relationship between HRSI applications and delight. Originality. Previous academic research of service innovation largely focused on TRSI, letting HRSI remain largely unstudied. However, we believe that in the hospitality service industry, human service is the primary factor affecting customers' experiences, which in turn dramatically influences their satisfaction and delight. Additionally, the debate on whether "high-touch" or "high-tech" plays a more significant role in the service

industry has been ongoing. Our results provide new information and meaningful guidelines to hospitality practitioners, supplementing academic research on service innovation by clearly identifying the role of technology and human-related service innovation mechanisms.

英文關鍵詞：Service innovation; Technology-related service innovation; Human-related service innovation; Satisfaction; Delight, SmartPLS

## **Technology- or human-related service innovation? Enhancing customer satisfaction, delight, and loyalty in the hospitality industry**

### **Abstract**

**Purpose.** The service industry increasingly recognizes that to achieve and sustain competitive advantage, they must provide new and innovative products or services to satisfy customers' continually changing needs. Service innovation, as a result, attracts much attention from both industry and academia. Extant studies suggest that technology-related innovation mechanisms, such as customer self-service technology, have a positive effect on satisfaction. However, the relationship between technology-related service innovation (TRSI) versus human-related service innovation (HRSI) and customer delight has, to the researchers' understanding, never been studied.

**Design/methodology/approach.** We applied the PLS-SEM method to examine a conceptual model and related hypotheses.

**Findings.** Our results indicate that while both TRSI and HRSI applications have positive and significant relationships with satisfaction and delight, HRSI applications have a stronger effect. In addition to the direct effect, TRSI mechanisms also moderate the relationship between HRSI applications and delight.

**Originality.** Previous academic research of service innovation largely focused on TRSI, letting HRSI remain largely unstudied. However, we believe that in the hospitality service industry, human service is the primary factor affecting customers' experiences, which in turn dramatically influences their satisfaction and delight. Additionally, the debate on whether "high-touch" or "high-tech" plays a more significant role in the service industry has been ongoing. Our results provide new information and meaningful guidelines to hospitality practitioners, supplementing academic research on service innovation by clearly identifying the role of technology and human-related service innovation mechanisms.

**Key words:** Service innovation; Technology-related service innovation; Human-related service innovation; Satisfaction; Delight, SmartPLS

## 1. Introduction

The service industry is experiencing a major paradigm shift in the 21st century due to the rapid development of technology, informing the provision and receiving of services. The introduction and popularization of many cutting edge technologies, such as wireless broadband internet, mobile devices, AI/AR/VR applications, and Internet of Things (IoT) have affected almost every service industry, including hospitality (Tung and Law, 2017; Wolfe, 2018), and will continue to profoundly transform service design and delivery (Hotel News Resource, 2017; Lema and Agrusa, 2009). Consequently, service innovation has become a global phenomenon and has been suggested as the panacea to maintain a company's competitive advantage. Service innovation is defined as a new service, or the renewal of an existing service, which provides benefits to both organization and customer through added value to customers (Toivonen and Tuominen, 2009). Increased proficiency and reliance on pervasive technology by a growing population has become a common norm in today's society. Rosenbaum and Wong (2015, p.1863) indicated in their study that many travelers now consider hotel technology offerings routine business practice. These include computerized reservation systems (Meuter, Ostrom, Bitner, and Roundtree, 2003), mobile information guides (Riebeck, Stark, Modsching, & Kawalek, 2008), wireless internet (DiPietro & Wang, 2010), and check-in and checkout self-service kiosks (Griffy-Brown, Chun, & Machen, 2008). Responding to the shift in consumer behavior, hospitality practitioners are urged to implement cutting-edge technologies to attract and engage customers to stay competitive. For example, Starwood Hotels invested in mobile check-in technology and replaced traditional keycards with mobile entry devices (Chahal & Kumar, 2014). Silk Place, Tainan, introduced a robot delivery service for amenities to hotel guests. Other self-service devices, such as restaurant order tablets and airport check-in kiosks have become a common scenario in today's service settings. The major benefits of self-service technology (SST) applications stem from their ability to enhance customer service by customizing service experiences, increasing service choices, and expanding interactions between customers and organizations (Curran and Meuter, 2005; Davis, Spohrer, and Maglio, 2011). The benefits are increasing operational efficiencies (Gursoy, 2017), reduced operational costs (DiPietro and Wang, 2010; Siguwaw and Enz, 1999), and added consistency to service delivery (Berry, 1999; Dabholkar, 1996). This inevitable trend of technology adoption is transforming the service industry from a traditional "high-touch and low-tech" into a "low-touch and high-tech" environment, as supported by Bitner, Brown, and Meuter (2000).

In stark contrast, strong opinion supports the vital role human factors play during service encounters (Kandampully, Bilgihan, and Zhang, 2016; Luo, Wang, and Tai, 2019; Shin, Perdue, and Kang, 2019). Service encounters are viewed by customers as a social experience, and, therefore, they may prefer human interaction during the encounter process (Zeithaml and

Gilly, 1987). Excellent service experience is built upon the careful design and successful implementation of various, and equally important, elements including facilities, atmosphere, process, and human service. Among these, human service is suggested to be the primary factor that distinguishes exceptional companies from ordinary ones (Luo et al., 2019). The core of service lies in human interactions. Unique and authentic human interaction, even minor gestures by employees, can differentiate offerings in the marketplace (Bowen, 2016) and build a distinctive brand image for the company (Bolton, Gustafsson, McColl-Kennedy, Sirianni, and Tse, 2014). Despite technology often outperforming humans, creativity and empathy are two areas where humans remain superior to technology (Larivière, Andreasson, Kunz, Sirianni, Voss, Wunderlich and De Keyser, 2017). Technology can achieve operational outcomes of efficiency, consistency, and reliability that meet customer expectations, but service employees' displays of assurance, responsiveness, and empathy can initiate a warm exchange between people, thus meeting customers' emotional needs and exceeding their expectations (Parasuraman, Berry and Zeithaml, 1991). Only through services that address customers' emotional needs, can they provide unique and memorable experiences (Wang, Wang, and Tai, 2015). As Kandampully et al. suggested (2016, p.157) that exceptional service that delights customers requires a human factor – not only what is being offered, but how it gets offered (Gruman and Saks, 2011; Hammedi, Kandampully, Zhang, Bouquiaux, Kandampully, and Duddy, 2015). The reason for many customers' return to the same service provider is the warm and enjoyable interaction they have with certain service employees and the feeling of familiarity, while being pampered and respected. While the application of technology has attracted much attention and resources in the hospitality industry, the human factor cannot, and should not, be overlooked.

Recent studies regarding service versus technology innovation in service and hospitality industries focus largely on: technology adoption processes (Kaushik, Agrawal, and Rahman, 2015; Kim, Christodoulidou, and Brewer, 2012; Lopez-Bonilla and Lopez-Bonilla, 2015); technology acceptance behaviors (Weijters, Rangarajan, Falk, and Schillewaert, 2007); service innovation archetypes (Helkkula, Koçalkowski, and Tronvoll, 2018); and technology readiness (Zhu, Nakata, Sivakumar, and Grewal, 2007); among others. Very limited research has investigated the roles different types of innovation (i.e. TRSI and HSRI) play in customer satisfaction and delight. It is widely acknowledged that these are the key indicators of a customer's preference for the service provider. Customer delight, in recent decades, is suggested to outperform satisfaction in eliciting customers' positive emotions and therefore has a stronger relationship with customer loyalty (Crotts and Magnini, 2011; Deming, 1986; Kandampully, 1998; Kumar, Olshavsky, and King, 2001; Torres and Kline, 2006, 2013). We argue that only when customers' evolving needs are satisfied, and a pleasant affective state of delight is aroused, can their regular patronage be sustained, thereby achieving long-term loyalty. In response to many scholars calling for more specific investigations into different

types of service innovations to fulfill customers' cognitive and hedonic needs during service encounters (Shin and Perdue, 2019; Victorino, Kaniouchina, and Verma 2009), this study is dedicated to providing a clear understanding of the function of different types of service innovation (TRSI vs. HSRI) on satisfying customers' cognitive needs and eliciting customers' state of delight. The results of this study are expected to contribute managerially to hospitality practitioners through valuable insights into the function of various service innovation mechanisms, and the resultant impact on customer satisfaction, delight, and loyalty. This information can assist management better allocate limited company resources to the appropriate service innovation mechanism. Additionally, this study contributes academically by supplementing extant studies on the relationship between service innovation mechanisms and customer satisfaction, delight, and loyalty. Accordingly, the following objectives are proposed:

- 1) To understand customers' reactions toward various hospitality specific technology-related service innovation mechanisms.
- 2) To study the function of different types of service innovation (TRSI and HSRI) on customer satisfaction, delight, and loyalty.
- 3) To examine the moderating effect of TRSI mechanisms.

## **2. Theoretical foundations and hypotheses**

### ***2.1 An overview of service innovation***

To satisfy customers' rapidly changing needs and sustain long-term customer relationships, innovation is the pivotal component for every organization in adapting to this fast-evolving environment. Innovation was defined by Schumpeter (1934, p.66) as "a separate activity through which inventions are carried out in the market for a commercial purpose." Two inferred conditions include an actual market launch, and profit generation for the company (Synder et al., 2016). Toivonen and Tuominen (2009, p. 893) expand on this:

*Service innovation is a new service or such a renewal of an existing service which is put into practice and which provides benefit to the organization that has developed it; the benefit usually derives from the added value that the renewal provides the customers. In addition, to be an innovation the renewal must be new not only to its developer but in a broader context.*

Three additional conditions suggested by this definition further assist our understanding about service innovation namely: the types of service innovation (i.e., a new service or a renewal of an existing service); the source of the benefit (from added value provided to customers); and the scope (being new in a broader context than only to its developer).

Witell, Snyder, Gustafsson, Fombelle, and Kristenson, (2016) referenced the study of Coombs and Miles (2000) and categorized existing service innovation research into three

perspectives: assimilation, demarcation, and synthesis. The assimilation perspective suggests that knowledge of product innovation is applicable to all types of offerings (Witell et al., 2016). Studies applying the assimilation perspective focus heavily on the impact of new technology (Gallouj, 2002) and suggest that the service sector is becoming more technology- and capital-intensive (Gallouj and Savona, 2008), and supplier-dominated, suggesting that service firms are passive receivers of innovation from other sectors (Pavitt, 1984). The demarcation perspective proposes that “innovation in service industries is unique and needs to be treated differently from other types of offerings” (Witell et al., 2016, p.2870). Researchers taking demarcation perspectives argue that the assimilation perspective has failed to recognize the specificities of services (Gadrey, Gallouj, and Weinstein, 1995) such as the intangible nature of services, the need for customer integration, and the impacts of organizational knowledge and non-technological elements (Hipp and Grupp, 2005). Therefore, demarcation researchers propose a perspective of service innovation, distinct from manufacturing innovation, focusing heavily on the different features of service. Finally, the synthesis perspective contends that service innovation theories should be inclusive to cover both services and manufacturing (Coombes and Miles, 2000) and should not limit its perspective only to technological innovations. In view of the above discussions, current academic research on service innovation undoubtedly needs further effort and development to reach a consensus regarding its core concepts and theory construction.

This study believes that service innovation should be treated differently from other types of innovation due to the unique characteristics of service namely intangibility, inseparability, perishability, and variability (Regan, 1963; Rathmell, 1966; Shostack, 1977; and Zeithaml et al., 1985). If attention is paid to those qualities, it may be possible for even more creative ideas and applications to thrive. Therefore, this study defines service innovation as technological and non-technological related new services, as well as a renewal of an existing service, that is implemented in the market and generates benefits to the organization and customers.

The divergence of service innovation research exists both in its core concepts and its typology. Four main types of service innovation can be identified in previous research (Kahn, 2018) including product/service-, process-, marketing-, and organizational innovation. In addition, Snyder, Witell, Gustafsson, Fombelle, and Kristensson (2016) did a comprehensive literature review of 1046 academic articles and proposed four service innovation categorization including degree of change (radical vs. incremental), type of change (product vs. process), newness (new to the market vs. new to the firm), and means of provision (technology vs. organization). The researchers find the means of provision is especially relevant to this study since the objectives of this research are to study customers’ reaction and acceptance to different types of service innovation. Dotzel, Shankar, and Berry (2013) proposed e-innovations and p-innovations to emphasize the key role that the Internet

(technological element) and human interactions (human service element) play in service innovation. According to Snyder et al. (2016, p. 2405) “e-innovations are new services that provide customer benefits primarily through the Internet, whereas p-innovations are new service delivered primarily through human interactions.” By adopting previous scholars’ categorizations, this study divides service innovation in the hospitality industry into two categories, being including technology-related service innovation (TRSI) and human-related service innovation (HSRI), and studies customers’ reactions and acceptance of these two types of service innovation mechanisms.

## ***2.2 Service innovation applications in the hotel industry***

Hotels, as the leaders in the service industry, rely heavily on service quality and customer satisfaction. Hotel managers invest a substantial amount of time and resource on various applications of service innovation due to its effectiveness in providing novel and more efficient services to attract customers and satisfy their needs. Service innovations are diverse, and various studies suggest different types of service innovation practices in the hotel industry. De la Pena et al. (2016), for example, suggested that membership in international hotel chains, high-quality offers, diversified rooms, and adaptability to specific needs of each client, are effective innovative activities in determining room prices. The study conducted by Orfila-Sintes and Mattsson (2007) reviewed four types of service innovation in hotels including management innovation, external communications, service scope innovation, and back-office innovation. Management innovation refers to the quality of management processes, the ICT (information and communications technology) applications for management, and the improvements of organizational structure (Orfila-Sintes and Mattsson, 2007). External communications address the pivotal role ICT plays in assisting management to attain improved levels of effectiveness and efficiency of communication with customers (Orfila-Sintes and Mattsson, 2007). Service scope innovation often incorporates technological applications to improve service output and tangible aspects of service delivery (Conlon, Van Dyne, Nilner, and Yee Ng, 2004). The back-office innovation, according to Ngai and Wat (2003) and Sheldon (1983), involves back-office re-engineering by incorporating new technological assets for improvement in productivity and to achieve better efficiencies in service delivery. Bilgihan, Okumus, Nusair and Kwun (2011) categorize four types of IT applications in hotels, including front office application, back-office application, restaurant and banquet management systems, and guest-related interface applications.

## ***2.3 Technology-related service innovation applications***

As suggested by Tether (2005), and Toivonen and Tuominen (2009), new technology is considered by early studies as the main driver of service innovation. The impacts of new technologies in enhancing an organization’s operational efficiency, facilitating better communication quality with customers, and improving service efficiency are apparent. The

study conducted by Piccoli, Lui, and Grun (2017) specifically asserted that IT-enabled customer service systems (CSS) can increase customer preference elicitation through offering appropriate signifiers to aid users in formulating and recording their preferences. By better presenting and organizing service options, customers can find it relatively easier to choose from, and match, the services offered with their needs, and therefore increase their degree of satisfaction. Overby (2008) depicted that “IT-enabled CSS facilitates the presentation and disambiguation of a large number of options, and it also allows for the univocal match of these options to the salient preferences of the customer with precise identification and control.” Bitner et al. (2000) also indicated that customers’ service experience and satisfaction can be improved, through efficiency and effectiveness with the assistance of technology on customization, improving service recovery, and providing spontaneous delight. Yang, Peterson, and Cai, (2003) asserted similarly that, with the facilitation of IT-enabled CSS, customers’ satisfaction with the shopping experience can be attained through experiencing a higher degree of personalization and individual attention. Therefore, we proposed:

Hypothesis 1a: TRSI elements have a positive effect on customer satisfaction.

Few studies can be found regarding the impact of TRSI on customer delight. Only a handful of previous research addresses the indirect relationship through customization or personalization. For example, Piccoli et al. (2017) suggested IT-enabled CSS can assist customers to find better-matched services to satisfy their latent preferences and unexpressed needs by presenting more appropriate signifiers that can provide customers with guidance and direction during shopping episodes. With customers’ latent or unexpressed needs being fulfilled, their positive states of emotion (customer delight) can be aroused as indicated by previous scholars, whereby “personalization can induce desired emotions and improve affective feelings toward a service provider (Liang et al., 2012; Sarri, Ravaja, Laarni, Turpeinen and Kallinen, 2004), as well as enhanced trust and loyalty (Ball, Coelho, and Vilares, 2006).” Consequently, we proposed:

Hypothesis 1b: TRSI applications have a positive effect on customer delight.

#### ***2.4 Human service-related innovation applications***

Human service deserves more attention in the academic research of service innovation. As claimed by Howells and Tether (2004), service innovations include both technological and non-technological innovations (i.e. organizational and relational change), and such approaches aim to accentuate the importance of human and organizational capabilities in service innovations. Ottenbacher and Gnoth (2005, p.218) also indicated that “technology offers little competitive advantage for hospitality services because competitors are likely to obtain similar resources and technology.” Human interaction is suggested by many scholars as the dominant factor that affects consumer experiences of satisfaction and delight (Arnould

and Price, 1993; Hinkin and Tracey, 1998, Wang, Wang and Tai, 2015; Luo et al., 2019), and the most desirable outcome of forming a genuine emotional connection with customers can only be achieved through exceptionally positive human interaction (Berry and Carbone, 2007; Berry et al., 2006). The reason for the imbalance of research focusing on the human service element of service innovation research may be the difficulty in relating human service with innovation. People may regard better service performance as the improvement of the existing service, but not as something new that qualifies itself as innovation. By definition, though, service innovation is ‘a new service or a renewal of an existing service’. We believe extraordinary service performance can deliver a novel feeling in customers and therefore qualifies as an element of service innovation.

Even though the research on human service element is relatively scant, there are scholars addressing this issue. Ryu and Lee (2018, p. 305) indicated that “nontechnological innovation factors – such as information-intangible contents of service products, highly qualified employees, efficient delivery processes, service delights, and intensive customer interactions – are more critical for service innovation success than technological ones.” Harris and Ogbonna (2001) also contended that the attitudes and behaviors of frontline service employees have an extreme effect on customer perception and interpretation of new service encounters. The non-technological element of service innovation in this study particularly refers to the extraordinary service actions as evidenced in service employees’ absolute professionalism (both behaviorally and attitudinally), exceptional empathetic and attentive behaviors, and extreme helpfulness in providing one-stop services (Luo et al., 2019). The main differentiators between extraordinary service and ordinary service rely on the frontline employees’ empathetic and attentive behaviors, keen sensitivity, sharp observation skills, elaborative thinking ability, and proactive and quick response ability (Luo et al., 2019). The above-described attributes are similar to the element proposed by Sorensen et al. (2013) as social intelligence. According to Sorensen et al. (2013, p. 1451) “social intelligence requires, more importantly than traditional communicative skills, a type of anthropological expertise that makes employees capable of ‘reading’ and understanding users’ needs and satisfaction with different aspects of service by interpreting their behavior during service encounters.” Employees possessing social intelligence are capable of understanding, observing and taking seriously the needs of the guest by being able to put oneself in his/her place, which is an important element of being able to get ideas, or to create new practices, based on service encounters (Sorensen, et al., 2013). Extraordinary service performance is, therefore, not only able to satisfy customers’ apparent needs, but also capable of eliciting customers’ surprisingly positive state of delight by detecting their hidden desires and actively providing appropriate service to satisfy their unexpressed requirements (Mattila and Enz, 2002; Menon and Dube, 2000; Torres and Kline, 2006, 2013; Tung, 2012; Wang, Wang, Tai, 2015). As human service or human interaction is suggested, by various researchers, as the dominant factor affecting

consumer experience (Arnould and Price, 1993; Hinkin and Tracey, 1998), and plays a critical role in creating customer delight (Berry et al., 2006; Wang et al. 2015; Wang, Luo, Tai, 2017), we propose:

Hypothesis 2a: HRSIs have a positive effect on customer satisfaction.

Hypothesis 2b: HRSIs have a positive effect on customer delight.

Hypothesis 2c: The effects of HRSIs on customer satisfaction will be stronger than the effects of TRSI applications.

Hypothesis 2d: The effects of HRSIs on customer delight will be stronger than the effects of TRSI applications.

## ***2.5 Customer satisfaction, delight, and loyal behaviors***

Customer satisfaction has long been proposed as the fundamental element for sustaining companies' profitability due to its prominent effect on inducing desirable customer loyal behaviors such as repeat purchase behavior (Bearden and Teel, 1983), and positive word-of-mouth (Ganesh, Reynolds, and Arnold, 2000; Zeithaml et al., 1996). As a result, customer satisfaction has been studied in relation to various elements in academic research, including service innovation research (COTEC, 2007; De la Pena et al., 2016; Ryu and Lee, 2018). Customer satisfaction is defined by Schiffman and Kanuk (2004) as "the individual's perception of the performance of the product or service in relation to his or her expectations." When customers' perception outperforms their expectation, satisfaction can be attained, driving customers' willingness to stay with the company to sustain their positive experience and thus to secure the company's profitability. Therefore, we propose a positive relationship between customer satisfaction and loyal behaviors.

In addition, the relationship between satisfaction and delight is also suggested. Customer delight is conceptualized as a positive, nonlinear response to satisfaction at very high levels (i.e., the delight zone of satisfaction; Eisenbeiss, et al., 2014; Kumar et al., 2013; Ranaweera and Menon, 2013). In other words, when customers' perceived experience vastly exceeds their expectations, a strong positive pleasurable affective state will be aroused, which leads to customer delight. The hypotheses are proposed accordingly.

Hypothesis 3a: Customer satisfaction has a positive effect on customers' loyal behaviors.

Hypothesis 3b: Customer satisfaction has a positive effect on customers' delight.

However, with increasing competitive intensity in the current marketplace, ensuring customer satisfaction through the provision of products or services that merely meet their expectations is no longer adequate to maintain long-lasting customer relationships (Deming, 1986; Torres and Kline, 2006, 2013). Previous studies have indicated that to sustain a long-term relationship with customers, companies are required to build an emotional bond by

providing unique shopping experiences. Kandampully (1998) stated that a loyal relationship between a firm and its customer is determined by the organization's ability to connect emotionally and forge a long-term bond with the customer. Customer delight is defined by Crotts and Magnini (2011) as a customer's experience of a product or service that provides an unanticipated level of value or satisfaction, which results in the elicitation of strong positive emotions of joy, thrill, and exhilaration in customers (Kumar et al., 2001). Because of the high level of positive emotion, customer delight has been suggested to be able to induce memorable experiences (Kumar et al., 2001; Torres and Kline, 2006), create an emotional bond between customers and providers (Pine and Gilmore, 1999), and increase customers' intentions to repurchase and recommend (Pine and Gilmore, 1999). Customer delight, as a result, is suggested to have a stronger correlation with customer loyal behaviors. The following hypotheses are drawn, and the conceptual framework is depicted in figure 1.

**[Insert Figure 1 about here]**

Hypothesis 3c: Customer delight has a positive effect on customers' loyal behaviors.

Hypothesis 3d: Customer delight has a stronger effect on customers' loyal behaviors than customer satisfaction does.

Except for the direct effect that TRSI may have on customer satisfaction and delight, we are also interested in the moderating role TRSI may have between HRSI and customer satisfaction and delight. To our understanding, the moderating effect of TRSI has never been studied before. We suspect that with the assistance of various applications of TRSI, front line service employees may find it easier to understand customers' preferences and to provide better quality service to customers, which can then attain higher customer satisfaction and delight. Therefore, we proposed the following hypotheses.

Hypothesis 4a: TRSI applications play a moderating role between HRSI and customer satisfaction.

Hypothesis 4b: TRSI applications play a moderating role between HRSI and customer delight.

**[Insert Figure 2 about here]**

### **3. Method**

We apply a partial least square (PLS) approach (Hair, 2010; Hair, Risher, Sarstedt, and Ringle, 2019) to analyze the data. PLS-SEM is commonly used for the estimation of causal relationships involving latent constructs that are measured indirectly by many indicators

(Salameh, Ahmad, Zulhumadi, and Abubakar, 2018), and is the preferred method when the research objective is theory development and explanation of variance (Taghizadeh, Rahman, and Hossain, 2018). PLS-SEM has advantages of supporting predictions, and the prediction-oriented results assessment (Evermann and Tate, 2016; Shmueli, Ray, Velasquez, Estrada and Chatla, 2016) and can be used if less rigid theoretical backgrounds are available (Hair, Sarstedt, Ringle and Mena, 2012; Henseler, Dijkstra, Sarstedt, Ringle, Diamantopoulos, Straub, Ketchen, Hair, Hult and Calantone, 2014). Theoretical background on the relationships between TRSI and HRSI applications and customer satisfaction and delight is limited. Therefore, we found partial least square approach is suitable for our study.

### ***3.1 Research procedure and measurements***

This study was a questionnaire survey conducted in two phases. The first phase survey was designed to discover service innovation applications (both technology-related and human-related service) currently implemented in four and five-star hotels in Taiwan. The aim was to obtain this information in highly-ranked hotels in Taiwan and to lay the foundation for the second phase of the questionnaire design. The researchers firstly conducted a comprehensive literature review to design a list of questions involving a variety of technology-related and human-related service innovation applications. We then invited high-ranking managers (i.e., director, supervisor and general manager) from eighteen four- and five-star hotels in Taiwan to answer whether these applications were implemented in their hotels and to include any applications that had been omitted from the survey questions. Participants were also asked to indicate other service innovation applications they planned to employ in the future. The results of the first phase survey identified six current TRSI applications, three future TRSI applications, and eight HRSI applications.

The second questionnaire was then designed with seven sections of questions. The first section contained questions about TRSI applications currently implemented in the hotels; the second section related to the TRSI applications that were to be employed in the future; the third section focused on HRSI applications. These three sections of questions were designed based on the results from the first survey. The fourth, fifth and sixth sections of questions were related to customer satisfaction, delight, and loyalty, respectively. These questions were adapted from previous studies (Finn, 2005, 2012; Oliver, 2010; Wang, 2011). The last section of questions was designed to collect participants' demographic information.

### ***3.1 Research sample***

The questionnaire was distributed to hotel guests using the snowball sampling technique. Specifically, three researchers distributed the questionnaire to their colleges, friends and relatives who frequently stay in four and five-star hotels when they travel. These acquaintances were then asked to distribute the questionnaire to their friends who have similar backgrounds and experiences. The whole process of data collection took about two

months and a total of 479 valid questionnaires were collected. Among these participants, slightly more were female responders, in a female to male ratio of 56.2% and 43.8%, respectively. The age breakdown of participants was: in their 30s (18.0%); 40s (33.8%); and 50s (29.6%), and educationally divided into bachelor (60.1%) and masters (30.3%) degrees. Most of them (48.6%) earned less than 1 million NT dollars per year with careers in service industry (23.6%), manufacture industry (13.2%), technology industry (10.2%) and finance & insurance industry (10.0%). A substantial number (70.6%) of responders are married and mostly travel for leisure purposes (88.1%).

**[Insert Table I about here]**

#### **4. Data analysis**

SmartPLS 3.8 software is used to estimate the proposed model. The PLS-SEM method runs two-step approaches for data analyses, involving measurement model testing and structural model testing.

##### ***4.1 Measurement model testing***

To assess the measurement model, we examined reliability and validity (convergent validity and discriminant validity) of the constructs. Item reliability examines whether the manifest indicators measure only a particular construct by checking their item loadings on the corresponding construct (Lok, 2015). It is determined through factor loading, composite reliability (CR) and Cronbach's  $\alpha$ . Two items (participate in online travel metasearch engine and equipped with Washlet) in the section of TRSI elements are excluded because the factor loadings did not exceed .50 (Hair et al., 2012). CR values of each construct range from .812 to .942 which exceed the threshold value of 0.7 (Hair et al., 1998). Cronbach's  $\alpha$  of each construct is from .693 to .909 surpassing the threshold value of 0.6 (Hair et al., 2006). These results indicate a high internal reliability of the proposed constructs.

To check for validity, average variance extracted (AVE) are used to test convergent validity while Fornell-Lacker ratio (Fornell and Larcker, 1981) is run to examine the discriminant validity. Convergent validity examines whether the AVE of each construct is larger than its correlation with other constructs. Discriminant validity examines the degree to which items differentiate among constructs by comparing the correlations between constructs and the square root of the average variance extracted for that construct (Taghizadeh, Rahman, and Hossain, 2018). AVE of each construct is between .521 and .843 which exceed the threshold value of 0.5 (Fornell and Larcker, 1981) and the square roots of the AVEs (the values on the diagonals) are greater than the construct correlations indicating a satisfactory convergent and discriminant validity of the proposed measures. The results of reliability and validity test are presented in the table II and III below.

[Insert Table II about here]

[Insert Table III about here]

#### 4.2 Structural model testing

To evaluate the structural model, a bootstrapping procedure with a resample of 5,000 (Henseler and Chin, 2010; Hair et al., 2016) was applied to estimate the significance of the paths in the model (the t-value) and to measure the explained variance or predictive power (the  $R^2$  value). Figure 3 and table IV highlight the results of path coefficients, significance levels and  $R^2$  values. Barclays et al., (1995) suggested that  $R^2$  is a measure used for assessing the predictive power of the model for the endogenous constructs. In other words, the  $R^2$  of examined variables indicate how well the examined variables measure their underlying latent constructs (Ahmad, 2015). Therefore, we look into  $R^2$  value to examine the predictive power of technology and human-related service constructs on customer satisfaction, delight and loyalty. We apply the critical values suggested by Cohen (1988) of  $R^2 > 0.67$  (strong predictive power),  $R^2$  around 0.33 (moderate predictive power) and  $R^2$  around 0.19 (weak predictive power). In this study,  $R^2$  values of satisfaction, delight and loyalty are 0.402, 0.648 and 0.642 respectively indicating that the proposed variables (TRSI and HRSI elements) have moderate to strong predictive power on customer satisfaction, delight and loyalty.

In PLS-SEM model, path coefficient value ( $\beta$ ) represents the causal relationships between proposed constructs and t-value is used to examine the significant level of the causal relationship between constructs. The critical values suggested by Hair et al., (2006) of 1.96 (significance level = 5 percent), 2.58 (significance level = 1 percent), and 3.29 (significance level = 0.1 percent) are applied. The causal relationships between constructs are presented in table IV below.

The results of direct effects show that all the proposed relationships are significant. Both TRSI ( $\beta = 0.378$ ,  $p < 0.001$ ) and HRSI ( $\beta = 0.396$ ,  $p < 0.001$ ) elements have significant relationship with satisfaction. The relationships between TRSI ( $\beta = 0.086$ ,  $p < 0.05$ ) and HRSI ( $\beta = 0.167$ ,  $p < 0.001$ ) applications and customer delight are also significant. In addition, satisfaction shows positive effect on delight ( $\beta = 0.658$ ,  $p < 0.001$ ) and loyalty ( $\beta = 0.210$ ,  $p < 0.001$ ) and delight has a positive and significant relationship with loyalty ( $\beta = 0.625$ ,  $p < 0.001$ ) as well. Therefore, H1a, H1b, H2a, H2b, H3a, H3b, and H3c are all supported.

In addition, the path coefficient values also verify the strength of the effect of TRSI and HRSI elements on satisfaction and delight. The path coefficient values ( $\beta$ ) of HRSI applications on customer satisfaction ( $\beta=0.396$ ) and delight ( $\beta=0.167$ ) are greater than the values of TRSI applications on satisfaction ( $\beta=0.387$ ) and delight ( $\beta=0.086$ ). This result suggests that HRSI applications have stronger effects on customer satisfaction and delight than TRSI applications. Furthermore, the relationship between delight ( $\beta=0.625$ ) and loyalty

is also stronger than the one between satisfaction ( $\beta=0.210$ ) and loyalty, which supports previous researchers' results indicating that delight has a stronger effect on customer loyalty (Crotts and Magnini, 2011; Deming, 1986; Kandampully, 1998; Kumar et al., 2001; Torres and Kline, 2006, 2013). Therefore, H2c, H2d, and H3d are supported.

In addition to the direct relationships between proposed constructs, we suspect that TRSI applications may also moderate the effect of HRSI applications on customer satisfaction and delight. That is, with the help of TRSI applications, service personnel may operate their job more efficiently and be able to provide better services, which result in an increase in customer satisfaction and delight. Therefore, we examine the moderating effect of TRSI mechanisms. To evaluate the moderating effect, the interaction effect model (with the moderating effects) is used to compare with the original model (without the moderating effects). The interaction effect model is calculated by multiplying the moderator indicators (TRSI) with the predictor indicators (HRSI) (Lok, 2015). The results show that TRSI mechanisms only moderate the effects of HRSI applications on delight, but not on satisfaction. Therefore, H4b is supported but H4a is rejected. The result of the moderating effect is presented in table IV and figure 4.

**[Insert Table IV about here]**

**[Insert Figure 3 about here]**

**[Insert Figure 4 about here]**

## **5. Discussion**

This research applied the PLS-SEM approach to study the causal relationships between TRSI mechanisms versus HRSI applications and customer satisfaction, delight, and loyalty. Several interesting findings are discovered. First, both TRSI and HRSI elements have positive and significant relationships with satisfaction and delight. This result resonates with previous scholars' research results (Bilgihan et al., 2011; Bitner et al., 2000; Luo et al., 2019; Piccoli et al., 2017; Sorensen et al., 2013; Yang et al., 2003). This result supports the hotels' efforts in introducing new technologies, or enhancing service personnel's service performance. These efforts can deliver a positive message that the hotel has the customers' best interests in mind and constantly strives to improve their service quality. Consequently, this can increase customers' satisfaction and delight with the hotel. Therefore, hotel practitioners are encouraged to continuously improve their service quality by means of introducing new technologies, as well as enhancing human service performance to sustain customers' satisfaction and delight.

We investigated further to compare which service innovation mechanism (TRSI vs. HRSI) had greater effects on customer satisfaction and delight. The statistical results showed

that HRSI applications outperform TRSI elements for both customer satisfaction and delight. We believe that the hospitality industry is a human-centric industry where intense human interactions are required and valued. Exceptionally positive human interactions can directly elicit the most powerful emotions of customers, and thus leaving memorable impressions with customers. Further, customers' emotions, hidden and higher order needs (i.e., self-esteem) can only be identified and satisfied through direct human interactions. Technology is most criticized for its inability to feel and perform real-time interactions during service encounters. However, customers can only experience the service as personal, unique and memorable when their emotional state is acknowledged, and their hidden and higher order needs are satisfied. Customers can thus have a long-lasting impression of the hotel which is the stronger indicator of customer loyalty. TRSI mechanisms may communicate a sense of novelty and convenience to customers, but this feeling may soon fade if new technologies are not constantly introduced to maintain the sense of novelty. Therefore, even though introducing and implementing new technology service mechanisms is an inevitable and important trend in the hospitality industry, for hotel practitioners we reiterate that human service remains the most effective and pivotal element in delivering exceptional service experiences that are valued most highly by customers.

Another possibility is that technology and human service do not compete against each other, but rather collaborate. Hence, we examined the moderating effect of TRSI mechanisms on HRSI applications and satisfaction and delight. The results indicate that TRSI mechanisms only moderate the effect of HRSI applications on delight, but not on satisfaction. Previous studies suggest that technology can assist in increasing customer satisfaction through providing the appropriate signifiers, while customizing services, to match their personal needs and facilitating the presentation and disambiguation of a large number of options, thereby aiding users to formulate and record their preferences. (Bitner et al., 2000; Overby, 2008; Piccoli et al., 2017). A plausible reason for the different outcome is that, unlike previous studies that mainly focused on the effect of technology, we examined the collaborative effect of both technology and human service. Technologies that facilitate the recoding of customers' preferences and habits provide more information to assist service personnel in discerning the customers' hidden needs, leading to more personalized and attentive services, even before customers request them. This level of service is beyond their expectations and evokes strong feelings of pleasure. Therefore, it exceeds satisfaction and leads directly to customer delight.

## **6. Conclusions and Implications**

The role of service innovation is becoming increasingly critical in the contemporary hospitality industry as the competition intensifies. When service offerings among competitors are undifferentiated, customers seek better and more innovative alternatives. In today's

business environment, it is imperative that companies take action leading to innovation. The prevalence of change requires innovation to sustain customer loyalty and maintain competitive advantage in industry. Service innovation is attracting substantial research attention to various topics including technology adoption processes (Kaushik et al., 2015; Kim et al., 2012; Lopez-Bonilla and Lopez-Bonilla, 2015), technology acceptance behaviors (Weijters et al., 2007), service innovation archetypes (Helkkula et al., 2018), technology readiness (Zhu et al., 2007), among others. Technology innovation is central to academic research on service innovation. Despite the reiteration of the critical role of technology innovation, there are scholars voicing the importance of human services, and especially in hospitality, as a service industry. This industry is commonly acknowledged as a human-centric industry which is viewed by customers as a platform for social experiences (Zeithaml and Gilly, 1987), where human interactions are highly valued. We believe that customers' consumption experiences consist of cognitive and hedonic needs. Technology applications may fulfill customers' cognitive needs by offering efficient, accurate, and stable services. Human interaction, however, is often required to identify, respond to, and resolve, their hedonic or affective needs. Technology has limited capability to communicate respect, which would boost self-esteem and creating a sense of appreciation and loyalty in customers. Academic research on service innovation highlights numerous areas deserving further investigation and discussion. These include: human service as innovation, and the effect of different types of service innovation on satisfaction, and the relationship between different types of service innovations and customer delight, among others.

We conclude that while both types of service innovation mechanisms have positive and significant relationships with satisfaction and delight, HRSI applications exercise a stronger influence on both satisfaction and delight. In contrast, TRSI mechanisms play a moderating role in this relationship. Our research provides valuable new information accentuating the significance of HRSI applications on increasing customer satisfaction and eliciting customer delight while redefining the role that TRSI mechanisms play in hospitality service encounters.

The results of this study also provide several important managerial insights. First, this study reconfirms the positive effects of TRSI and HRSI applications on increasing customer satisfaction and delight. Hotel practitioners are encouraged to continuously introduce new technologies and improve service personnel's performance, to sustain customers' loyalty to hospitality service providers. In addition, HRSI applications exert stronger effects on satisfaction and delight than TRSI mechanisms. Additionally, customer delight is found to be the better indicator of customer loyalty. This result provides a valuable guideline for managers to better allocate company resources to the more effective applications, thereby successfully eliciting positive responses of delight and to foster customer loyalty. Finally, TRSI applications moderate the relationship between HRSI applications and customer delight.

Hotel managers should therefore have a better understanding of the roles TRSI and HRSI applications play, and design a better modality of cooperation, enabling service employees to better use the personal information collected by technology applications to perform exceptional services that delight customers.

## 7. Limitations and Future Research

A limitation of this study was that the list of TRSI applications may not have been fully inclusive, as we were unable to include a list of technology applications that were planned for future implementation. Future research could include a comprehensive list of more advanced technologies. Additionally, there were few foreign participants as the majority of survey respondents were Taiwanese. Future research can replicate this study in other countries to establish whether these findings are applicable and generalizable when using participants from other countries.

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108年度專題研究計畫成果彙整表

計畫主持人：王怡潔		計畫編號：108-2410-H-041-001-			
計畫名稱：服務創新與顧客滿意、顧客感動之研究					
成果項目		量化	單位	質化 (說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等)	
國內	學術性論文	期刊論文	0	篇	
		研討會論文	0		
		專書	0	本	
		專書論文	0	章	
		技術報告	0	篇	
		其他	0	篇	
國外	學術性論文	期刊論文	1	篇	正在投稿Cornell Hospitality Quarterly
		研討會論文	0		
		專書	0	本	
		專書論文	0	章	
		技術報告	0	篇	
		其他	0	篇	
參與計畫人力	本國籍	大專生	1	人次	此大專生協助網路問卷編輯與經費核銷業務，過程可讓大專生了解學術研究之過程，並熟悉經費核銷之行政相關手續。
		碩士生	1		此研究生協助蒐集研究相關文獻資料，網路問卷編輯與經費核銷業務，過程可教育研究生學術研究之文獻蒐集與問卷設計之技巧，與量化問卷分析之方法。
		博士生	0		
		博士級研究人員	0		
		專任人員	0		
	非本國籍	大專生	0		
		碩士生	0		
		博士生	0		
		博士級研究人員	0		
		專任人員	0		
其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)					