A multilevel study on preferences for self-service technology versus human staff:

Insights from hotels in China

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Abstract: Rapid technological developments bring with them an inevitable, still unresolved debate over high-tech versus high-touch service. Technology adoption usually involves multilevel phenomena (e.g., individual, organization, and industry-wide). Moving beyond previous work, which has focused primarily on individual-level adoption, this research aims to develop a hierarchical framework integrating multiple domains. Based on 59 in-depth interviews with hoteliers and customers, the framework unveils the mechanisms of organizational and individual preference construction for self-service technologies compared with human-delivered services. Findings reveal that the interplay between the external environment, organizational context, internal service encounters, and core customer experience influences customers' and hoteliers' preference construction. Results further show that organizations pay more attention to the environment and organizational context, whereas individuals tend to highlight differences between customers more strongly. Theoretical and practical implications are also discussed.

Keywords: Self-service technology; Preference construction; Human services; Multilevel research; Hierarchical framework

1. Introduction

Modern technological advances have enabled hoteliers to serve customers without employees' direct involvement (Meuter, Ostrom, Roundtree, & Bitner, 2000; Shin & Perdue, 2019). Self-service technologies (SSTs) are high-tech and "low-touch" interfaces, in contrast to traditional interpersonal encounters which are generally high-touch and low-tech (Kim & Qu, 2014). The rapid development of technology has sparked contentious debate over the value of human-touch versus tech-focused services in the hospitality domain (Wei, Torres, & Hua, 2016). SSTs have simplified many aspects of human life and will continue to grow in popularity. Nonetheless, SST adoption and utilization remain relatively low, and some customers return to human-delivered services after experiencing SSTs (Kaushik, Agrawal, & Rahman, 2015). As a people-oriented service industry, hotels face difficult decisions regarding whether to introduce SSTs (Oh, Jeong, & Baloglu, 2013).

Understanding the factors influencing a hotel's introduction of SSTs is key to successful implementation of these technologies (Hua, Morosan, & DeFranco, 2015). Academic research seeking to understand technology use in this sector has been dominated by a focus on consumer adoption. Prior research has provided a rich background for theorizing individual acceptance (Frambach & Schillewaert, 2002; Shin & Perdue, 2019), but existing theoretical frameworks (e.g., the technology acceptance model [TAM]) focus on only one or a small number of factors and do not account for the influences of external or managerial actions. Most technology adoption situations involve phenomena at multiple levels, including individuals, organizations, industries, and societies (Tscherning, 2011). In some cases, individuals may be forced to use SSTs as organizations eliminate face-to-face service offerings completely (Feng, Tu, Lu, & Zhou, 2019). Since hotels' budgetary constraints and government requirements can lead to the

failure of some SSTs (Liu, Hung, Wang, & Wang, 2020), the bias towards individual-level variables in explaining technology acceptance may not reflect the reality that this industry faces (Tscherning, 2011).

The inherent mismatch between single-level research and the complexities of real-life SST adoption has prompted conversations about practitioners' and consumers' responses to SST-infused hospitality services. Consistent with this deepening discussion, the first objective of the present study was to develop a multilevel framework encompassing the determinants of organizational and individual adoption of high-tech tools by explaining how hoteliers and customers develop SST preferences. The second objective was to explore and explain the discrepancies between customers' and hoteliers' perceptions. Such multilevel research bridging the micro–macro divide should yield a fuller understanding of technology adoption. With knowledge of the multilevel determinants of technology adoption and how they interrelate, practitioners, including marketers and managers, can better market technology to organizations and promote customers' acceptance and use of technology within these settings

2. Literature review

2.1 Definition of self-service technology

With ongoing technological advances, service development and delivery have changed greatly (Meuter, Bitner, Ostrom, & Brown, 2005). New types of technology-based services continue to emerge. Academics are taking note of this transformation and have begun to examine technology-based services (Froehle & Roth, 2004; Schumann, Wünderlich, & Wangenheim, 2012). Dabholkar (1994) presented a classification scheme for technology-based service delivery that allocates service from three dimensions, namely who (i.e., person-to-person and person-to-technology), where (i.e., at a customer's home/workplace; at service sites), and how (i.e., physical distance and proximity) service delivery occurs. Notably, person-to-technology service is delimited by customers using technology to perform self-service; thus, this type of service can be regarded as SST. Although Dabholkar (1996) introduced the notion of technology-based self-service options, he did not clarify the concept. Meuter et al. (2000) later operationalized SSTs as "technological interfaces that enable customers to produce a service independent of direct service employee involvement" (p. 50). This definition has since become a mainstay in conceptualizing SSTs (e.g., Considine & Cormican, 2016; Cunningham, Young, & Gerlach, 2009).

As original SST formats (e.g., vending machines) are updated, innovative and artificial intelligence (AI)–based SSTs are produced (Meuter et al., 2000). Hotels are increasingly investing in and deploying various SSTs, including self-check-in/check-out systems, self-service ordering gadgets, smart speakers, and robots (Kim, Christodoulidou, & Brewer, 2012; Shin & Perdue, 2019). Presumably, integrating multiple SSTs can reduce firms' operating costs while raising profits (Kasavana, 2008). This study thus explored various SSTs instead of

concentrating on a single type (e.g., Fan, Wu, & Mattila, 2016; Kokkinou & Cranage, 2015) in accord with Wei et al. (2016).

2.2 Self-service technology in hotels in mainland China

SSTs in mainland China emerged relatively late but have caught up quickly. Hotels in China have now pioneered SST adoption (Liu et al., 2020). The history of SSTs in hotels in mainland China indicates that technologies have brought sweeping changes to traditional service (Fig. 1). According to MCTPRC (2020), up to the year 2020, China was home to 9,923 starred hotels. Most hotels provide online reservation and payment services through online travel agencies, their own websites, and smartphone apps. Domestic hotels such as Wanda, 99in, and Hanting have also begun to test AI-based SSTs. For example, East Hotel Hangzhou, Yingsu Film Hotel Suzhou, and Dragon Hangzhou in mainland China have introduced facial recognition check-in kiosks. The COVID-19 pandemic forced the hospitality and tourism industry to suddenly pause—yet given capabilities to limit customer–employee contact, SSTs present a risk-reduction strategy and possible panacea to COVID-19's effects on the service industry (Hao, Xiao, & Chon, 2020; Huang, Makridis, Baker, Medeiros, & Guo, 2020; Shin & Kang, 2020). The pandemic undoubtedly accelerated high-tech offerings' proliferation in this industry (Jiang & Wen, 2020): as of October 2020, more than 3000 hotels in China were equipped with robots from Yunji Technology, a service robot provider.

However, compared with attention to SSTs in Western countries such as the U.S. (Buell et al., 2010; Fan et al., 2016), a lack of knowledge persists about SSTs in China. Differences exist across perspectives and contexts, corroborating Mattila (1999) who conveyed that Asian and Western customers possess distinct values regarding luxury hotel stays. Lu et al. (2011) found that Taiwanese customers were inclined to use conventional personal check-in services at an airport, whereas Koreans, Australians, and Americans preferred to use SSTs. Concerning the application of SSTs in hotel settings, neglecting the nuances of customers' home culture will likely lead to negative impacts on customer service and hotel performance (Fisher & Beatson, 2002). Nationality greatly influences SST adoption and use (Fisher & Beatson, 2002; Lu et al., 2011). For instance, as Macau's Hotel X did not test SSTs in the local context before installing SST kiosks, a low utilization rate came as a result (Rosenbaum & Wong, 2015). Research on SSTs in hotels in China thus holds practical and theoretical importance.
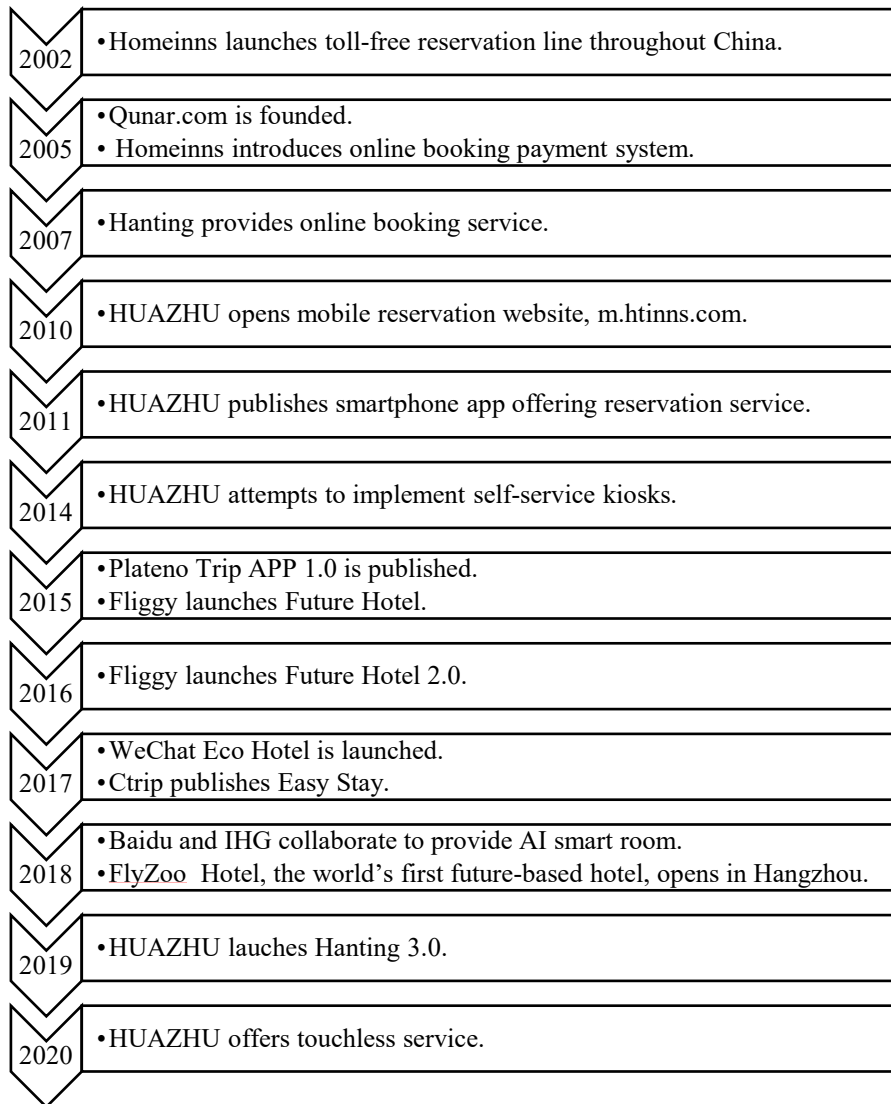
Fig.1. The history of technology development in hotels in mainland China.

2.3 Theories and concepts of technology adoption

Technology adoption has long been a key area of research, within which the main unit of focus has been individuals (Frambach & Schillewaert, 2002; Shin & Perdue, 2019; Tscherning, 2011). Various theories or concepts have been used to explain individual-level adoption, including theory of reasoned action, theory of planned behavior, resource-matching theory, self-efficacy theory, TAM, technology readiness, and task–technology fit theory (Kokkinou & Cranage, 2015). These theories have provided a fertile basis for interpreting individual acceptance (Frambach & Schillewaert, 2002; Shin & Perdue, 2019). Drawing on these theories and concepts, researchers have investigated the attributes, attitudes, intentions, and behaviors that can explain information technology (IT) adoption (Tscherning, 2011).

However, as noted above, technology adoption usually involves multilevel phenomena (Tscherning, 2011), and a focus on individual-level adoption may not reflect the imperatives faced by a given industry (Tscherning, 2011). Thus, research at the organizational level has grown (Liu et al., 2020). To understand organizational dynamics with regard to technology

adoption, individual-level theories have been borrowed to explain organizational applications (Liu et al., 2020). For instance, Wang and Qualls (2007) proposed a modified TAM to capture hospitality organizations' adoption behavior. However, individual-level analysis may differ from organization-level analysis (Klein & Kozlowski, 2000). That is, the atomistic fallacy applies when scholars attempt to generalize findings from individual-level research to higher levels, as relationships identified at lower levels may not translate to higher levels (Klein & Kozlowski, 2000). In shifting from micro- to macro-level studies, researchers should carefully evaluate the relevance of individual constructs at higher levels of analysis (Klein & Kozlowski, 2000). A move from purely micro (individual-level) research to meso (organization-level) research is hence taking place. Meso refers to a company level (e.g., hotel), bridging the individual level (e.g., customers) and the macro level (Loufrani-Fedida & Aldebert, 2020; Öberg, Henneberg, & Mouzas, 2012). The importance of meso considerations has been confirmed in research on organizational behavior and in management science (House, Rousseau, & Thomas-Hunt, 1995). Theories such as the technology–organization–environment (TOE) framework, the unified theory of acceptance and use of technology, and diffusion of innovation have also been developed to understand organizational adoption (Rogers, 1995; Venkatesh, Morris, Davis, & Davis, 2003).

Despite this increasing sophistication, a lone level of analysis may not provide a complete view of technology adoption (Tscherning, 2011). Multilevel research is thus needed to address the various levels of theory and to integrate the micro-domain's focus on individuals with the broader focus (Tscherning, 2011). Multilevel research is similarly essential to capturing the nested complexity of technology adoption (Klein & Kozlowski, 2000). Tscherning (2011) adapted Coleman's diagram into a multilevel framework of technology adoption to explain how social network theory, at the individual and social network levels, can predict IT adoption. Majchrzak and Markus (2012) claimed that technology affordances and constraints theory can facilitate the interpretation of how individuals and organizations use technology and how such use affects their performance. Frambach and Schillewaert (2002) formulated a multilevel model of organizational innovation adoption, incorporating variables that determine an organization's decisions along with factors that influence decisions made by individuals within an organization.

Although these studies contribute to our understanding, empirical support is needed to verify emerging frameworks or theories, as they were initially derived from a review of prior literature derived from a review of prior literature. Liu et al. (2020) held focus-group discussions with hotel practitioners and segmented the organization-level adoption of SST into three stages: adoption decision, implementation, and customer acceptance. They further revealed the determinants across these stages. However, they acknowledged the need to integrate organizational and individual perspectives (Liu et al., 2020). There are many benefits to combining two levels of analysis (individual and organizational), as mentioned in previous research on organizational behavior and management science (House et al., 1995; Loufrani-

Fedida & Aldebert, 2020).

In summary, although prior studies have offered conceptual contributions to multilevel research on technology adoption (Frambach & Schillewaert, 2002; Liu et al., 2020; Tscherning, 2011), scholars have yet to fully consider the rich data that can be obtained from individuals, organizations, and their mutual interactions. Therefore, this study involved multilevel research from two prevalent social science perspectives to bridge the micro–macro divide (Tscherning, 2011). Research at the individual level assumes a micro perspective, seeking to understand individuals' thoughts, feelings, and behavior (Rousseau & House, 1994); research at the organizational level is considered meso and aims to understand organizations and market dynamics to marry the individual and macro levels (Tscherning, 2011). Such a multilevel approach is best suited to exploring the dynamics between individual- and organization-level technology adoption (Tscherning, 2011).

2.4 Factors influencing technology adoption

Based on the aforementioned theories, scholars have examined factors influencing individual and organizational technology adoption separately, namely from the standpoints of customers and hoteliers respectively (e.g., Liu et al., 2020; Oh et al., 2013). Studies concerning SSTs are relatively scarce (Shin & Perdue, 2019). There were only 23 journal articles exploring SSTs in hospitality and tourism between 2010 and 2017, most of which (65%) examined SST adoption (Shin & Perdue, 2019), with a major focus on customers' attitudes and behavioral intentions (Kim & Qu, 2014). Attitudes account for customers' mental inclinations or reactions to SSTs based on their evaluations of these innovations (Curran & Meuter, 2005). Behavioral intention represents one's likelihood of adopting SSTs (Oh et al., 2013) and has been shown to be positively associated with actual behavior (Kim & Qu, 2014).

Based on the extant literature, antecedents of customers' attitudes and their behavioral intentions to adopt SSTs can be classified into four groups: technology characteristics, customer characteristics, situational influences, and task complexity (Liu & Hung, 2020; Shin & Perdue, 2019). Technology characteristics include perceived usefulness, perceived ease of use, and control (Lu, Chou, & Ling, 2009). Customer characteristics include demographic features (e.g., age) and consumer profiles (e.g., self-efficacy and need for interaction) (Dabholkar & Bagozzi, 2002). Situational influences cover employee presence and demonstration, tolerance for waiting, order size, other customers' adoption decisions, and service providers' incentives for technology use (Collier, Moore, Horky, & Moore, 2015; Lu et al., 2009).

Recently, research at the organizational level has attracted growing interest (Liu et al., 2020). Studies have indicated that customer acceptance largely drives managers' decisions on technology application (Hansen, 1995; Sahadev & Islam, 2005; Wünderlich, Wangenheim, & Bitner, 2013). Employees are also essential (Li & Hsu, 2016). A labor force adaptable to change is important in preparing hospitality firms to deploy effective SST delivery systems (Lema,

2009). In addition, support from top management plays a key role (Leung, Lo, Fong, & Law, 2015; Wang, Li, Li, & Zhang, 2016). Decision makers' demographics (e.g., age, education level, and job tenure) and profiles (e.g., managerial IT knowledge) can affect organizational technology acceptance as well (Ozturk & Hancer, 2014). Moreover, firms' technology adoption is tied to firm-related characteristics (e.g., hotel size, chain affiliation, and financial readiness), environmental factors (e.g., location and perceived pressure from competitors), and technological characteristics (e.g., complexity and expected benefits) (Leung et al., 2015; Sahadev & Islam, 2005; Siguaw, Enz, & Namasivayam, 2000; Wang et al., 2016; Yadegaridehkordi, Nilashi, Nasir, & Ibrahim, 2018).

Conducive although prior literature regarding the antecedents of technology adoption, the separate investigation of individual adoption and organizational acceptance does not align with phenomena around technology adoption occurring at multiple levels (e.g., individuals, organizations, and industries) (Tscherning, 2011). Single-level analysis may limit the understanding of technology adoption (Tscherning, 2011). As noted, most studies on individual adoption have not considered external or managerial contexts (e.g., Oh et al., 2013). Research in sociology and political science has highlighted the tension between an individual's capacity to make adoption decisions independently and the influences of the organizational environment on individuals' choices and opportunities (Tscherning, 2011). Thus, a bias towards adopter-side variables in explaining the acceptance of innovations may paint an incomplete picture (Tscherning, 2011).

Customers' adoption of SSTs has appeared somewhat frequently in the literature, and such studies offer useful firsthand data to inform practitioners' decisions about technology adoption (Liu et al., 2020; Shin & Perdue, 2019). However, whether practitioners accurately perceive their customers' degree of acceptance is an open question (Liu et al., 2020). Frameworks on organizational technology adoption, such as TOE, rarely include this dimension as a major construct (Liu et al., 2020). Practitioners' accurate understanding of customer acceptance is central to their decisions on further SST application (Rosenbaum & Wong, 2015). Past research has indicated apparent discrepancies between customers' expressed views on technology adoption and hoteliers' perceptions of their customers' views (Liu et al., 2020). This mismatch indicates a need for more research that integrates organizational and individual perspectives on technology adoption (Liu et al., 2020).

In short, analyzing technology adoption at one level is less complicated but may also be less accurate; a multilevel approach can provide additional insight into IT adoption (Tscherning, 2011). Therefore, this study aimed to link the micro and macro levels, presenting multilevel research to unveil how organizations and individuals make decisions about technology adoption and to identify and explain differences between customers' and hoteliers' perceptions.

3. Methodology

In-depth interviews, the primary data collection method in qualitative research, constituted the main data source in this study for several reasons. First, because qualitative research is inductive, it was deemed most appropriate given the study objectives (Waller, Farquharson, & Dempsey, 2016). In addition to testing theories, qualitative research can generate new theories (Waller et al., 2016), consistent with the goal of developing a hierarchical framework that can explain the mechanisms of SST adoption at individual and organizational levels. Second, qualitative research explains the quality or nature of something by addressing relevant circumstances and unearthing unexplored processes. Because a multilevel understanding of technology adoption is limited, in-depth interviews with practitioners and customers were used to obtain rich data on individuals, organizations, and their interactions. Most SST research has emphasized quantitative methods. Interviewing users of both SSTs and human-delivered services presents fruitful opportunities to compare individuals' rationale for choosing one service mode over another (Oh, Jeong, Lee, & Warnick, 2016). The present qualitative study also comes in response to a call to use diverse research methods, including interviews (Shin & Perdue, 2019).

In this study, hoteliers and customers (representing the supply and demand sides of hotels, respectively) were key informants. Managers from hotels that had implemented SSTs or had used innovative SSTs in hospitality were recruited along with customers who had used hotel SSTs. Screening questions ("Have you stayed in a hotel in mainland China within the past 12 months?" and "Did you use SSTs during your last stay?") were used to confirm customers' knowledge of hotel SSTs. Convenience and snowball sampling methods were adopted to access qualified informants. Convenience sampling refers to recruiting informants who are easily accessible such as friends, family members, and colleagues (Veal, 2011). In the present study, eligible acquaintances of the authors were contacted first, and then additional qualified participants were reached based on these individuals' recommendations (i.e., snowball sampling). Snowball sampling involves contacting additional eligible informants through interviewees (Veal, 2011). If these contacts agreed to participate, then the authors asked for their preferences and made an appointment for interviews. Majority of the face-to-face interviews were conducted at Shenzhen, Hangzhou and Hong Kong. A few interviews were conducted via phone for interviewees' convenience. To ensure data quality, all interviews were audio-recorded with interviewees' consent.

Before holding the main set of interviews, a pilot study was conducted to assess the validity, reliability, aptness, and articulation of interview questions. In late December 2017 and early January 2018, three hotel managers and four well-informed customers participated. Interview questions were modified slightly based on the results of the pilot study. The interview mainly involved two types of questions. The first type asked which kinds of SSTs customers/hotels had used and which they preferred; the second type asked them to explain

their preferences. Examples of hotel SSTs discussed by participants included online room selection; check-in and check-out kiosks; mobile check-in and check-out; mobile tablets, televisions, smartphones, smart speakers, and touch-screen tables used to order services and control in-room facilities; and robots.

From January to April 2018, 27 in-depth interviews with hoteliers and 25 interviews with customers were conducted during formal data collection. The seven interviews from the pilot study were also suitable for use, resulting in a total of 59 interviews. The inclusion of the pilot test in the final study is due to the following considerations. First, the pilot test did not lead to major changes in the interview protocol. That is, final interview questions were similar to those posed in the pilot test. Second, informants in the pilot study met the eligibility requirements for target participants (i.e., interviewees in the pilot and main studies were from the same population). Third, the inclusion of pilot test data in final studies has been observed in top journal articles (e.g., Wang, Xiang, & Fesenmaier, 2014). Interviews lasted slightly more than 1 hour (65.65 min) on average. Of the 30 hotelier participants, 14 were general managers and seven were women, ranging from 28 to 56 years old (Table 1). These informants worked at a diverse set of hotels in terms of size, category, and affiliation. The 29 customer interviewees had patronized economy, midscale, upscale, and luxury hotels throughout China (Table 2). Their ages ranged from 25 to 55 years. Eighteen customers were women.

Table 1
Demographics of interviewed hoteliers.

Variables		N	%	Variables		N	%
Gender	Male	23	76.7	Position	Front desk manager	3	10
	Female	7	23.3		Director of human resources	3	10
Age	28–34	9	30		IT manager	2	6.7
	35–44	15	50		General manager	14	46.7
	45–56	6	20		Others	8	26.6
Hotel category	Business	21	70	Brand affiliation	Domestic chain	4	13.3
	Resort	7	23.3		Independent	8	26.7
	Business & resort	2	6.7		International chain	18	60
Hotel scale	Economy	1	3.3	Hotel location	Hangzhou	9	30
	Midscale	1	3.3		Shenzhen	9	30
	Upscale	13	43.4		Other cities in China	12	40
	Luxury	15	50				

Table 2
Demographics of interviewed customers.

Variables		N	%	Variables		N	%
Age	25–34	24	82.8	Travel purpose	Business	15	51.7
	>34	5	17.2		Leisure	10	34.5
Gender	Female	18	62.1		Business & leisure	1	3.5
	Male	11	37.9		Visiting family & friends	3	10.3
Hotel scale	Economy	6	20.7	Hotel location	Hangzhou	4	13.8
	Midscale	5	17.3		Shanghai	4	13.8
	Upscale	9	31		Shenzhen	3	10.3
	Luxury	9	31		Jinan	3	10.3
Hotel category	Business	23	79.3		Beijing	2	6.9
	Resort	3	10.3		Other cities in China	13	44.9
	Business & resort	2	6.9				
	Homestay	1	3.5				

Content analysis was adopted to identify themes and reveal underlying messages. Content analysis is commonly used to pinpoint interview text characteristics and reveal underlying meanings, biases, values, and opinions by categorizing and exploring themes (Holsti, 1969; Jones, 1995). Holsti (1969) mentioned that content analysis is appropriate for analyzing interviews given its usefulness in interpreting conversational messages by categorizing and exploring themes. Therefore, the researchers adopted content analysis to interpret data gathered through in-depth interviews to identify themes and reveal underlying messages.

First, the data collected through interviews were prepared by literally transcribing information (Creswell & Clark, 2007). A professional transcription company was employed to transcribe all interview recordings. One of the authors then examined the transcripts word-for-word to confirm accuracy. Prior to coding the data, transcribed text was explored through repeated reading and memos about the corresponding rich information (Creswell & Clark, 2007). Second, data analysis began with coding the transcripts. Coding is the process of systematically grouping and labeling raw data units (Creswell & Clark, 2007; Holsti, 1969). The following five recording units were characterized by being classified into a given category and used by a majority of content analysis research: (1) single word or symbol, (2) theme, (3) character, (4) sentence or paragraph, and (5) item (Holsti, 1969). The theme "a single assertion about a subject" (Holsti, 1969, p. 116) was leveraged by the present study to reduce the data given to exploring values and preferences (Holsti, 1969). Third, codes were grouped into categories with reference to content units that characterize the foregoing recording units (Holsti, 1969). Given the lack of standardized classification schemes, the authors adopted trial-and-error methods to construct categories (Holsti, 1969). Category construction involves moving back and forth, checking the usefulness of provisional categories, and adjusting them in accordance with the content (Holsti, 1969). Finally, with the help of NVivo 11, six categories were identified to influence customers' and hoteliers' preferences: (1) environmental inhibitors and enablers, (2) organizational inhibitors and enablers, (3) attributes of SSTs and human

services, (4) service task attributes, (5) customer differences, and (6) customer experience (Tables 3–8).

The validity and reliability of data were also tested. The focus of triangulation is to seek multiple sources (Willis, 2007), which can be acquired through diverse data collection methods, varied information sources, diverse contexts or theories, different researchers, and multiple studies (Willis, 2007). To ensure validity, triangulation was performed across information sources. Although only in-depth interviews were conducted to collect data, study informants included hotel managers and customers. These distinct populations contributed to the comprehensiveness and trustworthiness of this study. Moreover, multiple settings were considered to promote trustworthiness: informants from different types of hotels (i.e., luxury, upscale, midscale, and economy) were included.

Reliability was verified through two techniques. The most popular technique for guaranteeing the reliability of analysis results is to ask two or more coders to perform independent coding (Jones, 1995). Therefore, the authors verified the identified codes, themes, and dimensions independently. They then compared, discussed, and adjusted the analysis results until they reached a consensus (Harding, 2013). Consistency through time was also considered (Prothro, 1956). In particular, the authors completed the first round of coding for customer interviews in May–August 2018 and repeated their data analysis in November 2018. The first round of analysis for hotelier interviews spanned August–September 2018 before being repeated in November 2018 and early December 2018.

4. Findings

The content analysis of interviews revealed that individuals and hotel organizations were both influenced by factors covering six dimensions: environmental factors, organizational factors, attributes of SSTs and human services, service task features, customer differences, and customer experience. The following sections present examples and quotations from in-depth interviews to illustrate these influences by dimension.

4.1 Environmental context

"The application of SSTs follows the overall environment and trends," Hotelier #13 said. A comparison of hoteliers' and customers' opinions indicated that hoteliers often considered environmental factors more frequently and comprehensively (Table 3). Specifically, public readiness helps to promote the popularity of self-service. Both hoteliers and customers expected that preferences for SSTs should increase as SSTs become more common. On the contrary, the unpopularity of technology, customers' attraction to human-delivered services, and unfamiliarity diminished individuals' desire for SSTs. Ten hoteliers mentioned that hotels could cultivate customers' tendencies to use SSTs through effective promotion. Unfortunately, customer misbehavior remains problematic in mainland China, inhibiting hotels' application of portable SSTs. Hoteliers worried about the loss of portable SSTs because some customers

may steal these in-room amenities.

Table 3
Environmental inhibitors and enablers.

Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)
Public readiness	(+) Developed consumption habits	22 (54)	25 (77)
	(-) Misbehavior	5 (9)	0
Social values	(-) Human apathy	1 (2)	0
	(+) Environmental protection	5 (10)	5 (5)
Government regulations	(-) Check-in regulations	21 (52)	4 (4)
	(-) Payment regulations	10 (17)	3 (5)
Industry development	(+) Applications in other industry	5 (8)	0
	(+) Usage by peers	15 (20)	0
	(-) Industry nature/image	12 (21)	11 (34)
Technology development	(±) Technology development	26 (134)	12 (23)
Labor issues	(+) Lack of labor	6 (10)	0
	(+) High turnover rate	3 (3)	0
	(+) High labor costs	8 (11)	3 (5)

Note: + denotes positive influence; - denotes negative influence; ± denotes mixed influence.

Along with societal developments, anticipated outcomes influenced participants' preferences. Data analysis indicated that hoteliers and customers both expected SSTs to exert positive impacts on the environment, thus contributing to their preferences for these devices. However, hotelier participants also noted that SST applications could evoke apathy, reducing their preferences for SSTs. In their opinions, people are emotional animals, and the use of emotionless technologies may result in indifference.

Hotelier #6 commented, "[The use of robots] depends on the development of the whole industry." In addition to inspiring competitive pressure, observing competitors' successful implementation and application of SSTs motivated hotels to adopt such technology. Some hoteliers indicated they did not have the energy to be the first hotel to debug and test new SSTs, but if other hotels demonstrated the usefulness and benefits of these devices, then they would consider introducing such options (e.g., Hotelier #29). Conversely, the nature of the service industry tempered customers' and hoteliers' preferences for SSTs. Many commented that hotel service is a human-oriented business and that hotels are expected to arrange everything rather than shifting the responsibility to consumers. Aside from intra-industry influences, hoteliers indicated that SST applications in other industries (e.g., food takeout) compelled them to introduce SSTs. External industry applications, not just intra-industry pressure and experiences, should thus be considered in future research along with practical applications.

Customer and hotelier informants both indicated that their preferences also depended on the direction and extent of technological development. Technology trends have effectively forced some managers to adopt SSTs, but some may not adopt SSTs immediately since current iterations are not well developed and SST operation still requires having a human in the loop. Customer #5 argued that SSTs often provide "half self-service" rather than pure self-service.

In addition, this study revealed labor issues affecting hotels' and customers' preferences for SSTs. Some respondents noted that SSTs could mitigate labor shortages and reduce high turnover. By contrast, Customers #13 and #19 claimed that labor is not a scarce resource and that it would therefore be inappropriate for hotels in China to replace service employees with SSTs. Furthermore, given that guests pay good money to receive personal service, hotels should not use SSTs to save labor (Customer #19).

Inhibitors from the Chinese government could not be ignored. Hotel managers most frequently mentioned the negative effects of government regulations on the check-in process. The Chinese government mandates that hotels upload guests' identifying information in real time, making self-check-in impossible without government approval. Furthermore, Chinese credit cards cannot be used without the card owner providing a signature and password. *"Without solving this issue, it seems impossible to use mobile check-in at hotels,"* said Hotelier #8. However, thanks to the rapid development of online and mobile payment options in mainland China, automated payments are becoming a reality.

4.2 Organizational context

A comparison of hoteliers' and customers' opinions indicated that regardless of the hotel's profile, hoteliers considered more organizational factors than customers, including incompatibility with existing features, support from top management, and contributions from technology companies (Table 4). Similar to hoteliers, customers stated that the hotel's profile and the benefits they expected to receive from a hotel influenced their preferences. Specifically, both groups believed that new, business, and non-luxury hotels with high customer volumes were better suited to SSTs. The influence of hotel size seemed related to technology type: hotel size positively influenced hotels' adoption of self-service check-in and check-out kiosks, whereas it negatively influenced the adoption of in-room SSTs. Nevertheless, hotelier informants felt that SSTs were more appropriate in hotels with 100 or 150 rooms than in those with 600 rooms. Apparently, once the hotel size reaches a certain level, reliance on technology declines (Siguaw et al., 2000).

Table 4
Organizational inhibitors and enablers.

Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)
Hotel profile	Opening date: (+) New hotel	10 (16)	1 (1)
	(±) Hotel size	12 (16)	1 (1)
	Hotel type: (+) business or non-luxury hotel	25 (107)	15 (33)
Incompatibility	(-) Space incompatibility	12 (18)	0
	(-) System incompatibility	12 (30)	0
Top management	(-) Disagreement among management	7 (12)	0
	(-) Underemphasized IT department	2 (2)	0
	(+) Management openness to technology	14 (22)	0
	(±) Hotel group standards	16 (34)	0
	(-) Owner restrictions on budget	10 (16)	0
Perceived benefits for hotels	(+) Economic profits	23 (88)	11 (16)
	(+) Benefits for employees	24 (47)	3 (3)
	(+) Convenience of operation and management	12 (21)	5 (9)
	(+) Brand marketing	16 (36)	16 (26)
Technology company contributions	(+) Active promotion	4 (5)	0
	(+) Collaboration with hotel	7 (10)	0

Note: + denotes positive influence; - denotes negative influence; ± denotes mixed influence.

Hoteliers and customers also pointed out that SSTs benefited hotels, and this factor contributed to their preferences. Both groups spoke highly of the economic advantages of SSTs: decreased workloads and pressure, simplified work, enhanced work efficiency, ease of management, and convenience of operation. Moreover, SSTs were seen as conducive to brand marketing. Hoteliers stated that innovative SSTs such as robots functioned as a selling point to attract customers, and customer informants confirmed this view. Customer #14 said, "[SSTs] enhanced my appreciation of the hotel. I think the hotel is advanced in technology adoption."

Incompatibility between SSTs and hotels' current resources, disagreements among management, understaffed IT departments, and owners' budgetary restrictions all negatively influenced hotels' preferences for SSTs. As Hotelier #28 stated, "We have decided to use [self-service kiosks]. However, the owner needs to invest in the technology. Therefore, [SST use] ultimately depends on whether the owner can provide enough funding." By contrast, free SSTs offered by technology companies enhanced hoteliers' interest in SSTs. Hotelier #5 indicated, "If there is a collaboration, I can use it… However, if you ask me to rent, I do not want to spend the money because of the cost."

4.3 Channel attributes

The interviews revealed the effects of various SST characteristics on customers' and hoteliers' preferences for SSTs relative to human-delivered services (Table 5). Both hoteliers and customers criticized SSTs as lacking customization and personalization. They found SSTs inflexible in dealing with customer needs, whereas service employees "would satisfy [customers'] personalized needs. That is, you can negotiate with employees when you have

15

requirements" (Customer #15). At the same time, some customers indicated that technological advances led to an array of personalized services. For example, Customers #9 and #21 observed that online room selection systems offered them personalization. Moreover, customers praised the stability of SST-based services. Such devices would typically not provide good service today and poor service tomorrow, as can happen with human services.

However, customers and hoteliers also cited instances in which SSTs seemed relatively useless compared to human services. In their view, SSTs simply completed tasks as programmed with no opportunity for two-way communication. As such, customers could not provide instantaneous feedback or have other previously unrequested needs met when receiving services. In a similar vein, hotels could not contact customers in a timely manner using SSTs. Customers and hoteliers also voiced concerns about SSTs' ability to deal with service failures; facing such a situation, customers may expect a service employee to help (Customer #22). Contrary to the simple functionality of current SSTs, waiters in restaurants can address customers' diverse needs in addition to helping them place orders, serving food, and retrieving dishes. Furthermore, the information provided by SSTs was described as less immediate than that offered by staff. Customer #5 also mentioned that technology system updates may cause customers to feel uncomfortable as they struggle to keep up with changes.

Customer and hotelier informants indicated that perceived ease of use, a user-friendly interface, and requirements for customers influenced their service preferences. If an SST with an approachable interface was easy to use, they would prefer it; otherwise, they would continue to prefer humans. Customers mentioned that some SSTs (e.g., self-check-out technologies) appeared suitable only for individuals with certain skills. If customers did not meet these criteria, their difficulties in using SSTs would waste time, reduce efficiency, and result in negative experiences.

Despite these concerns, hoteliers and customers recognized SSTs as more reliable than traditional services. SSTs seemed less likely to make mistakes and were always punctual, effectively guaranteeing service quality. Furthermore, customers and hotel managers mentioned SSTs' 24/7 availability. Hoteliers stated that SSTs do not need rest, cannot fall ill, and cannot resign; rather, they are always on call, enabling hotel guests to receive service at any time.

Table 5
Channel attributes.

Attributes of self-service technologies				Attributes of human services			
Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)	Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)
Standardized	(-) Rigid	10 (15)	6 (11)	High-touch	(-) Flexible	11 (16)	4 (5)
	(-) Standardized	3 (3)	5 (7)		(-) Personalized	7 (11)	1 (3)
	(-) Emotionless	13 (25)	6 (11)		(-) Emotional	14 (30)	10 (12)
	(+) Consistent	0	6 (8)		(+) Unstable	8 (15)	12 (24)
Useless	(-) Incapable of communicating	7 (8)	13 (19)	Useful	(-) Responsive	8 (11)	16 (25)
	(-) Poor problem solving	4 (5)	3 (4)		(-) Empathetic problem solving	4 (4)	1 (1)
	(-) Simple function	7 (12)	9 (14)		(-) Diverse functions	1 (2)	0
	(-) Late update	2 (2)	7 (10)				
Easy to use	(+) User-friendly interface	6 (6)	8 (20)				
	(+) Ease of use	4 (6)	15 (36)				
	(-) Requirements for customer	5 (7)	6 (9)				
Reliable	(+) Low risk	2 (2)	10 (23)				
	(+) 24/7 service	7 (8)	7 (11)				

Note: + denotes positive influence; - denotes negative influence; ± denotes mixed influence.

4.4 Service task features

Data analysis revealed that various service task features influenced hoteliers' and customers' preferences for SSTs (Table 6). Different service environments gave rise to different expectations and needs. As such, hoteliers' and customers' preferences varied according to service task attributes and customer needs.

Table 6

Service task features.

Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)
	(±) Complexity	18 (48)	10 (14)
Task attributes	(±) Frequency	9 (11)	13 (23)
	(-) Standardization	4 (7)	3 (3)
Customer needs	(-) Ill-defined needs	0	4 (4)
	(-) Unique needs	18 (41)	25 (107)

Note: + denotes positive influence; - denotes negative influence; ± denotes mixed influence.

Specifically, customers held distinct opinions about the influence of service complexity, generally based on whether a service was originally provided by employees. In terms of in-room activities initially performed by customers themselves, five customers said they would rather use conventional methods for easily completed tasks (e.g., manually closing curtains) than try innovative technologies such as electronic curtains. For simple tasks, they found that technology did not make a notable difference. On the other hand, two customers said they preferred SSTs for more complex tasks. Customers' views of tasks originally completed by service employees were the opposite; the simpler a task, the more customers preferred SSTs. In other words, the conventional channel that SSTs substituted appeared to moderate the effect of task complexity on technology adoption.

The data also showed that task standardization and frequency affected customers' and hoteliers' preferences. Because customer informants seldom ate meals, ordered room service, or watched TV at hotels, they identified no major differences between SSTs or human services in these areas. In contrast to this indifference, Hotelier #11 expressed a preference for having SSTs handle night-shift room service. Hotelier #14 explained, "We put fewer people on the night shift. Thus, robots must deal with it."

Whether customers had a clear purpose or special need related to a service task also shaped their preferences regarding SSTs. If customers had a clear idea of what they

wanted, they were more likely to prefer SSTs, as Customer #10 indicated: "If my purpose is strong—for example, I want a towel—and I know what I want, I prefer to order via [an AI management system]." Similarly, if customers did not have a special need, they were more inclined to use SSTs. In many cases, they did not care whether a service was provided via SST or a service employee as long as it was delivered properly. When customers had special needs, however, they and hoteliers both indicated a preference for employees.

4.5 Customer differences

Customers' and hoteliers' preferences for SSTs were related to customer demographics, personality, and trip profiles (Table 7). As Customer #5 said, *"Every service has to be refined. That is, whether this service can appropriately be substituted. Indeed, it should be refined to customers who use this service."*

Table 7

Customer differences.

Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)
Demographics	Age: (+) Young	25 (62)	10 (24)
	Gender: (+) Male	0	1 (2)
	Occupation: (+) Hospitality	0	4 (6)
	(+) High education	3 (3)	0
	(+) First-tier cities	3 (3)	0
	(-) Social status	7 (15)	0
Personality	(-) Talkative	10 (14)	5 (7)
	(+) Open to technology	3 (3)	11 (17)
	(+) Efficient	0	1 (1)
	(±) Lazy	0	5 (7)
Prior experience	(+) First time	0	15 (27)
	(+) Good experience in other fields	0	5 (6)
Trip profile	(+) Frequent travel	4 (6)	5 (7)
	(+) Familiar with hotel	0	4 (5)
	(+) Travel Companion	1 (1)	6 (13)
	Trip purpose: (+) Business trip	15 (28)	4 (6)
	Trip arrangement: (-) Package trip	1 (1)	2 (3)

Note: + denotes positive influence; - denotes negative influence; ± denotes mixed influence.

Many participants noted that the elderly preferred SSTs less than young people, who have been raised in an information era and are more comfortable with technology. By contrast, degradation in elders' physical functioning over time could constrain their preferences for technology. Additionally, customer informants mentioned that their

preferences were affected by their gender and occupation, whereas hotelier informants emphasized the influence of customers' education level, residence, and social status. They suggested that customers with higher levels of education or who lived in first-tier cities in China were more likely to prefer SSTs. Eight of the 30 hoteliers mentioned that they preferred to provide high-touch service to customers with high social status. In their opinions, these guests were too important to be told to take care of themselves.

Customers stated that their preferences for SSTs were associated with personality factors. Customer #14 explained that acceptance of a robot delivering room service "may be related to personality. Actually, I am a person who is afraid of communicating with strangers." This notion was shared by hoteliers, as some managers mentioned that certain customers did not want to interact with service employees, whereas other customers preferred to chat with staff members. Data analysis further revealed that the lazier a customer was, the more likely they were to favor convenience; however, the convenience of a particular channel depended on the original channel being replaced by an SST (e.g., a service employee vs. controlling in-room facilities manually). Moreover, customer informants who were open to technology and liked to complete tasks efficiently preferred SSTs over human services.

According to customer and hotelier informants, preferences for SSTs also depended on a customer's trip profile including travel frequency, travel companion(s), trip purpose(s), and trip arrangements. The positive influence of frequent travel may be based on the greater familiarity travelers can gain with new technology or with a certain hotel or city. Traveling with friends or significant others was found to motivate preferences for SSTs, as having companions can reduce one's technology anxiety. Business travelers who tended not to have many special needs and who highly valued efficiency were more likely to prefer SSTs than leisure tourists. Additionally, differences between independent trips and package tours with regard to check-in and check-out procedures were mentioned. Hotelier #29 was skeptical of SSTs' abilities to manage room-sharing issues or various customer payment methods. Alternatively, some tour guides dealt with check-in or check-out on behalf of guests traveling with them (Customer #27).

Customers in this study indicated that their prior experiences with SSTs shaped their preferences. If customers had not used SSTs previously, they tended to want to

experience the technology. In contrast, some customers were reluctant to use SSTs precisely because they had never used the technology or enjoyed its benefits (e.g., Customers #5, #13, and #19). Additionally, some customers stated that their experiences with SSTs in other fields (e.g., self-check-in at the airport) affected their preferences for SSTs at hotels. If their experiences in other industries were negative, they may not prefer SSTs in hotels. No hotelier informants cited this impact of prior experience on customers.

4.6 Customer experience

Customers and hoteliers both expressed that their preferences for SSTs depended on whether the customer experience was enhanced over their experiences with traditional human services. Customer #15 explained, "It is a question of whether the customer experience is improved or decreased compared with [human-delivered services]." Hotelier #22 agreed: "Therefore, in a word, only if the change is an improvement over the original state will I decide to use this technology." The following discussion delineates how the five dimensions of customer experience with SSTs may reinforce customers' and hoteliers' preferences (Table 8).

First, aesthetic experience related to the anthropomorphic nature of SSTs, including a device's appearance and voice, influenced customers' preferences. The more anthropomorphic SSTs were, the more strongly customers preferred them. Two customers shared their experiences with robots whose voices they found unappealing or unfriendly, diminishing their view of SSTs. In addition to voice, hoteliers and customers indicated that the more aesthetically appealing SSTs were, the more strongly they were preferred.

Table 8
Customer experience: Appropriation criteria and reinforcers.

Customer experience with self-service technologies				Customer experience with human services			
Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)	Category	Subthemes	No. of hoteliers (No. of references)	No. of customers (No. of references)
Aesthetic experience	(+) Anthropomorphic	0	4 (5)	Aesthetic experience	(-) Proper appearance	0	1 (2)
	(+) Proper appearance	10 (15)	7 (12)				
	(-) Unappealing voice	0	2 (4)				
Affective experience	(+) Pleased	7 (13)	11 (16)	Affective experience	(+) Bored	5 (5)	8 (10)
	(+) Comfortable	1 (4)	15 (27)		(-) Comfortable	0	2 (2)
	(+) Surprising	6 (9)	7 (13)		(+) Normal	1 (1)	8 (11)
	(+) Relaxed	0	4 (7)		(+) Stressful	2 (2)	6 (12)
	(+) Entertaining	8 (17)	8 (11)				
	(+) Fresh	18 (45)	18 (51)				
	(-) Causing regret	0	2 (3)				
Cognitive experience	(+) Sanitary	0	5 (8)	Cognitive experience	(+) Frowsy	0	4 (10)
	(+) High accuracy rate	20 (60)	27 (114)		(+) High service failure rate	5 (8)	11 (18)
	(+) Convenient	24 (109)	28 (204)		(+) Inconvenient	3 (3)	8 (10)
	(+) Efficient	26 (144)	28 (155)		(+) Low efficiency	4 (6)	19 (43)
	(+) Practically useful	14 (32)	24 (62)		(-) Practically useful	9 (12)	9 (13)
	(+) Simplified process	16 (45)	27 (167)		(+) Troublesome process	4 (6)	20 (40)
	(+) Economic value	8 (11)	11 (22)				
Actional experience	(+) Not needing to bother service employee	2 (3)	1 (1)				
	(+) Control	8 (17)	15 (32)				
	(+) Make me blame myself	3 (3)	1 (2)				
	(+) Improve customer participation	7 (9)	0				
Social experience	(+) Respected	1 (1)	3 (4)	Social experience	(-) Respected	4 (4)	4 (6)
	(+) Safe	11 (19)	14 (42)		(+) Unsafe	0	3 (3)
	(+) Trusted	3 (4)	19 (30)		(+) Distrust	1 (1)	0
	(+) Privacy protected	14 (26)	16 (20)				
	(+) Fashionable	8 (12)	2 (3)				
	(+) Progressing society	1 (1)	2 (2)				
	(+) Special	2 (2)	0				
	(+) Make customer rethink life habits	4 (4)	0				

Note: + denotes positive influence; - denotes negative influence; ± denotes mixed influence.

Second, SST use evoked different emotions, including entertainment, surprise, freshness, comfort, pleasure, relaxation, and regret, which were labeled as affective experiences. Hoteliers used SSTs to entertain, surprise, and delight customers; customers reported using SSTs for fun and feeling surprised, delighted, pleased, and fresh as a result. However, customers' surprise and delight sometimes declined as the popularity of SSTs increased, and they might not actively use such technology as the novelty faded (Customers #12 and #23). Hoteliers stated that they hoped to enhance customers' comfort with SSTs. Some customers shared that SSTs helped them to relax. Customer #4 explained, "There is no [obligation] to communicate with emotionless SSTs. … They definitely serve me, and I feel free to accept their service." By contrast, overwhelmingly assiduous attention from employees made some customers feel stressed. Additionally, Customers #17 and #21 expressed disappointment when a hotel advertised that it was equipped with innovative SSTs that turned out to be unavailable.

Third, the cognitive value of using SSTs affected hoteliers' and customers' preferences, including the usefulness of the information provided, enhanced convenience, improved efficiency, simplified process, high accuracy rate, and reduced need to give tips. Interestingly, some customers also preferred SSTs for reasons of cleanliness and sanitation. Customer #14 explained that she worried about the cleanliness of a product delivered by a service employee, as she wondered if it might have fallen to the ground inadvertently or be covered with spit, which the employee would never disclose.

Fourth, actional experience associated with control, consideration for service employees, and self-attribution regarding service failure exerted positive influences on customers' and hoteliers' preferences for SSTs. For instance, hoteliers and customers both mentioned that customers occasionally did not want to bother service employees and hence preferred SSTs. Managers and customers also concurred that it was the customer's fault if service failure occurred when using SSTs, and they suggested that customers would be more willing to accept such service failure when they caused the errors themselves. Additionally, hoteliers highlighted the improved level of customer participation. Hotelier #14 mentioned that customers liked sharing their experiences on social media: "In my opinion, most [customers] will share this. Many people took photos [in the hotel] and said, 'Look, a robot is serving me.'"

Fifth, social values such as fashion, privilege, respect, trust, safety, and privacy were found to contribute to hoteliers' and customers' preferences for SSTs. Managers indicated that SST use made customers feel fashionable, cool, and respected. Customers themselves regarded

innovative SSTs as a privilege. Customer #18 commented, "[SSTs] gave me a sense that I have this kind of right [in this hotel], which other hotels do not offer. I think this is a kind of privilege. You feel that you are respected." Customer and hotelier informants were surprised that hotels were leading the way in certain aspects of social life. As Customer #9 shared, "It feels as if society is progressing when one uses innovative SSTs." Managers further indicated that the use of innovative SSTs in hotels compelled customers to reconsider their daily habits. Meanwhile, customers indicated that they felt trusted by hotels that used SSTs to serve them. Customer #9 explained, "I think the hotel trusts me. It was not worried that I would damage the in-room amenities."

Customers demonstrated mixed perceptions of safety and privacy related to SSTs. In some cases, they felt relieved and safer when tackling problems on their own rather than depending on others (i.e., service employees). Others, however, worried about their personal safety or the privacy of their information. Customer #27 wondered, *"What do I do if an SST explodes? What do I do if it becomes aggressive and I cannot fight him off?"*

5. Discussion and conclusions

The rapid development of technology has generated contentious debate over the provision of human-centered versus tech-focused services in hospitality (Wei et al., 2016). However, research on technology adoption has been mostly limited to individual-level analyses, with few studies presenting higher-level (e.g., organizational) or multilevel analyses (Frambach & Schillewaert, 2002; Öberg et al., 2012; Shin & Perdue, 2019). No suitable multilevel framework has been developed to bridge the gap between the micro (individual) and higher (e.g., organization, society, or industry) levels. To fill this gap, this study conducted a multilevel research to explore preferences regarding SSTs at the individual and firm (hotel) levels to bridge the micro–macro divide (Tscherning, 2011). Results showed that customers' and hotels' preferences for SSTs versus human staff were influenced by the environmental context (Table 3), organizational factors (Table 4), attributes of SSTs and human services (Table 5), service task features (Table 6), customer differences (Table 7), and customer experience (Table 8). A service encounter is regarded as "the communication process when the service product is delivered from the employee to the customer in the hotel domain" (Yang, 2008, p. 35). In this work, customers, service delivery channels (i.e., service employees or SSTs), and service tasks were integrated to form a new level—the service encounter. This arrangement also coincides

with task–technology fit (TTF), in which the alignment between task requirements, individuals' abilities, and technology functionality plays a crucial role (Goodhue & Thompson, 1995). This study extended technology functionality to the features of service channels by revealing the influences of these features when the channel is replaced by SSTs (i.e., hotel staff services vs. customers performing tasks themselves). Therefore, a simplified four-level framework was developed (Fig. 2), consisting of the environmental context, organizational features, internal service encounters, and core customer experience.
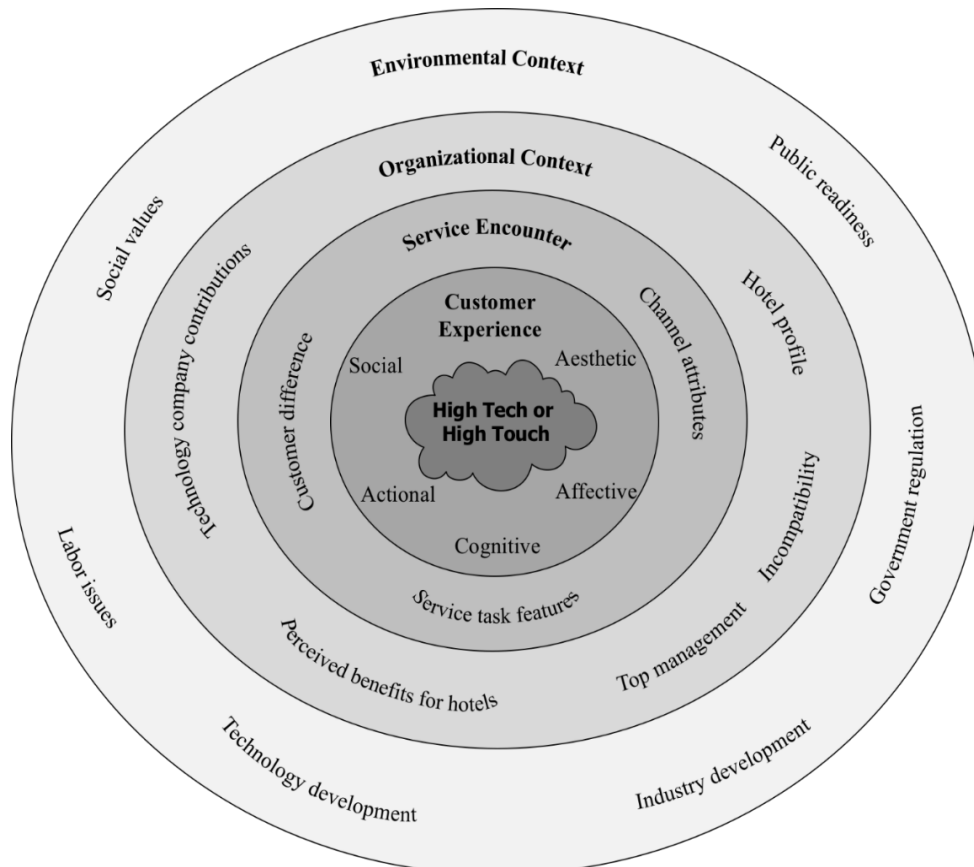
Fig. 2. A hierarchical framework for preference construction.

In the outermost layer, hotels' and customers' preferences are influenced by the environment. Environmental factors include public familiarity, government regulations, labor issues, the industry, technological developments, and anticipated environmental influences (e.g., apathy and concerns about environmental protection).

The second layer highlights the collaborations and disagreements between organizations, including hotels, technology companies, and other hotel stakeholders (e.g., hotel owners). Also, expected benefits were found to influence hotels' and customers' preferences and experiences. A particular hotel's profile was also newly found to affect customers' preferences.

The next layer involves encounters in which customers and service channels (service employees or SSTs) co-produce services, and includes the characteristics of the service tasks.

The core layer covers customer experiences during service encounters. The data analysis revealed a multidimensional customer experience structure (i.e., aesthetic, affective, cognitive, actional, and social experiences) and indicated the impact of each dimension on the hoteliers' and customers' SST preferences. Hoteliers and customers usually compared their SST experiences with those involving traditional human services when making judgments concerning SST preferences.

Customers' and hotels' preferences could be influenced by any layer of the model, and interplay may occur between the layers. Given the simplified and generic structure of the proposed hierarchical framework, it can be adapted to specific innovations and individual or organizational situations. Importantly, notable differences were observed between customers' and hoteliers' views. In general, organizations paid more attention to environmental and organizational contexts, whereas individuals tended to highlight customer differences more frequently. Hotel representatives and customers made similar comments about the attributes of SSTs and human services, service task features, and customer experiences with SSTs compared with human services.

5.1 Theoretical implications

This study makes three major theoretical contributions. First, it provides an alternative approach (a multilevel lens) to examining the nested complexity of real-life technology adoption (Klein & Kozlowski, 2000). Instead of focusing on customers' intentions to use technology, this study explored customers' and hoteliers' preferences for SSTs relative to human services. The findings provide insights beyond those of traditional technology adoption research, in which customers' intentions to use technology have played a dominant explanatory role. Researchers have generally ignored the effects of the organizational contexts within which individual adoption occurs (Klein & Kozlowski, 2000). These single-level analyses have led to incomplete models (Klein & Kozlowski, 2000; Tscherning, 2011). In addition to filling a research gap around organizational adoption, this multilevel study bridged the micro–macro divide by integrating the micro-domain's concentration on individuals with a broader organizational focus. More specifically, findings provide empirical support for integrating individual-level theories (e.g., TTF) and organization-level frameworks (e.g., TOE). Consistent

with the TOE framework, hoteliers in this study indicated that technological (Section 4.3), organizational (Section 4.2), and environmental (Section 4.1) contexts each influenced their organizations' technology adoption (Baker, 2011; Kurnia, Karnali, & Rahim, 2015). Nevertheless, studies on individual SST adoption have not addressed the impacts of environmental and organizational characteristics. Thus, findings from a customer perspective should fill this gap. Moreover, the discovery that task characteristics, customer differences, and channel attributes influence customers' and hoteliers' preferences offers empirical support for TTF, highlighting the correlations between task requirements, individuals' abilities, and technology functionality (Goodhue, 1995). This study revealed that the channel features replaced by SSTs (human services) also affected preferences for high-tech services. Thus, this study extended research on technological characteristics to the features of service channels (Section 4.3). The TOE framework is often used to elucidate organizational technology adoption, while TTF usually helps to explain individual technology adoption (Dishaw & Strong, 1999; Yen, Wu, Cheng, & Huang, 2010). However, no studies have incorporated the concepts of TOE and TTF into a common framework for organizational and individual technology adoption. This qualitative study integrated and expanded these two frameworks based on qualitative data (Fig. 3) and confirmed that single theories do not fully explain organizational innovation adoption (Brancheau & Wetherbe, 1990). Although the findings do not advocate for any specific theory, they provide an example of how to build a holistic framework for preference construction or technology adoption. Furthermore, these qualitative data extend the integrated model by adding new specific factors and customers' experiences with different service channels (Fig. 3). The discovery that customer experience affected consumer behavior is consistent with Parise, Guinan, and Kafka (2016). The literature has suggested that SST attributes, customer involvement, and employee service shape customer experience (Grace & O'Cass, 2004; Kelly et al., 2017a; Kraak & Holmqvist, 2017; Meuter et al., 2003; Wei, Torres, et al., 2017; Yang, 2008). Thus, the relationships between the service encounter features and customer experience are illustrated in Fig. 3.
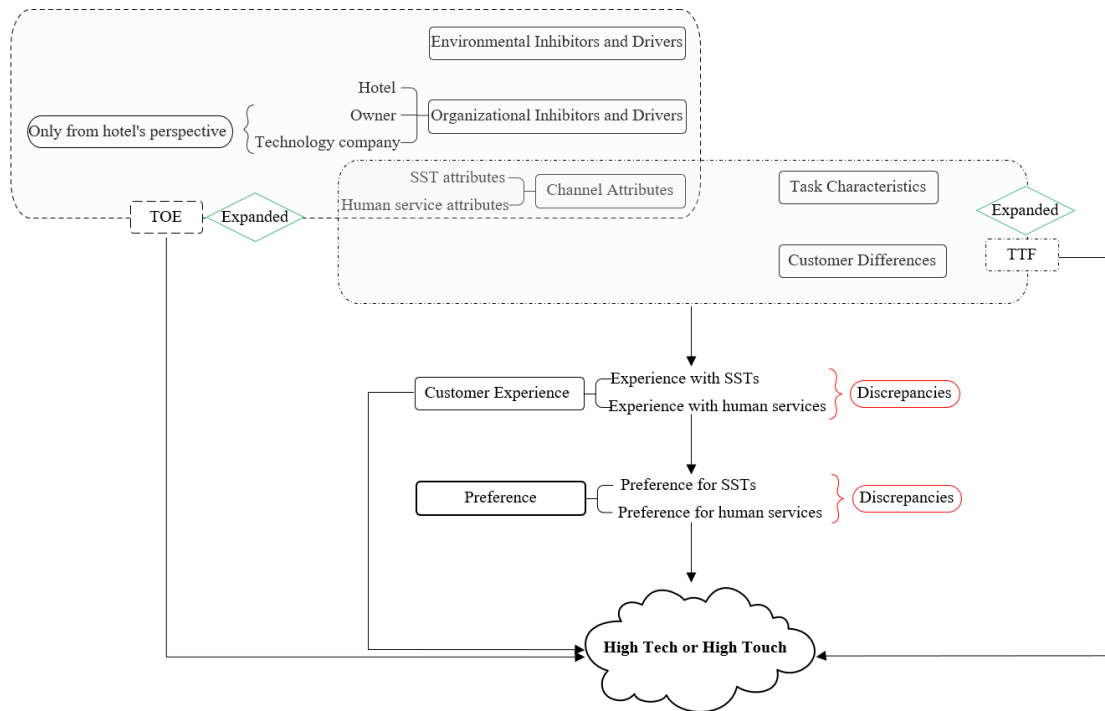
Fig. 3. An extended and integrated framework of TOE and TTF.

Second, the developed hierarchical framework helps to resolve the debate between high tech and high touch. Although the technology acceptance model is useful for understanding technology adoption, the model's exclusive and simplistic measurement of technology characteristics (e.g., perceived usefulness) seems to limit its explanatory power. Rather than being determined by a single factor, individual technology adoption and the organizational application of SSTs are influenced by a range of factors. Albeit some studies have introduced and tested the effects of other factors, such as customer demographics, these influences are usually examined in different research contexts (Kim et al., 2012; Simon & Usunier, 2007). Thus, the findings of these studies may be too dispersed to be useful for academics and practitioners. The various themes identified from the rich interview data improve our understanding of how organizational characteristics, service encounters, customer experience, and the environmental context inhibit and facilitate organizational and individual preferences. These factors substantiate the findings of earlier studies (e.g., industry and task complexity) and were newly identified in this study in a hotel context in relation to SST application and adoption. For instance, data analysis indicated that anticipated social values (i.e., human apathy and environmental protection) influenced their preferences, thus extending our knowledge of organizational technology adoption. Moreover, the technology adoption research has mostly concentrated on factors that enhance adoption, while neglecting factors that restrain it.

However, "non-adoption is not the mirror image of the adoption decision" (Frambach & Schillewaert, 2002, p. 172). Thus, the identified negative and mixed influences of some determinants add new knowledge to our understanding of technology adoption. For example, despite an emphasis on high-touch services, excessive human attention may make customers uncomfortable. Another example lies in the newly identified negative influence of disagreements among managers and a lack of emphasis on IT departments. This is in contrast with the positive influences of top management support previously highlighted in the organizational technology adoption literature (e.g., Leung et al., 2015).

Third, the findings of this study offer novel insights into SST experience. Although customer experience with SSTs has garnered increasing research attention (Wei et al., 2017), this field remains in a nascent state (Shin & Perdue, 2019). The identified five-dimension experience structure addresses research gaps concerning customer experiences with SSTs and enhances our understanding of customer experience management in an SST-based experience economy in which interactions between customers and service employees are eliminated (Curran & Meuter, 2005). Although some studies have considered the influence of experience, simple measurement items, such as whether respondents have used SSTs before (Kim et al., 2012) and the frequency of their SST use (Meuter et al., 2005), may not fully reveal the complexity of such influences. Thus, the five identified dimensions of experience with specific themes can ground future research on SST experience, which is in line with the idea that the use of SSTs reveals a shift from gaining functional to experiential returns (Wei et al., 2016). In this respect, academics and practitioners are encouraged to rethink the experience economy. Some participants argued against hotels' shifting their responsibilities to consumers, whereas hotels thought that doing so improved customer participation. Accordingly, in an SST-based experience economy, the value of increased customer participation should at least equal the value customers gain from adopting SSTs (Hilton, Hughes, Little, & Marandi, 2013).

This study also provides new insight into how organizations interpret the customer experience. As hoteliers seek to design and deliver desirable consumer experiences, customers' experiences should be investigated from a hotelier standpoint (Kingman-Brundage, 1989; Zhang et al., 2008). This emphasis is consistent with Hilton et al.'s (2013) suggestion that scholars studying SSTs should extend their explorations beyond consumers' experiences with SSTs to encompass organizations' views of the customer experience. Moreover, the findings of this study reveal differences between customers' opinions and hoteliers' views. For example,

hoteliers tended to ignore specific factors that customers valued, such as relaxation and cleanliness. Conversely, hoteliers placed importance on reconsidering life habits, improved participation, and special experiences, whereas customers did not mention these factors.

5.2 Practical implications

This study also has a number of significant practical implications. First, the findings can help hotel practitioners make more rational SST adoption decisions. In particular, hoteliers should carefully consider the environmental context, organizational features, characteristics of service encounters, and customer experience. For instance, free SSTs offered by technology companies were found to enhance hoteliers' preferences for SSTs. However, if hotels were required to pay large sums to rent or buy the technology, their preferences for such options tended to decline: "If there is a collaboration, I can use it. … However, if you ask me to rent, to spend money, I do not want to pay the money because of the cost" (Hotelier #5). Thus, hotels should seek to collaborate with technology companies and gain assistance from other hotel stakeholders to promote SST application. Hotels should also take into account the time needed to introduce SSTs. The findings of this study indicate that although hotel SSTs remain trendy, most do not perform flawlessly. Thus, it is recommended that hotels do not adopt SSTs immediately as the current iterations are not well developed. Hoteliers should instead pay attention to the direction and extent of technological development from a whole-environment perspective. Essentially, prior to implementation, hotels should thoroughly test SSTs or wait until devices have been better developed before procuring them.

The findings of this study support the introduction and implementation of SSTs in the hospitality industry in China. Data analysis revealed that government regulations can inhibit hotels' preferences for SSTs. Although studies have shown that government support influences organizations' adoption of technology (Hameed, Counsell, & Swift, 2012; Kuo, Chen, & Tseng, 2017), hoteliers interviewed in this study did not report this effect, even though the Chinese government has presented measures to facilitate technological development, such as the *Notice on the Action Plan of the Implementation of "Tourism + Internet"* (2015) and *Development Planning for a New Generation of Artificial Intelligence*)(2017). There are two likely explanations for this finding. First, government measures are not geared toward a hotel context. Hotels presumably do not benefit from these policies directly, whereas the check-in regulations (the government mandate that hotels upload guests' identifying information in real time) are

aimed specifically at hotels. Therefore, hotelier informants criticized this regulation and did not voice support for other endeavors. Second, according to the reference-dependent preference, "losses are weighted more than gains" (Masiero, Pan, & Heo, 2016, p. 18). Therefore, when introducing SSTs, hoteliers may pay more attention to regulations than to government support.

Hoteliers and customers also voiced divergent opinions on labor issues in China. Incurring higher labor costs increased hoteliers' preferences for SSTs, whereas customer informants did not regard labor costs as a valid reason for replacing human services with SSTs. Customers argued that they had paid for human services, and labor costs in mainland China were not high enough to warrant full technological replacement. According to the reference-dependent preference, decision making is influenced by a reference point (Kahneman & Tversky, 1979). In this sense, the status quo of service employees influenced hotels' SST adoption, representing an alternative to service employees. More specifically, labor costs in China are not as high as overseas, dulling any pressing need to replace human services with SSTs. The discrepancies observed between customers' and hoteliers' opinions provide further support for the integration of multilevel analyses.

The findings also enhance the knowledge of customer experience management in an SST-based experience economy. Effective service management can contribute to organizational profitability and success in a competitive marketplace (Meuter et al., 2000). SSTs and service employees excel in different dimensions of the customer experience. For instance, the customer experience could be improved in terms of freshness by SSTs but reduced in terms of respect compared with experiences provided by human services. Considering these inconsistencies, service organizations should identify the kinds of customer experiences they wish to provide and then decide whether to deploy SSTs (and if so, what kinds). Furthermore, experiences with traditional human services influenced customers' and hoteliers' preferences. In addition to direct influences, data analysis revealed disparities between experiences with SSTs and human services. These findings inform debates around enhanced (Kasavana, 2008) and diminished customer experiences (Meuter et al., 2003). Results also address deficiencies in empirical research regarding the influence of experience from a comparative perspective. Moreover, customers' and hoteliers' diverging opinions can guide hoteliers in investing in service improvements. Findings also showed that hotelier informants tended to ignore specific factors that customers considered important, such as SSTs' anthropomorphism, an unappealing voice, relaxation, regret, and cleanliness. Thus, hoteliers should pay more attention to these factors.

Lastly, the findings of this study can provide valuable marketing guidance for hotel practitioners. One caution emerging from this work is that hotels should not overpublicize technological innovation, as some customers in this study recounted poor experiences of hotels promoting innovations that were later unavailable. This kind of false advertising accomplishes the opposite of what hoteliers and customers want. For example, Customers #17 and #21 expressed disappointment when a hotel advertised that it was equipped with AI-based SSTs that were in fact unavailable: "I felt lost. Because I saw a guide that said [the hotel] had [SSTs], and this was one of its selling points. However, I did not find them. I felt very disappointed because I did not have the chance to [use the SSTs]" (Customer #21). Moreover, hotels that offer SSTs should promote the desirable features that were emphasized by the customer interviewees. For instance, customer informants mentioned the positive effects of consistent SST-based services, whereas hoteliers did not. Customers' emphasis on consistency reflects the advantages of standardized SST-based services (Schumann et al., 2012). This consistency can improve service quality (Kaushik et al., 2015; Kim & Qu, 2014) and boost customers' preferences for SSTs. Therefore, hotels should promote SSTs' consistency when marketing such devices.

6. Limitations and future research

This study has a few limitations that should inspire future work. First, the study setting was limited to hotels in mainland China. As mentioned earlier, differences exist among perspectives, contexts, and cultures (Fisher & Beatson, 2002; Lu et al., 2011; Mattila, 1999). Therefore, future studies should examine this topic from a cross-cultural perspective.

Second, the conceptual framework in this study was developed based on in-depth interviews. Future quantitative research is needed to determine the generalizability of the proposed framework. Research should also apply an integrated TOE and TTF approach in which an organization-level framework is combined with individual-level theories to quantitatively examine technology adoption.

Third, beyond individual and organizational levels, adoption scenarios involve the perspectives of groups and societies (Tscherning, 2011). Therefore, future research should draw on social network theory to analyze adoption at the social, group, organizational, and individual levels. Theoretical information science research has indicated that social network theories can help explain technology adoption behavior (Tscherning, 2011). In this study, analysis focused

on the individual and organizational levels. Thus, scope remains for future research to examine technology adoption at the society–industry–organization level, organization–group/team level, and group–individual level.

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