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Opting for smart hotels: do digital immigrants perceive differently than digital natives do?

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Abstract

Purpose – This study expanded the model of technology acceptance and investigated how the relationship between usefulness, ease of use, efficiency, personalization, safety and security and behavioural intention differ on Gen Z and silver tourists toward smart hotel. This study further applies multiple group analysis to examine whether there are substantial differences among these two groups of respondents.

Design/methodology/approach – Using an online survey, this study was undertaken with Gen Z and silver tourists in mainland China who had stayed in smart hotel over the past 12 months. A total of 474 valid responses were collected. Structural equation modelling and multigroup analysis were employed to test the proposed relationships.

Findings – This study revealed that personalization did not affect the behavioural intention among Gen Z tourists, meanwhile, there is no positive relationship between usefulness, efficiency and behavioural intention on silver group. Additionally, the findings revealed that there are no substantial differences among Gen Z (digital natives) and silver customers (digital immigrants) regarding smart hotel behavioural intentions.

Practical implications – This study offers strategic guidance for hotel managers to design and reposition smart hotel based on different customer sectors. Further, important implications for smart devices manufacturers are also provided to improve the functioning of hotel service robots.

Originality/value – This is the first study to compare the drivers and outcomes of behavioural intentions among different age groups of tourists toward smart hotels.

Keywords Smart hotel, Behavioural intention, Multigroup analysis, Gen Z and silver tourists, Technology acceptance model

Paper type Research paper

Introduction

Service automation is intended to optimize the utilization of cutting-edge technologies, including the Internet of Things, cloud computing, smart devices and big data (Pizam *et al.*, 2024). Thus, smart hotels constitute a significant future trend in the hotel industry because they feature sophisticated intelligent technologies, such as virtual assistants and robotic butlers (Sthapit *et al.*, 2024). Compared with traditional hotels, smart hotels allow guests to experience a stay that is more consistent and efficient and offers convenient service, which can

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result in a significantly higher level of satisfaction (Akel and Noyan, 2024). Thus, to ensure that smart hotels are effectively constructed to accomplish these objectives, it is essential to examine the factors that influence tourists' intention to stay in a smart hotel, which is the focus of the current study.

Existing studies indicate that age plays a critical role in technology adoption (Ali *et al.*, 2022). Generation Z, which was born in 1995 or later, is the first generation to grow up with constant access to digital technology, resulting in a digital-first and technoholic mindset (Puiu, 2017). With rapid growth in impact and purchasing power, Gen Z is the future of many industries, particularly the tourism industry (Chen *et al.*, 2022). Given the increased use of cutting-edge technologies in hospitality customer services, combined with the growing purchasing power of Gen Z customers in China, it is crucial to investigate the antecedents of behavioural intentions toward smart hotels for this group. On the other hand, older adults are increasingly using smart technology, especially during the post-pandemic era (Perdana and Mokhtar, 2022); however, they have not received enough attention in the literature (Anderberg, 2020). The silver market, which includes those aged 50 and above (Griesel, 2018), represents a substantial global market for the tourism industry (Xu *et al.*, 2023). As a growing market for leisure activities, the tourism industry stands to benefit from this demographic shift (Patterson, 2017). According to China's Ministry of Culture and Tourism, the number of silver tourists exceeded 267 million in 2021, accounting for 23% of the entire market (Xu *et al.*, 2023). As digital immigrants, silver tourists are often considered as having less access to smart technologies and are less familiar with the latest advancements (Xu *et al.*, 2023). Recent studies have shown that smart technology has played a central role in tourism and hospitality in the post-COVID-19 pandemic era (Wong *et al.*, 2022). To make novel technologies useable and useful for silver tourists, it is critical to examine the attributes involved in the technology adoption of the smart hotel context among this population.

Existing studies on technology adoption among digital natives and immigrants have primarily focused on comparisons of information and communication technology (ICT)-related purposes, such as smartphone usage, mobile payments, online purchases or social media effects (Wickord and Quaiser Pohl, 2022; Wu *et al.*, 2023). However, few studies have investigated how digital natives and immigrants perceive smart technologies such as artificial intelligence, virtual reality, augmented reality or even robotics (Guo *et al.*, 2024). Furthermore, little is known about the differences concerning smart technology adoption and the related behaviour between specific age groups because the role of moderators (DN vs DI) has been ignored. Because they are representative of digital natives and immigrants, we argue that investigating the antecedents of smart technology adoption among Gen Z and silver customers of smart hotels can help gain a deeper understanding of the complex factors behind this phenomenon.

The literature on technology adoption in the smart hotel context among specific age groups is sparse. Although studies exist on the antecedents of the behavioural intentions of smart hotels from different perspectives, for example, Yang *et al.* (2021) examine customer behavioural intentions from an external standpoint, and Chang *et al.* (2022) focus on both psychological and experiential aspects; apparently, no research has explored group comparisons between younger and older customers. Although studies suggest that perceived usefulness, entertainment, safety and security are the most critical attributes influencing behavioural intentions among smart hotel customers (Kim *et al.*, 2021; Yang *et al.*, 2021), the antecedents of smart hotel behavioural intentions among specific age groups remain unexplored. Unlike Yan *et al.* (2024), who explore the behavioural intention attributes of silver tourists alone in the smart hotel context, the current study focuses on the group comparison of smart hotel stay intentions between Gen Z and silver tourists.

Thus, to fill the above gaps in the literature, the current study aims to examine the key factors influencing Gen Z and reducing customers' intention to stay in smart hotels. Furthermore, using multigroup analysis (MGA), the current study also examines the group differences in behavioural intentions between Gen Z and silver tourists. The present study

seeks to answer the following research questions: (1). What are the most influential factors affecting Gen Z and silver tourists' stay intentions in smart hotels? (2). Are there differences between Gen Z and silver tourists regarding the antecedents of smart hotel behavioural intentions? Therefore, the present study contributes to the literature by providing a group analysis of behavioural intentions in the smart hotel context. The findings of the current study also provide important insights for hotel management and smart device manufacturers on how to enhance the behavioural intentions of specific customer segments under the new normal.

Literature review

Technology adoption among digital natives and immigrants

As mentioned earlier, the silver generation refers to the population over the age of 50 (Griesel, 2018), who are termed "digital immigrants" (Prensky, 2001). Digital immigrants, who experienced digitization at a later stage in their adults' lives, are often sceptical of the latest technologies (Wong *et al.*, 2022). However, digital immigrants report higher levels of technology adoption than digital immigrants in the previous generation (Anderson and Perrin, 2017). In contrast, Gen Z are digital natives, who are often digitally savvy and generally early adopters of novel technologies (Kim and Yang, 2016). Because of their early exposure to new technologies, digital natives normally immerse themselves in a networked environment and exhibit greater ease in embracing digital technology than digital immigrants do (Kesharwani, 2020).

Several studies have revealed that digital natives and immigrants have certain differences concerning technology adoption (Agardi and Alt, 2022; Wickord and Quaiser Pohl, 2022). For example, Agardi and Alt (2022) compare the differences in mobile payment acceptance between digital natives and immigrants based on the theory of technology acceptance. The results reveal that, for Gen Z, perceived compatibility had the strongest effect on the intention to use mobile payments, which was not the case for silver consumers. Financial risk negatively influences mobile payments for silver consumers, but the same effect is not found for Gen Z (Agardi and Alt, 2022). Wickord and Pohl (2022) also research problematic smartphone usage in different age groups. The results reveal obvious differences between digital immigrants and digital natives in the expression of problematic smartphone usage (Wickord and Pohl, 2022). Similarly, Sharma *et al.* (2020) report similar results in hospitality industry, that the factors affecting consumers' intention to purchase travel online differ between digital natives and immigrants in terms of performance expectancy, facilitating conditions, hedonic motivation and habits.

Nevertheless, a few studies have found no significant differences between digital natives and immigrants toward new technologies (Guo *et al.*, 2024; Wu *et al.*, 2023). Wu *et al.* (2023) have conducted a multigroup analysis on the effect of social media influencer marketing on sustainable food purchase and report no significant differences among digital natives and immigrants. Through multiple regression analysis, the results of Guo *et al.* (2024) indicate that there is no difference between digital natives and immigrants in terms of the perception of ethical risk related to artificial intelligence. In addition, the empirical findings of Moore *et al.* (2022) reveal that digital immigrants demonstrate a greater ability to cope with technological change than previously understood. Moreover, Perdana and Mokhtar (2022) state that COVID-19 has accelerated the adoption rate of digital technologies by several years and has had a significant effect on both young and old generations. Therefore, it is important to investigate whether differences exist in current technology adoption between digital natives and immigrants in the post-pandemic era of the smart hotel context.

Smart hotel acceptance from different perspectives

The concept of smart hotels originated in 2008 and has gained significant attention in recent years (Sthapit *et al.*, 2024). According to Wu and Cheng, a smart hotel is "a practical business

term referring to a new model of hotels operating with advanced technologies" (2018, p.42). The widespread implementation of innovative technology in the hotel industry has increased the need for researchers and professionals to investigate customer perceptions of smart hotels and how to strengthen their intentions to stay. Past studies have examined customer behavioural intention in the context of smart hotels from different perspectives (Chang *et al.*, 2022; Fu *et al.*, 2022; Yang *et al.*, 2021). For example, a study by Yang *et al.* (2021) examines customers' intention to visit from an external standpoint, suggesting a positive relationship between technology readiness and technological amenities.

Chang *et al.* (2022) include both psychological and experiential aspects by integrating experiential quality and psychological states within a framework of cognitive appraisal theory; their findings indicate a positive relationship between experiential quality, confidence, motivation, satisfaction and loyalty. Moreover, Chen *et al.* (2021) focus on the experiential perspective and examine how consumers perceive and go through the interactive journey of smart intelligence services. Their study indicates that sensory experience and emotional experience have positive relationships with customer satisfaction. In addition, Kim and Han (2022) investigate customer behaviour for a smart hotel and consider the perceptions of the internal and external constraints on certain behaviours. Furthermore, Fu *et al.* (2022) focus on inhibited continuous usage intention by examining the challenges of service robots in smart hotels from the perspectives of psychological and emotional stimuli. However, studies on identification dimensions focusing on customers' real needs are lacking.

In another study, Kim *et al.* (2021) examine the role of the expected benefits in developing perceived value and attitudes toward a smart hotel; their study indicates that personalization, safety and security significantly influence customers' behavioural intentions. Moreover, Kim *et al.* (2020) examine how consumers evaluate the performance of a smart hotel; they consider qualities such as efficiency, ease of use, reliability, convenience and control and investigate how these attributes affect customers' attitudes and intentions to engage in word-of-mouth intention. Both studies focused on the customer's perspective and their subsequent behavioural intentions toward smart hotels. However, none of these studies utilized any theoretical framework, highlighting the absence of theoretical rigor and need for a comprehensive model in future research. Therefore, it is crucial to integrate the expected benefits or perceived performance of a smart hotel with the technology acceptance model to examine customers' behavioural intentions from a benefits perspective. In addition, prior research on smart hotels has predominantly focused on various demographics rather than specific age groups; thus, comparative analysis among smart hotel customers through multigroup analysis is essential.

Theoretical foundation and hypothesis development

Technology acceptance model is based on the idea of reasoned action and was first proposed by Fishbein (1979). Technology acceptance model was developed to forecast consumers' willingness to adopt new technology (Venkatesh *et al.*, 2012). The four fundamental elements of the model include perceived usefulness, perceived ease of use, attitudes toward usage and intentions to use technology (Han *et al.*, 2021). Several studies have utilized technology acceptance model as their theoretical foundation to investigate customers' behavioural intentions toward service robots in the hospitality industry (Kao and Huang, 2023; Said *et al.*, 2024). Therefore, the first two hypotheses were proposed:

H1. Perceived usefulness has a positive effect on attitudes toward smart hotels among Gen Z and silver tourists.

H2. Perceived ease of use has a positive effect on attitudes toward smart hotels among Gen Z and silver tourists.

Other studies suggest that alternative factors need to be incorporated into the technology acceptance model when examining behavioural intentions (Sharma *et al.*, 2023). Wixom and Todd (2005) propose three fundamental methods for developing extended technology acceptance model models. One of these approaches involves integrating supplementary belief components to assess their ability to predict attitudes toward new technologies. Expected benefits refer to the anticipated advantages or positive feelings that individuals have toward adopting certain innovative services (Kim *et al.*, 2021). Studies in the field of tourism and hospitality, for example, Kim and Han (2020) and Hwang *et al.* (2020), have examined the potential advantages of new technologies, including smart hotels (Kim *et al.*, 2021). The findings indicate that customers' expectations are influenced mostly by efficiency, personalization, safety and security. In addition, the acceptance of advanced technologies is influenced by several factors, with efficiency being one of the most significant variables (Kim *et al.*, 2021). Thus, we propose the third hypothesis:

H3. Perceived efficiency has a positive effect on attitudes toward smart hotels among Gen Z and silver tourists.

The term "personalization" is used to describe the act of tailoring information, products and services based on the unique characteristics of the users. Companies are increasingly employing big data to analyse customer preferences and accurately offer services (Guo *et al.*, 2022). This is because of the numerous opportunities that cutting-edge technology offers for engaging customers in a more personal way (Wang, 2024). In addition, personalized service is anticipated to increase the favourable impressions of customers toward smart hotels (Kim *et al.*, 2021); hence, we propose the next hypothesis:

H4. Perceived personalization has a positive effect on attitudes toward smart hotels among Gen Z and silver tourists.

It has been extensively studied in industries related to information security, and data privacy concerns are frequently raised when smart technologies are utilized (Pizam *et al.*, 2024). Perceptions of safety and security are considered significant factors in the adoption of technology (Han *et al.*, 2021). Smart hotels are generally anticipated to maintain high levels of security and safety (Kim *et al.*, 2021). Therefore, the following hypothesis was proposed:

H5. Perceived safety and security have positive effects on attitudes toward smart hotels among Gen Z and silver tourists.

The attitudes of customers eventually affect their behavioural intentions (Han *et al.*, 2021; Zhang *et al.*, 2023). Some studies indicate a positive relationship between attitudes and behavioural intentions in the context of smart tourism (Han *et al.*, 2021; Quan *et al.*, 2022). Accordingly, the following hypothesis was proposed:

H6. Attitude toward smart hotels has a positive effect on stay intention among Gen Z and silver tourists.

Furthermore, five research hypotheses stated below are articulated to describe the differences between Gen Z and silver tourists in terms of the perceived benefits of attitudes toward smart hotels because the digital age significantly impacts customers' intentions and behaviours (Wickord and Quaiser Pohl, 2022; Agardi and Alt, 2022; Wu *et al.*, 2023):

H7. There is a significant difference in the effect of usefulness on attitudes toward smart hotels between Gen Z and silver tourists.

H8. There is a significant difference in the effect of ease of use on attitudes toward smart hotels between Gen Z and silver tourists.

H9. There is a significant difference in the effect of efficiency on attitudes toward smart hotels between Gen Z and silver tourists.

H10. There is a significant difference in the effect of personalization on attitudes toward smart hotels between Gen Z and silver tourists.

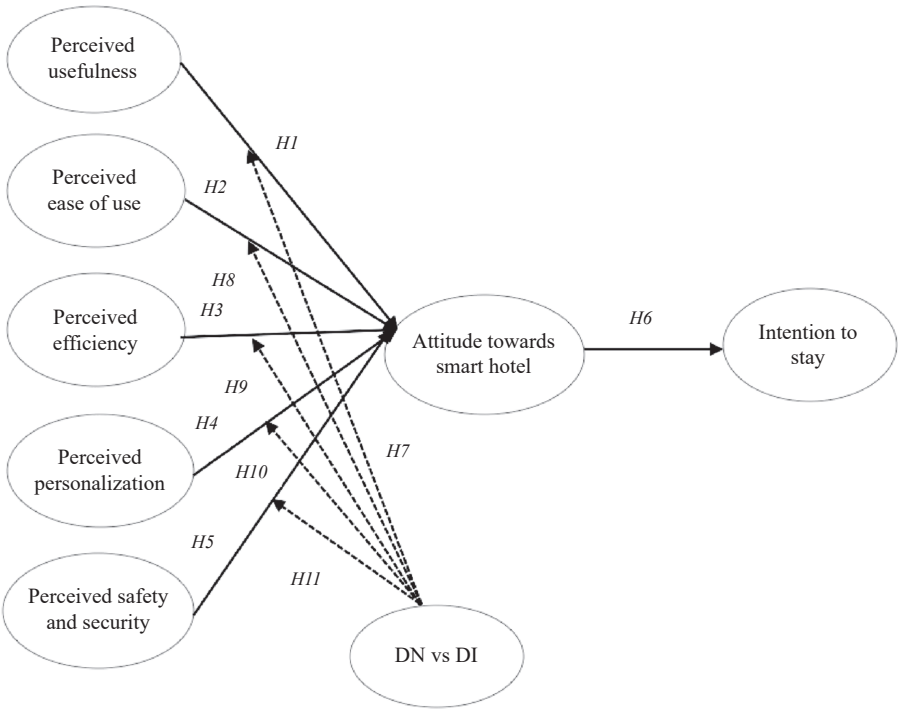
H11. There is a significant difference in the effect of safety and security on attitudes toward smart hotels between Gen Z and silver tourists. (See Figure 1)

Method

Sample and data collection procedure

The target respondents in the current study were Gen Z and silver tourists from mainland China. Given that the smart hotel concept is relatively new and has garnered attention just in the past few years, the respondents in the current study needed to have travelled during the past 12 months and stayed at a smart hotel during their trip to adequately react to the survey questions.

Using a quantitative method and purposive sampling, data are collected via a self-administered questionnaire from March to April 2024. A pilot test with 97 samples was conducted before the final data were obtained. The Cronbach's alphas of all the constructs are greater than 0.7. Then, an online survey link was distributed through a WeChat group (one of the most popular social media platforms in China) and the Credamo platform. Credamo is a popular



Source(s): Authors' own work

Figure 1. Conceptual model

and sophisticated online marketing research company, which offers extensive data collection services on a broad scale (Liu *et al.*, 2024). To ensure that the survey was correctly targeted, a series of screening questions were posed, including "How many times have you traveled during the past 12 months?" and "Have you stayed in a smart hotel during your travel?" Those who responded negatively were not permitted to participate. To help respondents better understand the smart hotel context, a video of FlyZoo hotel (the first unmanned hotel in China) was included in the questionnaire as the example. Besides, only the specific age group of respondents were targeted to ensure the reliability of the study. The Credamo company helped to share the questionnaire with qualified members in the database. As for procedural approaches, respondents were assured of anonymity and informed that there were no right or wrong answers.

A total of 474 valid responses were collected. As shown in Table 1, just over half of the respondents were female (55.4%). The highest proportion of respondents were in the 23–27 years old age group (36.3%). In terms of marital status, the largest category was married (66%). Regarding education, 60% held a bachelor's degree, followed by 21.1% with a diploma.

Measures

The questionnaire had two main sections. The first comprised questions related to the respondents' demographic and travel characteristics. The second comprised the items for the seven constructs employed in the hypothesized model. All these items were scored on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). Perceived usefulness was measured via four items adapted from Venkatesh and Davis (2000) and Yang *et al.* (2021). Perceived ease of use was measured via four items adapted from Venkatesh and Davis (2000) and Yang *et al.* (2021). Four items adapted from Kim *et al.* (2021) and Chen *et al.* (2021) were used to measure perceived efficiency. Perceived personalization was measured using four items adapted from Kim *et al.* (2021) and Chen *et al.* (2021). The perceived safety and security comprised four items adapted from Kim *et al.* (2021) and Chen *et al.* (2021). Three items adapted from Han *et al.* (2021) were used to measure attitude. Finally, three items adapted from Yang *et al.* (2021) were used to measure stay intention. Therefore, a total of 26 items were employed in the current study. The questionnaire was developed in English, translated into Chinese, and tested with back translation to ensure a high level of accuracy. The items were checked and revised by three experts in artificial intelligence of hotel industry to ensure face validity and content validity.

Table 1. Demographic profile

Variable	Category	$N = 474$	%
Gender	Male	211	44.6
	Female	263	55.4
Marital status	Single	161	34
	Married	313	66
Age	18–22	65	13.7
	23–27	172	36.3
	50–59	104	21.9
	60–69	92	19.4
	70–79	32	6.8
	80 and above	9	1.9
Education	High school and below	44	9.3
	Diploma degree	100	21.1
	Bachelor degree	288	60.8
	Master degree and above	42	8.8

Source(s): Authors' own work

Data analysis

Partial least squares-structural equation modelling (PLS-SEM) (Hair *et al.*, 2017) with SmartPLS 4.1.0 software was used to assess both the measurement and structural models. PLS-SEM was employed because it has the advantage of being able to handle non-normally distributed data and complex models (Hair *et al.*, 2019). For moderating effects, PLS-SEM multigroup analysis (PLS-MGA) is used to analysis whether there are crucial differences in path coefficients across groups (Rasoolimanesh *et al.*, 2021). Before conducting PLS-MGA, measurement invariance needs to be established; thus, we applied the measurement invariance for composite (MICOM) approach (Rasoolimanesh *et al.*, 2017). In addition, the current study used G*Power to calculate the minimum sample size for power analysis (Kang, 2021). Power analysis identified a sample size of 123 for each group for a statistical power of 0.95. Therefore, with a sample of 474 completed questionnaires, filled in by both the Gen Z and silver respondents (237 for each group), the sample was more than large enough to perform the data analysis.

Results

Assessment of measurement models

Using PLS-SEM, we assessed the measurement and structural models for both the Gen Z and silver groups of tourists. The research model for the current study included seven reflective constructs: perceived usefulness, perceived ease of use, perceived efficiency, perceived personalization, perceived safety and security, attitudes toward smart hotels and the intention to stay. To assess the measurement model, the indicator and construct reliability, convergent validity and discriminant validity of these seven reflective constructs for both Gen Z and silver tourists were assessed (Ali *et al.*, 2018; Hair *et al.*, 2017). To ensure reliability and convergent validity, the outer loadings should be > 0.7. Table 2 indicates that the indicator reliability of all other items is ensured. In addition, the composite reliability (CR) and rho A should be greater than 0.7, and the average variance extracted (AVE) should be greater than 0.5 (Hair *et al.*, 2017). A shown in Table 2, the reliability and convergent validity for all seven constructs are acceptable for both Gen Z and silver tourists. Discriminant validity was evaluated through the heterotrait–monotrait ratio, which is a more conservative and robust method than the Fornell–Larcker criterion (Henseler *et al.*, 2015). As shown in Table 3, no discriminant validity issues are found.

The measurement invariance should be established for both groups of Gen Z and silver tourists as a requirement to perform MGA (Rasoolimanesh *et al.*, 2017). The literature suggests MICOM for composite-based algorithms because it is ideal for PLS-MGA (Henseler *et al.*, 2016; Rasoolimanesh *et al.*, 2020). The MICOM approach includes three steps: (1) assessment of configural invariance, (2) assessment of compositional invariance via the correlation between constructs and (3) assessment of equal means and variances (Rasoolimanesh *et al.*, 2017). Partial measurement invariance is required to perform MGA, which is obtained by establishing configural and compositional invariance (Rasoolimanesh *et al.*, 2020). The results of MICOM show the establishment of partial measurement invariance, whereas full measurement invariance is not established, with some unequal variances. Thus, MICOM demonstrates the fitness of using the PLS-MGA.

Assessment of structural models and multigroup analysis

Full model testing. Prior to performing the MGA, the structural model for the two groups must be assessed. To assess the structural model, the R-squared (R^2) and Stone–Geisser (Q^2) criteria should be assessed. The results of the structural model assessment demonstrate the high R^2 of the study, with 0.597 and 0.426 for the Gen Z group and 0.475 and 0.463 for the silver group, both of which are considered acceptable in the behavioural sciences (Rasoolimanesh *et al.*, 2017). The value of Q^2 should be greater than zero to demonstrate the predictive ability of a

Table 2. Results of the measurement model

Construct/items	Loading Gen Z	Silver	rho A Gen Z	Silver	CR Gen Z	Silver	AVE Gen Z	Silver
PU			0.831	0.899	0.887	0.923	0.663	0.751
PU1	0.857	0.813						
PU2	0.784	0.847						
PU3	0.770	0.910						
PU4	0.842	0.892						
PEOU			0.770	0.929	0.851	0.949	0.588	0.822
PEOU1	0.752	0.889						
PEOU2	0.716	0.913						
PEOU3	0.805	0.918						
PEOU4	0.791	0.906						
PE			0.724	0.932	0.825	0.950	0.540	0.826
PE1	0.759	0.908						
PE2	0.712	0.907						
PE3	0.745	0.925						
PE4	0.724	0.894						
PP			0.758	0.879	0.846	0.915	0.579	0.729
PP1	0.769	0.839						
PP2	0.700	0.829						
PP3	0.798	0.897						
PP4	0.771	0.848						
PS			0.784	0.914	0.860	0.935	0.607	0.781
PS1	0.774	0.842						
PS2	0.757	0.868						
PS3	0.786	0.902						
PS4	0.797	0.922						
AT			0.759	0.871	0.861	0.915	0.674	0.783
AT1	0.820	0.828						
AT2	0.825	0.918						
AT3	0.816	0.906						
SI			0.755	0.888	0.857	0.930	0.667	0.815
SI1	0.831	0.875						
SI2	0.824	0.930						
SI3	0.795	0.903						

Note(s): PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PE = Perceived Efficiency; PP = Perceived Personalization; PS = Perceived Safety and Security; AT = Attitude towards Smart Hotel; SI = Stay Intention
Source(s): Authors' own work

structural model (Ali *et al.*, 2018). The results reveal that the Q^2 values of both groups are greater than 0 (Hair *et al.*, 2017). The bootstrapping results indicate that, with a confidence interval bias of 97.5%, the most prominent drivers of tourists' positive attitudes toward smart hotels are perceived usefulness and perceived efficiency, followed by perceived safety and security and perceived personalization. Thus, as shown in Table 4, H1 to H6 are all supported.

Multigroup analysis for the two groups

With respect to the MGA related to the moderating effects of the digital age, a multimethod combining Henseler's bootstrap-based MGA and permutation test with 5,000 subsamples is used to compare the results of the MGA (Rasoolimanesh *et al.*, 2017). Table 5 presents the results of the two groups, which show that perceived usefulness and perceived efficiency are significantly related to a positive attitude toward smart hotels for Gen Z tourists but not for those in the silver group. Regarding perceived ease of use and perceived safety and security,

Table 3. Discriminant validity assessment (HTMT)

Gen Z								Silver						
	AT	PE	PEOU	PP	PS	PU	SI	AT	PE	PEOU	PP	PS	PU	SI
AT														
PE	0.741							0.573						
PEOU	0.689	0.464						0.664	0.638					
PP	0.657	0.570	0.672					0.614	0.508	0.520				
PS	0.777	0.576	0.623	0.522				0.561	0.459	0.488	0.587			
PU	0.808	0.541	0.455	0.498	0.620			0.657	0.662	0.755	0.610	0.592		
SI	0.654	0.472	0.698	0.548	0.488	0.427		0.779	0.552	0.453	0.552	0.440	0.494	

Note(s): PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PE = Perceived Efficiency; PP = Perceived Personalization; PS = Perceived Safety and Security; AT = Attitude towards Smart Hotel; SI = Stay Intention
Source(s): Authors' own work

Table 4. Results of hypothesis testing

Hypothesis	Relation	Path coefficient	Confidence interval (97.5%) bias corrected	*p*-value (Bootstrapping)	Supported
H1	PU-AT	0.251	[0.144, 0.371]	0.000	Yes
H2	PEOU-AT	0.191	[0.058, 0.342]	0.007	Yes
H3	PE-AT	0.184	[0.082, 0.292]	0.001	Yes
H4	PP-AT	0.163	[0.056, 0.275]	0.004	Yes
H5	PS-AT	0.176	[0.066, 0.276]	0.001	Yes
H6	AT-SI	0.654	[0.581, 0.719]	0.000	Yes

Note(s): PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PE = Perceived Efficiency; PP = Perceived Personalization; PS = Perceived Safety and Security; AT = Attitude towards Smart Hotel; SI = Stay Intention
Source(s): Authors' own work

Table 5. Direct relationship for each group

	Gen Z				Silver			
	Path coefficient	*t*- value	*p*-value	Supported	Path coefficient	*t*- value	*p*-value	Supported
PU-AT	0.339	4.233	0.000	Yes	0.125	1.475	0.140	No
PEOU-AT	0.178	2.497	0.013	Yes	0.274	2.496	0.013	Yes
PE-AT	0.225	2.737	0.006	Yes	0.119	1.583	0.114	No
PP-AT	0.094	1.376	0.169	No	0.204	2.375	0.018	Yes
PS-AT	0.208	2.527	0.012	Yes	0.158	2.070	0.039	Yes
AT-SI	0.501	7.860	0.000	Yes	0.682	14.886	0.000	Yes

Note(s): PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PE = Perceived Efficiency; PP = Perceived Personalization; PS = Perceived Safety and Security; AT = Attitude towards Smart Hotel; SI = Stay Intention
Source(s): Authors' own work

the results reveal a significant positive relationship for both groups. In contrast, in terms of perceived personalization, the current study reveals a positive and vital influence on the positive attitudes among silver tourists, but the effect is nonsignificant among Gen Z tourists.

The results of the multigroup analysis are summarized in Table 6. The findings show that, except for the effect of perceived usefulness on attitudes toward smart hotels, the other differences are not significant. Thus, H7 is supported, and H8 to H11 are rejected.

Table 6. Multi-group analysis

Hypothesis	Relationship	Difference (Gen Z- silver)	*p*-value	Supported
H7	PU-AT	0.214	0.032	Yes
H8	PEOU-AT	−0.096	0.232	No
H9	PE-AT	0.106	0.170	No
H10	PP-AT	−0.110	0.158	No
H11	PS-AT	0.050	0.332	No

Note(s): PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PE = Perceived Efficiency; PP = Perceived Personalization; PS = Perceived Safety and Security; AT = Attitude towards Smart Hotel
Source(s): Authors' own work

Discussion and conclusions

Conclusions

In response to the increasing usage of service robots in hospitality industry, several researchers (Kao and Huang, 2023; Said *et al.*, 2024) draw on the technology acceptance model to study robot adoption among customers. Yet, it remains unclear how customers' behavioural intention toward smart hotels can vary across different age groups. In the current research, we aim to provide insights into this issue by comparing the behavioural intentions of younger and older customers.

The key findings of the current study are as follows: First, there is a significant positive relationship between tourists' perceived usefulness and attitudes toward smart hotels, which supports the findings of previous studies (Han *et al.*, 2021; Joe *et al.*, 2022; Yang *et al.*, 2021). This finding suggests that a higher level of tourists' perceived usefulness is correlated with a positive attitude toward smart hotels.

Second, perceived ease of use was found to have a positive effect on attitudes toward smart hotels. This finding is consistent with several earlier studies demonstrating that perceived ease of use with smart hotels was positively linked with attitudes and behavioural intentions among North American customers and Israeli tourists (Kim *et al.*, 2020; Solomovich and Abraham, 2024). Thus, the results confirm the prominent role of perceived ease in the formation of favourable attitudes toward smart hotels.

Third, perceived efficiency is a positive and statistically significant factor affecting attitudes toward smart hotels. This finding supports studies (Kim *et al.*, 2020, 2021) indicating that efficiency of smart devices has a significant and favourable effect on the development of customers' attitudes toward smart hotels.

Fourth, the relationship between perceived personalization and attitudes toward smart hotels for the Gen Z group was not supported. This contradicts existing studies suggesting that perceived personalization positively influences customers' attitudes toward smart hotels or smart-related technologies (Shah *et al.*, 2023; Shin *et al.*, 2023). A possible explanation could be that Gen Z individuals are new conservatives who embrace traditional beliefs and value authenticity even though they always lived with the new technology. Thus, they may not focus on personalization compared with the Y generation, who appreciate customized services and expect a greater degree of prestige (Dobre *et al.*, 2021). Moreover, perceived usefulness proved to be the strongest attribute that affect Gen Z's attitude, which indicated that younger generation put great importance on the functioning of smart devices.

Fifth, a positive association between perceived safety and security and attitudes toward smart hotels has been confirmed by our results. This result is consistent with the literature identifying a positive impact of safety and security including data privacy on positive attitudes toward hotel smart devices (Chen *et al.*, 2021; Boo and Chua, 2022). Additionally, the study confirms the relationship between attitudes toward smart hotels and behavioural intentions. This further underscores the insights from studies indicating that positive attitudes toward smart hotels contribute to behavioural intentions (Quan *et al.*, 2022; Kim *et al.*, 2021).

Sixth, for silver tourists, the results demonstrate that perceived usefulness and efficiency do not support a positive attitude toward smart hotels. This finding contradicts existing studies (Joe *et al.*, 2022; Kim *et al.*, 2020; Yang *et al.*, 2021) possibly because of the specific study context. Since silver tourists have plenty of leisure time because of their retired life (Zhang, 2023), they may not be particularly concerned with the speed of smart devices. In addition, if silver customers believe the smart devices are easy to use, they may ignore other factors such as usefulness or efficiency.

Lastly, as for group difference, the current study finds that the influence of usefulness on attitude varies between Gen Z and silver tourist, which verifies the value to consider the group differences between digital natives and immigrants. However, there are no differences between Gen Z and silver tourists regarding the impacts of ease of use, efficiency, personalization, safety and security towards the attitude of smart hotel, which deserve extended comments. Although the findings contradicted most of the literatures between digital

natives and immigrants towards technology adoption (Wickord and Quaiser Pohl, 2022; Agardi and Alt, 2022; Sharma *et al.*, 2020), the results were logical. On one side, Lim and Bowman (2022) found that older adults do not necessarily shy away from technology, especially after the COVID-19 pandemic. Meanwhile, Fristedt *et al.* (2021) indicated that the attitude differences towards technology are not limited to digital age, instead, the individual differences are more influential. In addition, the findings of Perdana and Mokhtar (2022) showed that older adults pay more attention to the benefits that technology would bring comparing with younger generation. On the other side, the empirical data and analysis of Guo *et al.* (2024) confirmed that the digital intergenerational differences do not show in the current stage of AI ethical cognition. The public, according to the authors, is still learning about artificial intelligence technology. Therefore, both digital natives and immigrants are still attempting to comprehend the novel technology, and differences won't become apparent until the artificial intelligence applications become widely known to the public.

Theoretical implications

Five main theoretical contributions are offered in the current study. First, given the relative lack of studies related to smart hotels, the current study provides greater clarity on the specific factors that characterize a positive attitude toward smart hotels and its impact on stay intention. Therefore, the results of the current study can guide future research directions and new discourses. In addition, the results extend the existing studies linked to the antecedents of behavioural intentions toward smart hotels. Although previous relevant studies have linked the expected benefits to smart hotels, there is an issue of theoretical rigor because theories are rarely applied (Kim *et al.*, 2021). The present study had used the technology acceptance model as the theoretical foundation of the integrated model, which extends the usage of technology acceptance model to the literature on smart hotels and related behavioural intentions. Furthermore, compared with the well-known technology acceptance model in the hotel context (Van *et al.*, 2020), our study has revealed that usefulness is not an influential factor among silver tourists, hence advancing our knowledge of the influencing mechanism of the silver group. We call for further investigations to explore this phenomenon.

Second, in addition to exploring the various antecedents of the attitudes toward smart hotels, the present study contributes by identifying attitudes toward smart hotels as a significant enabler of stay intention. Because of the limited studies of smart hotels, identifying attitudes and behavioural intentions is necessary. The results demonstrate the mediating role of attitude in behavioural intention (antecedents of attitude – attitude – behavioural intention). Therefore, a greater understanding of the outcomes related to attitudes has been achieved.

Third, the current study provides an opportune and meaningful discussion of the influence of the expected benefits on the behavioural intentions of Gen Z and silver tourists in the context of smart hotels. Previous studies have examined only demographically diverse respondents (Chang *et al.*, 2022; Han *et al.*, 2021). To the best of our knowledge, this is among the earliest of studies to examine silver tourists in the smart hotel context because the older generation and smart technologies are often seen as two different worlds (Mariano *et al.*, 2022). By investigating the antecedents of behavioural intentions among silver tourists, we contribute to a more holistic understanding of behavioural intentions in a smart hotel context.

Fourth, the current study contributes to the literature on digital natives and immigrants because most previous studies have only focused on traditional ICTs (Wickord and Quaiser Pohl, 2022; Wu *et al.*, 2023). Considering the uniqueness of service robots and smart devices, the present research extends the current knowledge of digital natives and immigrants by focusing on the context of cutting-edge technologies in the hotel industry. Thus, the current study provides a better understanding of digital intergenerational concepts in the field of smart technology-related services.

Finally, the present research contributes to the growing interest in exploring the smart hotel context (Sthapit *et al.*, 2024; Wang, 2024) by further comparing silver tourists' behavioural

intentions to service robots and smart devices with those of the younger generation. Moreover, the current study advances the knowledge of service robots and smart device usage in hotels by revealing the role of technology acceptance perception, efficiency, personalization and safety.

Practical implications

This research holds important implications for policy makers, smart devices manufacturers and hotel managers attempting to design or reposition of smart hotels. First, this typology of smart hotel behavioural intention attributes offers strategic guidance for deploying service robots and smart devices in hotels. Service robots or smart devices should not only be a selling point to hotels. Instead, they should be designed to fulfil service tasks efficiently and be functionable and effective during daily operation. Moreover, our findings suggest that hotel company managers should recognize the differentiations of customers when employing robotic services. Thus, they might need to design different protocols and focus on individual demand when assigning robots on duty. For example, with Gen Z customers, in addition to regular maintenance and system upgrading for service robots, managers might collaborate with smart device manufacturers to prepare a backup plan if any breakdowns occur. But for silver customers, managers should work on instructional guides with clear manuals and assign human employees on the side to make sure the usage of smart devices are easy and understandable.

Second, our results showed that how Gen Z and silver tourists' stay intentions of smart hotel can be strengthened. According to our findings, both Gen Z and silver customers value the factor of safety and security. Therefore, smart hotel management should cooperate with companies that innovate and produce smart technologies that are likely to fare the best. To this end, personal and data security for all in-house customers must be ensured (e.g. face scanning upon entrance, human staff on standby 24h a day, daily routine checks and safe internet firewall devices). Furthermore, the desire for safety and security among customers will also require smart device designers and manufacturers to continually research and invest in robotic technology for better data and privacy management. Customers' perceived trustworthiness, in turn, influences positive attitudes and the level of acceptance of the utilization of smart devices.

Limitations and future research

The limitations of the present research must be acknowledged. First, only five antecedents were included. Examining wider antecedents and outcomes would further enhance the understanding of attitudes toward smart hotels. Second, the data for this study was gathered from individuals residing in mainland China using an online survey, thereby constraining the generalizability of the findings to other population. In order to verify the applicability of the proposed model and the reported effects, future research should evaluate the model in other regions or countries. Third, since cross-sectional data was used in this study, which limited the identification of changes in users' behavioural overtime, future studies should adopt a longitudinal approach to capture the changes in respondents' attitudes and behaviours toward smart hotel over time. Fourth, future studies could broaden the scope of this study by examining the effects of smart hotel behavioural attributes on post-consumption outcomes, such as continuous intentions or word-of-mouth behaviours toward smart hotel. Fifth, the current study conducted comparison in two age groups, researchers are encouraged to compare more age groups or even different generations to yield more meaningful results. Finally, future studies may include other potential moderators, such as gender, educational level or technology readiness, to provide a deeper understanding of customers' perceptions of smart hotel.

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