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## Article

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Global Business & Finance Review (GBFR)

## Provided in Cooperation with:

People & Global Business Association (P&GBA), Seoul

*Suggested Citation:* Yang, Ke; Choi, Jeong-gil; Chung, Jellna (2021) : Extending the Technology Acceptance Model (TAM) to explore customer's behavioral intention to use Self-Service Technologies (SSTs) in Chinese budget hotels, Global Business & Finance Review (GBFR), ISSN 2384-1648, People & Global Business Association (P&GBA), Seoul, Vol. 26, Iss. 1, pp. 79-94,  
<https://doi.org/10.17549/gbfr.2021.26.1.79>

This Version is available at:

<https://hdl.handle.net/10419/253321>

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## Extending the Technology Acceptance Model (TAM) to Explore Customer's Behavioral Intention to Use Self-Service Technologies (SSTs) in Chinese Budget Hotels

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### ABSTRACT

**Purpose:** With the development and increasing adoption of the Internet in the early 21st century, SSTs (Self-Service Technologies) rapidly permeated all aspects of life. Many service providers in China are adopting a wide range of SSTs. This is mainly because they think SSTs improve customer service, increase productivity, and reduce costs. Problem is how potential customers perceive the SSTs and behave.

**Design/methodology/approach:** This study hypothesizes that the original TAM and extended TAM would not apply to customers using SSTs in Chinese budget hotels. All the relationships among variables on these models were tested by using a Structural Equation Model (SEM).

**Findings:** Results proved that all of the relationships on the original TAM do apply to customers using SSTs in Chinese budget hotels. However, the extended TAM does not fit into this particular market.

**Research limitations/implications:** This study examined the TAM with perceived risk and perceived playfulness to determine the factors influencing customers' behavioral intention to use SSTs in budget hotels. This approach is likely to ensure a stable theory development. Hence, the proposed model makes an important contribution to the emerging literature on SSTs. Moreover, this study originally hypothesized perceived risk affected on customers' satisfaction and behavioral intention to use SSTs in Chinese budget hotels. But it is rejected.

**Originality/value:** This study offers empirical evidence and makes contribution to future research related to further developing an understanding of the relationship between perceived risk and SSTs adoption.

*Keywords:* SSTs, TAM, Perceived risk, Perceived playfulness, Chinese budget hotel

## I. Introduction

Self-service technologies (SSTs) are a technological interface that enables customers to use services without direct intervention of service staff (Liu, 2020;

Meuter et al., 2000). SSTs were introduced in the early 1980s as self-pumping and automatic teller machines (ATM). With the development and spread of the internet in the early 21st century (Deel, 2010), SSTs are now permeating all aspects of life through quick and easy provision of high-quality services (Li & Wang, 2010). As a result, they have changed people's lives and brought more people into the production and delivery of services. Since SSTs

Received: Feb. 1, 2021; Revised: Mar. 18, 2021; Accepted: Mar. 25, 2021

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improve customer service, increase productivity and reduce costs (Castro et al. 2010), many service providers now use them to enable customers to experience services with minimum employees' involvement (Lema, 2009; Lin & Hsieh, 2007; Meuter et al., 2000).

However, China's hotel market has a different story: SSTs are only just being adopted to meet its demand for technology (Gu, 2017). SSTs were a late entry to the Chinese hotel market, but have developed rapidly (Hertzfeld, 2018). For example, SSTs and artificial intelligence-related projects such as Future Hotel, WeChat Eco Hotel and Easy Stay were announced in 2015. At the end of 2018, Alibaba Group launched its first futuristic hotel which attracted worldwide attention for its use of robotics (Liu & Kang, 2020).

With the evolution of SSTs in the hotel market in China, budget hotels are currently growing rapidly in the Chinese hotel industry (Mohapatra & Roy, 2008). In response to the rapid growth of the Chinese economy and corporate activities, the budget hotel sector has been greatly expanded, leading to the birth and growth of many budget hotel brands. These brands have not only been quickly accepted and recognized by Chinese customers, but also become a popular trend in the Chinese hotel market due to their high return on investment (ROI) and high demand (Hua, Chan & Mao, 2009). Most patrons of budget hotels are business travelers who simply want basic services and to check in and out as quickly as possible. For these reasons, SSTs are more in line with the needs of business travelers (Li & Zou, 2015).

In contrast, Sun (2011) pointed out that there have been many problems despite the enormous growth in China's the local budget hotel industry. In particular, the lack of employees and poor service quality due to the rapid mobility of budget hotel customers has hindered the development of budget hotels. To solve these problems and reduce the occurrence of human errors in service provision, some well-known budget hotels have begun implementing SSTs. However, as these are nascent technologies, most hoteliers are unsure of customer acceptance and fear that the lack of interpersonal contact might

reduce customer loyalty and deteriorate the relationship with the hotel (Meuter et al., 2005). Therefore, most budget hotels have a hybrid of personal interaction services and SSTs.

The SSTs in Chinese budget hotels take three forms: self-service machines in the lobby, via WeChat, or via the hotels' apps. All of these methods require the use of electronic devices, so they will give customers a different feeling and create a sense of play. Perceived playfulness is the pleasure that a user can derive from the use of a computer or other electronic device (Davis et al., 1992). Moreover, previous studies have highlighted that the more playful the customer perceives these technologies to be, the easier it is to accept and use them (Lee, 2016).

The application of SSTs reduces not only the occurrence of errors but also the cost of labor. It helps to provide a more consistent service environment (Curran et al., 2003). Despite these advantages, not all SSTs can be used in budget hotels. The use of SSTs in hotels is still in the trial phase, and most customers are waiting to see how it progresses. Moreover, SSTs are implemented require an internet connection, which makes it susceptible to privacy and property loss (Chathoth, 2007). Customers who are not well-versed in technology or comfortable with technological changes might find SSTs too stressful to use.

Previous studies have shown how customers' attitude toward SSTs is changing (Curran et al., 2003; Dabholkar, 1994; Weijters et al., 2007) and have introduced different types of SSTs (Kansal, 2016; Oh et al., 2013; Pi & Sangruang, 2011). Davis' (1989) technology acceptance model (TAM) has been widely used to study users' behavioral intention and confirmed the impact of perceived usefulness and perceived ease of use on the adoption of SSTs (Kaushik, 2015; Oghazi et al., 2012). The results of these studies have provided guidance to decision-makers on how to make SSTs more attractive to customers.

However, those results would not be applied to every customer in different countries. Considering the unique characteristics of Chinese customers, this study assumes that customers' acceptance of SSTs

in budget hotels in China is different from the generalized TAM, delivered from Theory of Reasoned Action (TRA). Mohsin and Lengler (2015) investigate and observe the expectations in hotel services on performance in China's budget hotels. One interesting fact is that Chinese customers expect high service quality, even in budget hotels. Liu et al. (2019) points out Chinese customers tend to have high service expectations. Since some large hotels or chain hotels in China have attempted to deploy SSTs in (Liu et al., 2020), this study helps to highlight effective ways to encourage the use of SSTs.

There is a need to study articulating if all the relationships on the original TAM and extended TAM can be applied to hotel patrons in China. In response to the growth of budget hotels in China, a clearer guideline for customers' acceptance of the SST is required. Therefore, this study identifies the impact of customer perception on the acceptance of SSTs in budget hotels. An accurate understanding of how customer perceptions influence the adoption of SSTs will allow budget hotels to create strategic plans and solutions to encourage customers to use them. This study provides guidance on how to make SSTs more attractive to customers in China's budget hotels.

## II. Literature Review

### A. Application of Self-service Technologies in China's Hotel Industry

Self-service technologies (SSTs) were proposed by Dabholkar (1994). Meuter et al. (2005) stated that consumers can perform certain activities (e.g., banking, purchasing subway tickets and checking in at airlines) by themselves, by using technology instead of relying on staff. For example, ATMs, online banking, subway ticket machines, self-gas stations, and airlines self-check-in. These applications of technology have substituted direct contact and interaction between customers and staff (Robertson & Shaw, 2006). SSTs can save labor costs and increase productivity (Curran

et al., 2003).

To enhance their service quality and brand value, some Chinese budget hotels are beginning to use SSTs. They used the program of daotian Property Management System (PMS) to amalgamate the self-services control with WeChat. In addition, customers should use WeChat official account to connect with hotels' system to complete a series of services, such as booking, prepaid, check-in check-out, and process of evaluation by themselves. Therefore, the guests do not require to interact with employees at the front desk. SSTs are also accessible to guests through hotels' apps. The services of the app not only provides regular services, such as the reservations, choosing a room, and check in/out, it also should have personalized service functions, like the control of rooms' equipment, alarm clock, and calling housekeeping (Li & Zou, 2015). The application of check-in/check-out self-help kiosk can supply 24-hour service and enhance service competence (Si, 2016). The customer does not need to wait to check in with the receptionist to arrange the room number, and they can obtain the room card directly by using the machine. Moreover, when checking out, customers can leave directly as long as the room card is inserted into the hotel's special machine. Therefore, the applications of SSTs in Chinese hotels are divided into three types: the hotel self-service machine in the lobby, WeChat and hotel apps.

### B. Technology Acceptance Model

Davis (1989) proposed the Technology Acceptance Model (TAM) based on the Theory of Reasoned Action (TRA). TRA (Fishbein & Ajzen, 1975) studied the model of intent in predicting and explaining behavior. TAM, an adaptation of TRA, has emerged as a powerful and concise way to set the precedent for technology use. These multi-attribute models have long dominated attempts to predict technology acceptance behavior (Chau & Hu, 2001; Gefen, 2002; Gefen & Straub, 1997; Yousafzai, Foxall & Pallister, 2010; Huang, 2013). The TAM applies the TRA

framework and assumes that acceptance of the technology is determined by the voluntary decision to use it. The intention is determined by the user's attitude to the technology and his or her perception of its usefulness (Ryu & Jang, 2006).

According to TAM, potential users of IT base their decision on whether or not to use that technology on its perceived usefulness and its perceived ease of use. Perceived usefulness is the subjective judgment of the potential user's utility of IT. Perceived ease of use is the cognitive effort expended by a potential user when learning and using the to learn and use the new technology. TAM argues that the behavioral intention depends on the attitude and perceived usefulness towards technical or information system, and the attitude is affected by perceived usefulness and perceived ease of use (Davis, 1989).

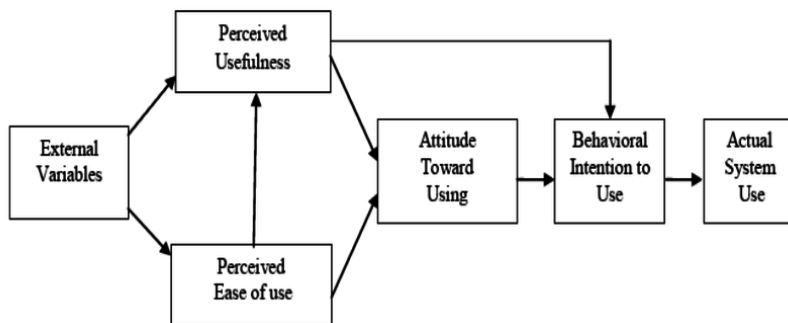
TAM has been widely used in Enterprise Resource Planning (ERP) system, mobile business, e-commerce, education, and network behavior. Pavlou (2003) used TAM to analyze why consumers prefer online shopping. Its reliability, usefulness and ease of use increased consumers' intention to shop online. Hung and Cheng (2013) used TAM to study knowledge-sharing intentions in a virtual community, and proposed that perceived usefulness and perceived ease of use are two important factors. Many empirical studies have shown that TAM can be used to study on consumers' acceptance of IT (Gefen, 2002). Since hotel SSTs are a type of information technology, the use of SSTs can be studied by TAM.

### C. Extending the Technology Acceptance Model with Perceived Risk and Perceived Playfulness

The premise of TAM is that perceived usefulness and perceived ease of use are important factors to affect people's attitudes and behavioral intention when using technology (Davis, 1989). Hubert et al. (2017) and Kansal (2016) later added other factors, such as perceived risk and playfulness.

The original definition of perceived risk came from psychology. Bauer (1960) stated that there was an implicit uncertainty in the consequences of purchasing decisions. Based on Bauer's definition, perceived risk consisted of two factors: the uncertainty and the severity of the consequences (Taylor, 1974). Choi (2001) regarded uncertainty as an important factor in general managers' strategic decisions. Therefore, perceived risk can be defined as the possibility of uncertainty and adverse consequences when purchasing products or services (Dowling & Staelin, 1994). Perceived risk therefore influences consumers' attitudes and choices (Featherman & Pavlou, 2003). Perceived risk affects the behavioral intention to use SSTs (Kansal, 2016). Hubert et al. (2017) found a negative relationship between perceived risk and TAM. Based upon previous research, this study considers perceived risk is a significant variable in the use of SSTs in hotels.

Barnett proposed the concept of playfulness was proposed in 1977. According to Barnett, playfulness



Source: Davis (1989)

Figure 1. Technology Acceptance Model

can be divided into personality traits and individual characteristics. In addition, playfulness can be interpreted as a stable personal feature or an emotional state (Lieberman, 2014). Many researchers have studied perceived playfulness in relation to the internet. Davis et al. (1992) defined perceived playfulness as the degree of pleasure that an individual derives from information technology. Moon and Kim (2001) defined it as “the degree to which the user feels his curiosity in the interaction with the network, and the degree to which the interaction is enjoyable.” Qian and Pan (2012) associated perceived playfulness with the enjoyment that users can obtain from receiving information from and interacting with other users.

The interpretation of the research model can be improved if perceived playfulness is seen as an intrinsic motivation to be added into the TAM. Perceived playfulness has a stronger effect on behavioral intention than perceived usefulness does (Moon & Kim, 2001). Van der Heijden (2004) identified a positive relationship between perceived playfulness and TAM. This study

therefore supports perceived playfulness as a significant variable in the use of SSTs in hotels. Table 1 and Table 2 extend the technology acceptance model by adding perceived risk and playfulness.

### III. Methodology

#### A. Research Hypotheses

This study hypothesizes that customers' acceptance of SST in budget hotels in China is different from that of TAMs, because Chinese customers are sensitive to service quality. Only a few large hotels and chain hotels in China use SST, so as the budget hotel market grows, clearer guidelines are needed for customers to accept SST. Budget hotels must make strategic plans to provide satisfactory service that will make SST appealing to Chinese customers. The following research hypotheses were developed.

**Table 1.** Extending TAM with Perceived Risk

Authors	Studies
Im et al. (2008)	The effects of perceived risk and technology type on users' acceptance of technologies.
Lee (2009)	Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit.
Lee & Song (2013)	Effects of trust and perceived risk on user acceptance of a new technology service.
Wu & Ke (2015)	An online shopping behavior model integrating personality traits, perceived risk, and technology acceptance.
Kansal (2016)	Perceived risk and technology acceptance model in self-service banking: A study on the nature of mediation.
Hubert et al. (2017)	Acceptance of smartphone-based mobile shopping: Mobile benefits, customer characteristics, perceived risks, and the impact of application context.

**Table 2.** The different studies by extending TAM with perceived playfulness

Authors	Studies
Moon & Kim (2001)	Extending the TAM to the World Wide Web. Information and management.
Van der Heijden (2004)	User acceptance of hedonic information systems.
Ho & Park (2005)	Mobile internet acceptance in Korea.
Oh et al. (2009)	Consumer adoption of virtual stores in Korea: Focusing on the role of trust and playfulness.
Torres et al. (2014)	The impact of content type and availability on e-book reader adoption.
Chang et al. (2015)	Exploring the intention to continue using social networking sites: The case of Facebook Playfulness.

The original TAM would not apply to customers using SSTs in Chinese budget hotels.

**H<sub>1.1</sub>:** Attitude to use SSTs is not affected by perceived usefulness

**H<sub>1.2</sub>:** Attitude to use SSTs is not affected by perceived ease of use.

**H<sub>2.1</sub>:** Behavioral intention to use SSTs does not significantly depend on attitude to using SSTs.

**H<sub>2.2</sub>:** Behavioral intention to use SSTs does not significantly depend on perceived usefulness of using SSTs.

**H<sub>3</sub>:** Perceived usefulness is not affected by perceived ease of use.

Previous studies have shown that using perceived usefulness as a variable in the TAM has a positive effect on attitude and behavioral intention (Castaneda et al., 2007; Davis, 1989; Hung & Cheng, 2013; Pavlou, 2003). Many researchers have confirmed that perceived usefulness has a positive influence on attitude and behavioral intention in different contexts. Childers et al. (2001) proved that perceived usefulness was the most important factor in online customers' attitude and behavioral intentions. Kim and Qu (2014) identified a significant relationship among perceived usefulness, attitude, and behavioral intention.

Davis (1989) defined perceived ease of use as the degree to which a person believes that using a particular system would be effortless. He also proposed that perceived ease of use had a positive effect on perceived usefulness and attitude. For this study, perceived ease of use is defined as the ease felt by hotel customers while using SSTs. SSTs are completely different from traditional personal services, and consumers need to acquire new skills in order to use them. If these skills are easier to learn, more consumers will use SSTs and prefer them to traditional services (Bateson, 1985). Igarria et al. (1995) used TAM to study computer use and found that perceived ease of use and perceived usefulness have a significant positive relationship on computer usage, and that perceived ease of use has a significant direct impact on perceived usefulness. Liao et al. (1999) noted

that the easier it is to use a virtual bank; the more customers will use it.

The extended TAM would not apply to customers using SSTs in Chinese budget hotels.

**H<sub>4.1</sub>:** Attitude to using SSTs is not affected by perceived risk.

**H<sub>4.2</sub>:** Attitude to using SSTs is not affected by perceived playfulness.

**H<sub>5.1</sub>:** Behavioral intention to use SSTs does not depend on perceived risk.

**H<sub>5.2</sub>:** Behavioral intention to use SSTs does not depend on perceived playfulness.

Many studies of internet behavior and recreational activities have focused on perceived playfulness. Moon and Kim (2001) indicated that playfulness is an important factor in human-computer interaction. Kim (2010) used perceived playfulness to explore customers' willingness to use electronic devices. Davis et al. (1992) highlighted that the behavior of individuals using information systems is influenced by internal and external motivation. Perceived playfulness is a type of internal motivation that emphasizes personal feelings. He also found that perceived playfulness affects both customer attitude and behavioral intention; many researchers have confirmed this finding (Bruner & Kumar, 2005; Lee et al., 2005; Oh et al., 2009).

Lin and Hsieh (2006) mentioned that perceived risk negatively affects people's attitude to new technologies. Since SSTs often coexist with personal services, other forms of service will be considered if consumers perceive that SSTs have higher risks. At present, most perception risk theories are used in the study of consumer purchase intentions and acceptance of information technology. To use SSTs in a hotel, guest are usually required to input their personal information through some electronic equipment. This poses the risk of a privacy breach and data theft. Therefore, it is necessary to examine the correlation between perceived risk and user acceptance. Featherman and Pavlou (2003) found that perceived risk has a significant negative impact on attitude. Im et al. (2008) used TAM to study the factors influencing online shopping and found that perceived risk affected

customer attitude toward using online shopping. Jarvenpaa and Todd (1996) demonstrated the relationship between perceived risk and behavioral intention.

Ajzen et al. (1992) argued that there is a significant positive relationship between attitude and behavioral intention. Fishbein and Ajzen (1975) indicated that the change in attitude of users can affect their behavioral intention and their behavior. Similar studies have shown that positive changes in attitude can significantly change behavior. Davis (1989) suggested that attitude is a precondition to behavior. In addition, Lee (2009) found that consumers' attitude to online banking can have a considerable effect on their behavioral intentions. In their study of the WeChat payment platform, Li and Li (2016) pointed out that users' attitude to WeChat has a positive influence on behavioral intentions.

### B. Research Model

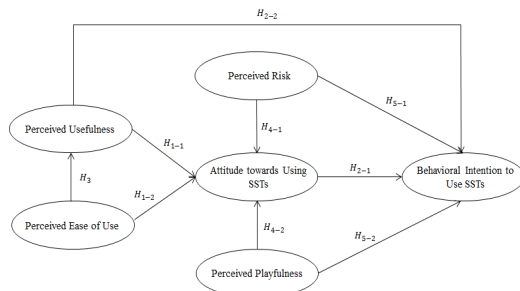


Figure 2. Research Model

### C. Measurement of Variables and Survey Composition

Based on the literature review, the definitions of terms and their measurements are discussed next. An onsite survey was conducted using a five-section questionnaire. The first section contains general questions to identify respondents. The second section is customers' perceptions, including perceived ease of use, perceived usefulness, perceived risk, and perceived playfulness. There are five questions each on perceived ease of use and perceived usefulness,

six questions on perceived risk and three questions on perceived playfulness. The third section explores customers' attitude to the use of SSTs in hotels and determines whether or not the customer is interested. The fourth section explores the behavioral intention of using SSTs in hotels. Both the third and fourth sections consist of three questions. The final section is about the respondent's demographics. Table 3 describes the survey composition.

### D. Data and Analysis

To obtain more accurate data, the questionnaire was administered to 313 customers in budget hotels in Shanghai, China from Oct. 15 to Nov. 15, 2018. Of the 313 surveys given out, 280 were usable.

In this study, collected data was analyzed by using Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structures (AMOS). Frequency analysis was used to analyze the data collected from the demographic statistics. Reliability analysis, correlational analysis and confirmatory factor analysis (CFA) were used to measure reliability and validity. Structural Equation Model (SEM) was used to verify hypotheses and modify the model.

## IV. Results

### A. Demographics

Table 4 shows that 144 of the respondents (51.4%) were male and 136 (48.6%) were female. Age distribution reflected a predominance of people 20-29 years of age (44.3%) followed by 30-39 (29.3%), 40-49 (11.4%), under 20 years old (10.7%) and more than 50 years old (4.3%). The educational background of the respondents was reported as less than high school 11 (3.9%), high school 71(25.4%), associate degree or bachelor's degree 144 (51.4%), master's 45 (16.1%) and doctorate 9 (3.2%). In terms of monthly income, the largest percentage of respondents earn



**Table 3.** Survey Composition

Variables	Measurements	Scale	Source
General Questions		Nominal Scale	
Perceived ease of use	Using self-service technologies in the hotel wouldn't require much mental effort.		Davis, 1989; Lin & Lu, 2000; Gefen et al., 2003; Shang et al., 2005
	It won't take much time to learn to operate self-service electronic devices in the hotel.		
	The various operations of the self-service electronic devices in the hotel are clear and easy to understand.		
	It is simple for me to get better service and products through using self-service technologies in the hotel.		
	Overall, using self-service technologies in the hotel is easy and convenient.		
Perceived usefulness	Using self-service technologies can save time to complete check-in/out and transaction quickly in the hotel.		Davis, 1989; Childers, 2001; Koufaris, 2002; Shih, 2004
	Using self-service technologies can improve service efficiency in the hotel.		
	Using self-service technologies in the hotel would make the service easier.		
	Using self-service technologies in the hotel would give me greater control over completing check-in/out and transaction.		
	Overall, using self-service technologies in the hotel is usefulness.		
Perceived playfulness	Using self-service technologies in the hotel is entertaining.	5-point Likert Scale	Moon & Kim, 2001; Oh et al., 2009; Lee, 2016
	The process of using self-service technologies in the hotel triggers my interest in exploring new things		
	The enjoyment derived from using self-service technologies in the hotel triggers my future adoption.		
Perceived risk	It may take more than required time to use self-service technologies in the hotel.		Dholakia, 2001; Shen, 2008; Lee, 2009; Liu & Fu, 2014; Kumar & Bajaj, 2016
	I am worried that if I don't know how to use self-service technologies in the hotel, I will be despised by my companions.		
	I may get lower discount as compared to human interaction service in the hotel.		
	After using self-service technologies in the hotel, it maybe not as good as expected.		
	Hotel self-service technologies are the transmission of transaction information through wireless networks and electronic devices, my personal information may not be kept safely.		
Attitude	In the hotel, using self-service technologies makes me nervous and anxious.		Taylor & Todd, 1995; Koufaris, 2002; Tsang et al., 2004; Hawkins et al., 2010
	I'm interested in using self-service technologies in the hotel.		
	It is a wise decision to use self-service technologies in hotels.		
Behavioral Intention	My assessment of the use of self-service technologies in the hotel is positive.		Davis, 1989; Boulding et al., 1993; Chen & Tsai, 2007; Li et al., 2014
	I will give priority to using self-service technologies in the hotel.		
	I would like to recommend other people to use self-service technologies in the hotel		
Demographics	I am willing to share the advantages of self-service technologies in the hotel.	Nominal Scale	

**Table 4.** Demographic Profile of Respondents

Variables	Items	Frequency	Percentage
Gender	Male	144	51.4%
	Female	136	48.6%
Age	Under 20 years	30	10.7%
	20–29 years	124	44.3%
	30–39 years	82	29.3%
	40–49 years	32	11.4%
	Over 50 years	12	4.3%
Education	Less than High School	11	3.9%
	High School	71	25.4%
	Associate degree or Bachelor's degree	144	51.4%
	Master's degree	45	16.1%
	PhD	9	3.2%
Monthly Income	Less than 5000RMB	36	12.9%
	5000~7999RMB	51	18.2%
	7000~8999RMB	105	37.5%
	9000~10999RMB	69	24.6%
	More than 11000RMB	19	6.8%

between ¥7,000 and ¥8,999 (37.5%), followed by ¥9,000 to ¥10,999 (24.6%), ¥5,000 to ¥7,999 (18.2%), less than ¥5,000 (12.9%), more than ¥11,000 (6.8%).

## B. Test of Reliability and Validity

### 1. Reliability

Reliability is the degree of consistency of the index measurement data. The most commonly used test method is Cronbach's alpha. The Cronbach's alpha values are generally between 0 and 1, and the closer the value is to 1, the stronger the consistency and reliability of the data. Guelford (1965) supposed that Cronbach's alpha value should be greater than 0.70, which represents high reliability; however, if it is smaller than 0.35, it would be unacceptable. The result of reliability analysis was reported in the Table 5 that the Cronbach's  $\alpha$  of perceived ease of use was 0.926, perceived usefulness was 0.882, perceived playfulness was 0.895, perceived risk was 0.946, attitude was 0.844, and behavioral intention was 0.782. All Cronbach's  $\alpha$  values were greater than 0.7, which was acceptable.

### 2. Validity

Validity is the degree to which the measurement scale reflects the characteristics of the measured value. Discriminant validity was measured via correlational analysis and convergent validity was measured via Confirmatory Factor Analysis (CFA). Campbell and Fiske (1959) supposed that all indicator factor loading should exceed 0.70, Composite Reliability (CR) value should be greater than 0.70 and average variance extracted (AVE) should be greater than 0.50, which represents high convergent validity. Table 5 shows that all factor-loading values in CFA of the measurement model exceeded 0.70. In addition, the composite reliabilities of construct ranged from 0.7832 to 0.9469. The AVE ranged from 0.5464 to 0.7486, which was greater than the variance. Therefore, all three conditions for convergent validity were met.

Discriminant validity assesses the extent to which a concept and its indicators differ from another concept and its indicator (Bagozzi et al., 1991). According to Fornell and Larcker (1981), the correlations between items in any two constructs should be lower than the square root of the average variance shared by items within a construct. Table 6 shows that the square root of the average variance extracted

(AVE) was greater than the correlations among the constructs. Therefore, that proposed construct measurements had discriminant validity.

**Table 5.** Cronbach's a of Measuring and Confirmatory Factor Analysis

Variables	Items	Cronbach's a	Factor Loading	CR	AVE
Perceived Ease of Use	Q1	0.926	.875	0.9283	0.7217
	Q2		.882		
	Q3		.882		
	Q4		.819		
	Q5		.785		
Perceived Usefulness	Q6	0.882	.829	0.8892	0.6174
	Q7		.793		
	Q8		.857		
	Q9		.741		
	Q10		.698		
Perceived Playfulness	Q11	0.895	.874	0.9208	0.7441
	Q12		.842		
	Q13		.872		
Perceived Risk	Q14	0.946	.868	0.9469	0.7486
	Q15		.881		
	Q16		.920		
	Q17		.778		
	Q18		.876		
	Q19		.862		
Attitude	Q20	0.844	.740	0.8482	0.6514
	Q21		.822		
	Q22		.855		
Behavioral Intention	Q23	0.782	.751	0.7832	0.5464
	Q24		.714		
	Q25		.752		

**Table 6.** Correlation Matrix between Constructs

	PEU	PU	PP	PR	ATT	BI
PEU	<b>0.8495</b>					
PU	.297**	<b>0.7857</b>				
PP	.195**	.237**	<b>0.8626</b>			
PR	-.137*	-.199**	-.134*	<b>0.8652</b>		
ATT	.249**	.282**	.203**	-.121*	<b>0.8071</b>	
BI	.321**	.269**	.237**	-.133*	.507**	<b>0.7365</b>

\*p< .05, \*\*p< .01, \*\*\*p< .001

Note: PEU=perceived ease of use; PU=perceived usefulness; PP=perceived playfulness; PR=perceived risk; ATT=attitude; BI=behavioral intention. The diagonal elements in bold are the square root of AVE (average variance extracted); off - diagonal elements are the correlation among constructs.

### C. Structural Equation Modeling

Structural equation modeling (SEM) are often used to assess unobservable latent constructs. It often invokes a measurement model that defines latent variables using one or more observed variables, and a structural model that imputes relationships between latent variables (Kline, 2011). This study tested the fit for the structural model to ensure that the model matched the data. In addition, the hypotheses were

verified through path analysis.

As shown in Table 7, the goodness of fit elements in our study satisfied the fit criteria of CMIN/DF (<3.0), GFI (>.80), IFI (>.90), NFI (>.80), CFI (>.90), and RMSEA (<0.08). Therefore, it showed a good model fit. In addition, the collected data can be used in path analysis in SEM. The results are reported in Table 8 and Figure 3.

The path significance of each hypothesized association in the research model and variance explained

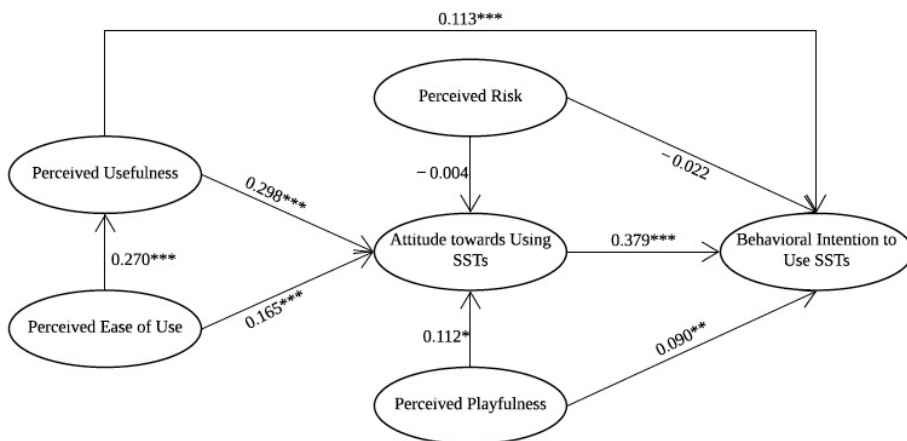
**Table 7.** Model Fit Summary of SEM

	CMIN	DF	CMIN/DF	GFI	IFI	NFI	CFI	RMSEA
Measured model	618.415	265	2.334	0.859	0.930	0.884	0.930	0.069

**Table 8.** Path Estimation Results for SEM

Models	Models	Path	Estimate	S.E.	C.R.	P
Original TAM	$H_{1-1}$	PU→ATT	.298	.073	4.088	***
	$H_{1-2}$	PEOU→ATT	.113	.053	2.141	.032
	$H_{2-1}$	PR→BI	.270	.052	5.221	***
	$H_{2-2}$	PU→BI	.165	.056	2.958	.003
	$H_3$	PEOU→PU	.112	.050	2.235	.025
Extended TAM	$H_{4-1}$	PR→ATT	.090	.037	2.436	.015
	$H_{4-2}$	PP→ATT	-.004	.042	-.104	.917
	$H_{5-1}$	PR→BI	-.022	.030	-.717	.474
	$H_{5-2}$	PP→BI	.397	.059	6.748	***

\*p< .05, \*\*p< .01, \*\*\*p< .001



**Figure 3.** Results of Research Model

by each path were examined. Figure 3 and Table 8 explains the standardized path coefficients and path significances. Figure 3 shows that all hypotheses other than  $H_{4-1}$  and  $H_{5-1}$  were rejected.  $H_{4-1}$  which states that attitude to the use of SSTs is not affected by perceived risk and  $H_{5-1}$  which behavioral intention to use SSTs does not depend on perceived risk, are supported. None of the other hypotheses in Figure 3 are in the expected direction and are not significant. Thus, perceived usefulness and perceived ease of use are positively related to attitude to the use of SSTs, rejecting  $H_{1-1}$  and  $H_{1-2}$  respectively. Attitude and perceived usefulness are positively related to behavioral intention to use SSTs, rejecting  $H_{2-1}$  and  $H_{2-2}$ , respectively. Perceived ease of use is positively related to perceived usefulness, rejecting  $H_3$ . Therefore, the original TAM is still applicable to customers using SSTs in Chinese budget hotels. For extended TAM, perceived playfulness is also positively related to attitude and behavioral intention to use SSTs, rejecting  $H_{4-2}$  and  $H_{5-2}$ . Since perceived risk is negatively related to attitude and behavioral intention to use SSTs, only supported hypotheses are  $H_{4-1}$  and  $H_{5-1}$ .

## V. Conclusion

### A. Discussion

Based on prior research and the findings of this study, a conceptual framework has been proposed to find critical perceptions of SSTs in practicing on attitude toward using and behavioral intention to use in budget hotels in China. A correct understanding of how customer perceptions influence the adoption of SSTs would allow budget hotels to create strategic plans that would encourage customers to use them. Therefore, this study examined the refined model that extended the TAM to include perceived risk and perceived playfulness and identified the factors influencing customers' behavioral intentions while using SSTs and increasing customer adoption of SSTs in budget hotels.

The results show that perceived usefulness and perceived ease of use had positive effects on customers' attitude and behavioral intention in the context of using SSTs in hotels. Thus, Davis' (1999) original TAM model applies to budget hotels in China. Hoteliers will need to improve the functionality and usefulness of SSTs. In addition, interactive interface options and processes must be simplified to improve usability. Even if there is risk, usefulness, ease of use, and a little bit of playfulness are added, customers will accept SSTs. In other words, if these elements are met, perceived risk does not interfere with attitudes towards using SSTs or behavioral intention to use SSTs.

If the extended TAM model by Kansal (2016) and Hubert et al. (2017) are applied and if perceived risk and perceived playfulness are added, the results differ. Perceived risk has a negative impact on customers' attitude and behavioral intention in the context of using SSTs in hotels, but it is not statistically significant. Customers accept SSTs if they find enjoy using them. The self-service interface should be attractive as possible to increase customers' interest.

Since mobile phones are the means through which budget hotels have implemented SSTs, they have familiarized Chinese consumers with new technology. In addition, as the network information security in China is nearly perfect, it seldom encounters risk loss. Even if there are unpredictable risks, the experience of guests at budget hotels can offer a clearer understanding when they use SSTs.

Understanding customers' perceptions of using SSTs could assist hoteliers in finding strategic ways to encourage hotel guests to use SSTs. In addition, it can help hotels to improve their service quality and enhance their brand image.

### B. Theoretical and Practical Implications

This study has the following theoretical and practical implications. It examined TAM in relation to perceived risk and perceived playfulness to determine the factors that are most likely to influence

the behavioral intention of guests at budget hotels to use SSTs. This approach is likely to ensure the stable development of a theory. Hence, the proposed model makes an important contribution to the emerging literature on SSTs. Moreover, this study's original hypothesis that perceived risk affected customers' satisfaction and behavioral intention to use SSTs in Chinese budget hotels was rejected. This study offers empirical evidence and makes a contribution to the understanding of the relationship between perceived risk and SST adoption.

While TAM remains useful in understanding the adoption of individual technologies, it does not consider the characteristics of the service channels provided by SSTs or the interaction with customers. For this reason, better strategies must be formulated to manage and deploy multiple service channels. Effective management of service delivery channels increases hotel profitability and competitiveness (Meuter et al., 2000). In this regard, money and time can be efficiently distributed, and customer relationships and loyalty can be enhanced to achieve future success (Liu & Hung, 2020).

The findings of this paper also have practical implications and recommendations for hoteliers in Chinese budget hotels that offer SSTs. This study highlighted that customers' perceived usefulness, perceived ease of use, and perceived playfulness are important for the adoption of SSTs in budget hotels. In particular, SSTs should give customers the impression of entertainment. These findings are also valuable guidance to help hotels encourage their customers' use of SSTs. For instance, hotels can provide detailed instructions, emphasize the simplicity and convenience of SSTs, or offer incentives to encourage their customers to use them. Incentives have proven effective in adopting customer behaviors. For example, Chinese people were unfamiliar with take-out apps or ridesharing applications. However, discounted pricing and coupons incentivized rapid uptake, and most people in China not use these apps.

In addition to the research results, the characteristics of Chinese customers and customers using budget hotels should be considered. According to Mohsin

and Lengler (2015), Chinese customers expect high-quality services even in budget hotels. Thus, to maintain service quality while applying SSTs, service failures must be reduced. The best way to prevent service failures is maintain a reliable service delivery system. For example, SSTs should be regularly checked. Moreover, employees at self-service stations or telephones connected to customer service should be responsible for maintaining the quality of SSTs.

### C. Limitations and Further Research

This study has several limitations which could be taken into consideration for future research. In order to get more accurate data, survey was conducted onsite, targeting actual customers in budget hotels in Shanghai, China. Additional research efforts paid to longitudinal studies would give a clearer picture on how the users and the relationships among variables change over time. Apart from adding perceived risk and perceived playfulness, additional extended variables can be added to the base TAM to provide more useful information according to the characteristics of SSTs.

Qualitative strategies such as focus group and in-depth interview to reach a deeper understanding of multiple viewpoints regarding acceptance and operation of SSTs can be applied to future research. Moreover, the apparent discrepancies between customers' expressed views and hoteliers' perceptions of customer opinions highlight the need for research that integrates organizational and customer perspectives. Based on the results and limitations of this study, future research should promote the use of SSTs in budget hotels.

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