TRAVELERS' ACCOMMODATION INTENTION TOWARDS SMART HOTELS: A TWO-STAGE ANALYSIS USING SEM AND fsQCA

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Abstract

Purpose – As IoT and AI advance, smart hotels are gaining popularity. This research explores why travelers prefer them, focusing on novelty, efficiency, compatibility, and value to understand accommodation intentions.
Methodology/Design/Approach – Targeting participants familiar with RAISA technology in smart hotels, this study uses structural equation modeling (SEM) and fuzzy set qualitative comparative analysis (fsQCA) to validate and examine the research model, identifying factors influencing travelers' acceptance of smart hotels.
Findings – SEM analysis shows that travelers' intention to choose smart hotels is influenced by perceived novelty, efficacy, and compatibility, both directly and through perceived value. fsQCA reveals three attribute configurations linked to a strong intention to stay at smart hotels, offering insights on how perceived attributes enhance travelers' intentions and helping hotels develop effective attraction strategies.
Originality of the research – This study examines smart hotel adoption determinants using innovation diffusion and information processing theories, expanding to include perceived novelty, efficacy, and compatibility. fsQCA insights highlight the importance of aligning these elements to increase adoption rates among travelers.
Keywords Smart hotel, Accommodation intention, Innovations, Value, fsQCA, AI

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INTRODUCTION

Advancements in Internet of Things (IoT) and Artificial Intelligence (AI) have enabled the emergence of smart hotels. Companies worldwide, such as Yotel Group in New York, City Hub and Citizen M in the Netherlands, City Box in Norway, Flyzoo Hotel in China, Henna Hotel in Japan, and Qu Silk Hotel in Taiwan, have adopted this operational model. A survey by ExpediaGroup (2019) revealed that 54% of accommodation providers globally plan to increase investments in information technology to enhance traveler experiences compared to traditional accommodation services. Accommodation providers are not only focusing on enhancing online services but also integrating information technology products into physical hotel venues to meet travelers' expectations, reduce operational costs, improve efficiency, and enhance service quality (Kaushik et al., 2015; Kim & Qu, 2014).

As the hotel industry integrates technologies like IoT and AI, scholars have shifted their focus to smart hotels. However, research has mainly centered on the technical aspects rather than consumer adoption behavior (Yang et al., 2021). In other fields, studies have identified factors like readiness, ease of use, usefulness, and adaptability affecting AI adoption (Foroudi et al., 2018; Roy et al., 2017; Roy et al., 2018). Additionally, perceived benefits, novelty, and value impact AI usage intentions (Adapa et al., 2020). Yet, there is limited research on how these factors influence travelers' decisions in AI-enabled smart hotels, revealing a crucial gap. Addressing this is vital as smart hotels transform guest experiences and efficiency. Understanding consumer behavior in adopting these technologies is key for hoteliers to stay competitive, especially post-pandemic with rising demand for contactless services. Thus, this study explores factors influencing travelers' intentions to use AI in smart hotels.

To surpass competitors, hotels use AI technology's innovative features to provide customers with unique and novel experiences (Pantano & Timmermans, 2019). Nevertheless, the adoption of AI technologies could be impeded by the confidence customers have in using these technologies, or their capacity to learn their usage (Foroudi et al., 2018). Consequently, scholars have investigated the self-efficacy of consumers in utilizing artificial intelligence technology. (Roy et al., 2020). Furthermore, Pantano and Timmermans (2019) pointed out that perceived compatibility is associated with the extent of consumers' adoption of AI technologies, depending on how well the technology aligns with their values, needs, and past experiences. However, existing studies have not thoroughly examined how perceived novelty, efficacy, and compatibility collectively influence consumer adoption decisions in the specific context of smart hotels. Thus, to clearly understand the process of travelers' accommodation intentions towards smart hotels generated through interactions via AI technologies, this study explores the impacts of perceived novelty, perceived efficacy, and perceived compatibility on travelers' accommodation intentions in staying at smart hotels.

Furthermore, the adoption of smart hotels by travelers may hinge not just on individual attributes, such as perceived efficacy, but also on the cumulative value derived from a constellation of interconnected attributes. (Immonen & Koivuniemi, 2018). This comprehensive perspective acknowledges that the decision-making process of travelers is shaped by a multifaceted combination of factors, rather than standalone components. Recognizing this complexity, our study adopts a holistic approach that integrates the Diffusion of Innovation theory (DOI) (Rogers, 2003) and Information Processing of Product Attributes (IPPA) (Veryzer & Hutchinson, 1998). Unlike previous attempts, this study also considers perceived value as a mediator variable to more comprehensively understand the impact process of perceived novelty, perceived efficacy, and perceived compatibility on travelers' accommodation intentions in staying at smart hotels. To achieve this comprehensive understanding, we employ both Structural Equation Modeling (SEM) and Fuzzy-set Qualitative Comparative Analysis (fsQCA) (Pappas et al., 2019). The use of SEM allows us to examine the linear relationships between variables, while fsQCA enables the identification of multiple attribute configurations that lead to high adoption intentions. By integrating these two analytical methods, this study not only captures the complexity and heterogeneity of consumer behavior (Yueh et al., 2016; Mikalef & Pateli, 2017) but also provides actionable insights that can help hoteliers differentiate their offerings and enhance customer satisfaction, thus making our findings practically valuable and theoretically compelling.

1. LITERATURE REVIEW AND HYPOTHESES

1.1. Smart hotels: current status and travelers' adoption of smart hotels

The concept of smart hotels, which emerged in 2008, has been propelled in recent years by the integration of modern information technologies like IoT, cloud computing, smart devices, and big data, leading to their increased development and popularity (Yang et al., 2021). A smart hotel is defined as one that adopts various advanced technologies to provide customers with non-traditional and more technology-driven experiences (Kim & Han, 2020). These advanced technologies offer hotel managers opportunities to earn higher profits by providing various cost-saving measures (Yang et al., 2023) and offer a competitive advantage by creating memorable travel experiences (Stylos et al., 2021). Chen et al. (2021) pointed out that the concept of a smart hotel refers to accommodation providers leveraging IoT and AI technologies such as cloud computing, smart devices, and big data to implement hotel management in specific forms like customer self-service technologies, robots, and voice or speech interfaces. Unmanned hotels can be considered a subcategory of smart hotels, but the concept of smart hotels is broader and includes, but is not limited to, unmanned services (Chang et al., 2022).

Recent research on smart hotels includes Wu and Cheng (2018), who examined technology attachment, experiential quality, risk, and sharing intentions. Casais and Ferreira (2023) highlighted how technology drives sustainability in smart hotels, enhancing service efficiency while maintaining interpersonal interactions. Yağmur et al. (2024) investigated hotel managers' views, strategies, and expectations regarding smart technologies and future employees. Wong et al. (2024) explored the smart service paradox, finding that while smart hotels offer a futuristic lifestyle, the complexity of smart devices can lead to customer frustration. Despite extensive research on smart hotel technologies, there is limited focus on traveller adoption (Yang et al., 2021). Yang et al. (2021) used the extended Technology Acceptance Model (TAM) to study the impact of technology readiness (TR) and attributes (TA) on visit intentions. Yang et al. (2023) examined how perceptions of smart hotel attributes and factors like prior experiences and personal innovation influence these intentions. Kim & Han (2020) analysed how attributes like convenience and personalization affect visit intentions through expected experience quality and emotions. While previous studies have focused on acceptance models and resistance factors, this study seeks to fill this gap by examining how innovation attributes influence adoption intentions, offering a new perspective on understanding traveller behaviours in the context of smart hotels.

1.2. Theoretical background and hypotheses development

As previously noted, smart hotels represent a technological innovation leveraging IoT, AI, big data, robotics, and automation to enhance customer experience and optimize hotel efficiency. The Innovation Diffusion Framework (Rogers, 2003) explains how the attributes of technological innovations—such as relative advantage, compatibility, complexity, trialability, and observability—affect consumers' intentions to adopt, actual usage, and sustained use. When consumers perceive a technological innovation as effective and compatible, they are more willing to adopt it and share its advantages with others. This study will use factors from innovation diffusion theory, like perceived novelty, efficacy, and compatibility, to understand what influences travelers' decision to use smart hotels, considering social and technological factors. The following description provides evidence for the links between perceived novelty, efficacy, compatibility, and the intention of consumers to adopt smart hotels.

1.2.1. Perceived novelty

Perceived novelty is consumers' perception of the novelty of an idea or innovation and their response to innovation (Rogers, 2003). When people perceive a product or service as novel, this may increase their perceived value of the product or service (Stollery & Jun, 2017). Therefore, perceived novelty is considered an important factor influencing perceived value (Chua et al., 2015). In recent years, numerous studies have confirmed a significant positive relationship between perceived novelty and perceived value (Karjaluoto et al., 2019; Zhang et al., 2021; Prodanova et al., 2019). As smart hotels offer Robots, Artificial Intelligence, and Service Automation (RAISA) technology, enabling guests to experience a completely new service model not previously available in traditional hotels, we propose the following hypothesis.

H1: Perceived novelty has a positive impact on the perceived value of smart hotels.

According to the Diffusion of Innovation theory (DOI), customers' perception of the novelty of technology influences their attitudes and intentions toward its successful adoption (Rogers, 2004). The intention to adopt innovations and the perception of their novelty are influenced by the scope and degree of individual exposure to technological advancements (Truong, 2013). Past research has indicated a positive correlation between the perception of novelty and the intentions of consumer behavior (Chua et al., 2015; Liu et al., 2020; Zhang et al., 2021; Assaker et al., 2011). For example, Kim et al. (2017) confirmed a positive correlation between the perceived novelty of internet technology and online services and consumers' adoption intentions. Therefore, we propose the following hypothesis.

H2: Perceived novelty has a positive impact on the accommodation intention of smart hotels.

1.2.2. Perceived efficacy

Efficacy is tied to an individual's performance of particular actions and is connected to the process of evaluating efficacy (Maloney et al., 2011). Perceived efficacy encompasses both self-efficacy and response efficacy (Roy et al., 2017), where self-efficacy involves an individual's confidence in their ability to successfully complete a task or achieve a specific goal; whereas response efficacy involves an individual's belief that taking specific actions will produce the desired effects or outcomes. This study considers perceived self-efficacy as a research variable and defines perceived efficacy, referring to Jokisch et al. (2020), as consumers' confidence in their ability to use RAISA technology in smart hotels. The results of studies by Nguyen et al. (2023) and Romero & Lado (2021) found that when perceived self-efficacy is higher, perceived value increases accordingly. Cao et al. (2022) also confirmed that perceived self-efficacy positively influences perceived value. In smart hotel experiences, customers with higher self-efficacy confidently use technology, effortlessly leveraging smart features, exploring advanced services, and increasing satisfaction while reducing the risks and frustrations of new technology, thereby enhancing their overall value assessment of the hotel. Thus, we propose the following hypothesis.

H3: Perceived efficacy has a positive impact on the perceived value of smart hotels.

Perceived efficacy is generally believed to have a positive impact on individuals' attitudes and intentions (Marakas et al., 1998; Holden & Rada, 2011), with behavioral intentions increasing as perceived efficacy increases (Lam et al., 2007). Hsia et al. (2014) found a correlation between self-efficacy among employees of high-tech companies in Taiwan and their intention to adopt technological innovations. Jokisch et al. (2020) also demonstrated a positive correlation between perceived efficacy and the adoption of technological systems. Considering this, we believe that consumers with high perceived efficacy have confidence in their ability to successfully cope with new technologies in smart hotels and believe that this technology will provide them with a good accommodation experience. Therefore, we propose the following hypothesis.

H4: Perceived efficacy has a positive impact on the accommodation intention of smart hotels.

1.2.3. Perceived compatibility

Perceived compatibility refers to the extent to which individuals embrace innovation when it aligns with their established values, needs, and previous experiences (Roy et al., 2020). When consumers first experience new innovative technologies, they decide whether to use them based on personal habits, behavioral patterns, thinking styles, values, etc. (Agag & El-Masry, 2016); therefore, consumers' perceived compatibility with innovative technologies is crucial (Jiang et al., 2021). Most current research indicates that perceived compatibility has a positive impact on consumers' perceived value of innovative technologies, thereby influencing their attitudes toward the use of the technology (Wang et al., 2020; Sebetci, 2018). Wang et al. (2020) also confirmed a positive correlation between perceived compatibility and perceived value. When consumers' usage of self-service parcel lockers aligns with their consistency in current and past experiences, they often perceive more value from the lockers and may develop a willingness to continue using them. Considering this, we believe that perceived compatibility will positively influence consumers' perceived value of staying at smart hotels. Therefore, this study proposes the following hypothesis.

H5: Perceived compatibility has a positive impact on the perceived value of smart hotels.

When consumers perceive innovative technology to be consistent with their values, needs, and experiences, they may be more willing to adopt the technology. This is because perceived compatibility makes new technology appear easier to integrate into individuals' lives and usage scenarios, reducing the cognitive effort and adaptation costs required to adopt new technology (Jiang et al., 2021; Amaro & Duarte, 2015). Ilfinedo (2018) identified a positive correlation between students' perceived compatibility with blogs and their intention to continue using them for learning. Adapa et al. (2020) argued that perceived compatibility has a positive impact on consumers' adoption and use of smart products. Cebeci et al. (2020) identified a positive correlation between customers' perceived compatibility and their intention to use a self-checkout system. Therefore, we propose the following hypothesis.

H6: Perceived compatibility has a positive impact on the accommodation intention of smart hotels.

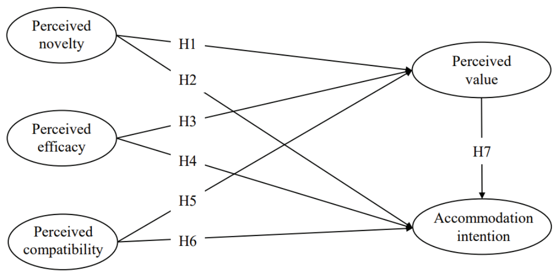
1.2.4. Perceived value and accommodation intention

Perceived value refers to the subjective evaluation given by consumers after using a product or service (Zeithaml, 1988; Feng et al., 2021). It often reflects consumers' overall evaluation of quality, features, and services, such as reliability, efficiency, etc. (Wang et al., 2023). Perceived value has been widely used to analyze consumers' behavioral intentions (Jamal & Sharifuddin, 2015). In addition to confirming that consumers' perceived value directly influences behavioral intentions (Grewal et al., 1998; Wang et al., 2023), it has also been confirmed that perceived value is one of the most important factors influencing behavioral intentions (Cronin et al., 2000). In this study, perceived value refers to the overall evaluation given by consumers after experiencing smart hotels; while accommodation intention refers to consumers' inclination or willingness to choose to stay at smart hotels. Accommodation intention is a subjective psychological concept that reflects individuals' tendencies and attitudes towards specific accommodation choices. Klobas et al. (2019) confirmed that perceived novelty and efficacy after experiencing smart home devices will affect consumers' perceived value and thereby influence behavioral intentions. Based on the above discussion, we propose the following hypothesis.

H7: The perceived value of smart hotels will have a positive impact on the accommodation intention.

Based on the literature review and research hypotheses discussed above, the conceptual model to be validated in this study is illustrated in Figure 1.

Figure 1: **The conceptual model**



2. RESEARCH METHODOLOGY

2.1. Research instrument

The survey questionnaire consists of two parts: Part A includes background questions to collect demographic information; Part B includes scenario questions to determine respondents' perceptions of the constructs. Measurement instruments for the constructs in this study have been developed in previous research. In order to adapt to the context of smart hotels, professionals and scholars with knowledge and experience in smart hotels were consulted, and corresponding modifications were made to the measurement items to ensure the content validity of each measurement item. The sources of the modified measurement items are shown in Table 1. To measure all variables, a Likert five-point scale was used in this study, ranging from (1) strongly disagree to (5) strongly agree.

2.2. Data collection

To test the conceptual model, we conducted a survey using an online questionnaire targeting travelers in Taiwan who had experienced RAISA smart hotels, including but not limited to Yotel Group in New York, City Hub and Citizen M in the Netherlands, City Box in Norway, Flyzoo Hotel in China, Henna Hotel in Japan, and Queer Hotel in Taiwan. The survey was conducted using the SurveyCake platform, a commonly used respondent recruitment platform in Taiwan. Scenario-based design and simulation are widely used methods to elicit respondents' behavioral intentions (Hahn et al., 2015). Before completing the questionnaire, respondents were asked to view scenario images illustrating the use of RAISA technology commonly found in smart hotels to help them understand the differences between smart hotels and traditional ones. During the survey period, 402 respondents from Taiwan participated in the online survey, out of which 34 participants were filtered out due to not having actual experience with smart hotels. Additionally, some participants were excluded due to comprehension, attention, or incomplete response issues, resulting in a final effective sample of 183 participants. According to preliminary estimation using G*Power (version 3.1) (Cohen, 2013), to achieve a general power of 0.95, an alpha value of 0.05, and an effect size requirement of 0.15, a minimum of 138 valid questionnaires was needed. Therefore, the final effective sample size of this study ensured the validity of testing the conceptual model.

Among the sample population, there were 114 males (62%) and 69 females (38%). The age groups were as follows: below 20 years old (11%), 21-30 years old (33%), 31-40 years old (40%), 41-50 years old (12%), and above 51 years old (4%). The sample showed that 12% had an income equal to or below 10,000 New Taiwan Dollars (NTD), 20% had an income between 10,000 NTD and 30,000 NTD, 58% had an income between 30,000 NTD and 50,000 NTD, and 10% had an income above 50,000 NTD.

Table 1: **Constructs, measurement items, and their sources**

Construct and measurement items
Perceived novelty (PN) – Adapted from Wells et al. (2010) PN1: Choosing a smart hotel is a novel experience. PN2: Choosing a smart hotel is new and refreshing. PN3: Choosing a smart hotel represents a simple yet innovative way of staying. PN4: Choosing a smart hotel allows me to experience novelty and change in everyday life.
Perceived efficacy (PE) – Adapted from Fazal-e-Hasan et al. (2021) PE1: Choosing a smart hotel allows me to quickly complete my check-in process. PE2: Choosing a smart hotel requires almost no effort to complete the check-in process. PE3: Choosing a smart hotel is a shortcut to completing the check-in process.
Perceived compatibility (PC) – Adapted from Moore & Benbasat (1991) PC1: Choosing a smart hotel suits my usual lifestyle. PC2: Using a smart hotel is a very suitable choice for me to check-in. PC3: Choosing a smart hotel completely meets my lodging needs. PC4: Choosing a smart hotel aligns with the check-in procedures I've used in the past.
Perceived value (PV) – Adapted from Chen & Dubinsky (2003) PV1: Overall, the service quality of a smart hotel is reliable. PV2: Choosing a smart hotel can bring me joyful experiences. PV3: In terms of price, the service quality of a smart hotel is worthwhile.
Accommodation intention (ADI) – Adapted from Compeau & Higgins (1995); Teo (2014) ADI1: I am willing to use smart hotels in the future. ADI2: I intend to use a smart hotel on my next trip. ADI3: I will recommend others to use smart hotels.

2.3. Data Analytics

In the data analysis, two approaches were applied: PLS-SEM was used to examine the hypothesized relationships, while fsQCA served as an additional method to determine the combinations of antecedent variables that affect travelers' adoption of smart hotels. Structural Equation Modeling (SEM) includes two primary methods for evaluating relationships between constructs: PLS-SEM and CB-SEM (Hair et al., 2011). Generally, these methods are considered complementary approaches. CB-SEM excels in theory validation, while PLS-SEM is more effective for theory development and construct prediction (Hair et al., 2012). As the primary objective of this study is to predict the intention to adopt smart hotels, PLS-SEM is more suitable for our research.

Additionally, we utilize fsQCA to offer an alternative perspective on our findings, as PLS-SEM relies on linear algebra and faces similar challenges to traditional methods such as linear regression, especially in terms of symmetry and net effects (Pappas & Woodside, 2021). Fortunately, fsQCA is capable of addressing these issues. Utilizing Boolean algebra, fsQCA excels in assessing causal asymmetry and intricate effects, thus enhancing the preliminary results of PLS-SEM (Prentice, 2020; Rihoux & Ragin, 2008).

3. RESULTS

3.1. Evaluation of measurement model

In order to guarantee the effectiveness of all measurement models (Hair et al., 2016), assessments were carried out to examine convergent validity and discriminant validity. In assessing convergent validity, we examined factor loading values, Cronbach's alpha (α), composite reliability (CR), Dijkstra-Henseler's rho (ρA), and average variance extracted (AVE). Each item's loading values surpassed 0.6, indicating satisfactory internal reliability of the survey's measurement items. Additionally, following the recommendations of (Hair et al., 2016), the recommended lower limits for α, CR, ρA, and AVE are 0.7, 0.7, 0.7, and 0.5, respectively. Our survey results, detailed in Table 2, exhibit $\alpha > 0.7$, $CR > 0.7$, $\rho A > 0.7$, and $AVE > 0.5$, indicating robust convergent validity.

Table 2: **Cronbach's alpha, composite reliability, Dijkstra-Henseler's rho, and AVE**

Construct	**Cronbach's α**	**CR**	**ρA**	**AVE**
PN	0.730	0.848	0.736	0.650
PE	0.783	0.859	0.789	0.604
PC	0.786	0.862	0.787	0.610
PV	0.841	0.904	0.845	0.759
ADI	0.751	0.858	0.764	0.670

Note: PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention.

Table 3: **Fornell-Larcker criterion**

Construct	PN	PE	PC	PV	ADI
PN	0.806				
PE	0.528	**0.777**			
PC	0.666	0.509	**0.781**		
PV	0.709	0.593	0.738	**0.871**	
ADI	0.678	0.622	0.694	0.723	**0.818**

Note: PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention. The bold numbers stand for the square roots of AVE.

Table 4: **VIF, Loadings, and cross-loadings**

Construct	Item	VIF	Factor loadings and cross-loadings				
			PN	PE	PC	PV	ADI
PN	PN1	1.343	0.793	0.372	0.382	0.482	0.434
	PN2	1.596	0.756	0.322	0.382	0.396	0.412
	PN3	1.478	0.760	0.406	0.402	0.463	0.485
	PN4	1.625	0.799	0.516	0.415	0.492	0.580
PE	PE1	1.538	0.496	0.772	0.510	0.558	0.529
	PE2	1.477	0.418	0.851	0.605	0.620	0.597
	PE3	1.542	0.364	0.793	0.488	0.531	0.508
PC	PC1	1.512	0.473	0.545	0.776	0.610	0.578
	PC2	1.627	0.431	0.555	0.797	0.544	0.579
	PC3	1.743	0.317	0.513	0.811	0.556	0.515
	PC4	1.425	0.358	0.462	0.737	0.593	0.487
PV	PV1	1.990	0.459	0.624	0.613	0.858	0.590
	PV2	1.846	0.553	0.596	0.642	0.851	0.612
	PV3	2.372	0.535	0.634	0.673	0.904	0.683
ADI	ADI1	1.530	0.530	0.453	0.519	0.529	0.778
	ADI2	1.964	0.531	0.646	0.649	0.650	0.893
	ADI3	1.467	0.468	0.553	0.525	0.590	0.778

Note: PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention. The numbers in the gray blocks represent factor loadings.

To assess discriminant validity, three approaches were used to confirm the uniqueness of the variables measured: initially, the technique related to Average Variance Extracted (AVE) was applied. As per Fornell and Larcker (1981), the maximum correlation coefficients among constructs were all below the square root of the AVE figures. Table 3 illustrates the discriminant validity of the constructs measured.

To further evaluate discriminant validity, a cross-loadings analysis was performed. As indicated in Table 4, all factor loadings surpass their respective cross-loadings, which confirms successful discriminant validity (Hair et al., 2016). Additionally, the Heterotrait-Monotrait (HTMT) ratio was examined. As indicated in Table 5, all variables fall below the 0.90 threshold, confirming satisfactory discriminant validity. (Chen et al., 2022). Overall, the testing outcomes demonstrate robust discriminant validity for the survey. Moreover, Table 3 reveals that the Variance Inflation Factor (VIF) values for all measurement items are under 10, indicating that multicollinearity is not a noteworthy concern for this survey (Petter et al., 2007).

Table 5: **HTMT ratio**

Construct	PN	PE	PC	PV	ADI
PN					
PE	0.688				
PC	0.643	0.874			
PV	0.725	0.900	0.900		
ADI	0.804	0.900	0.807	0.900	

Note: PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention.

3.2. Analysis of Structural Model

To examine H1-H7, we utilized smartPLS 3.0 along with bootstrapping technique (5000 iterations) to generate reliable results (Hair et al., 2016). The results indicate a good model fit with the following indicators: R-squared = 0.634 for Accommodation Intention, 0.654 for Perceived Value, NFI = 0.775 (>0.7), and SRMR = 0.072 (<0.08). Perceived novelty (f-squared = 0.089), efficacy (f-squared = 0.151), and compatibility (f-squared = 0.270) demonstrate small to medium effects on perceived value. In contrast, novelty (f-squared = 0.096), efficacy (f-squared = 0.055), compatibility (f-squared = 0.071), and value (f-squared = 0.059) consistently exhibit small effects on accommodation intention, according to thresholds of 0.02 for small, 0.15 for medium, and 0.35 for large effects. As depicted in Table 6 and Figure 2, perceived novelty (β=0.212), perceived efficacy (β=0.318), and perceived compatibility (β=0.419) significantly and positively influence perceived value, attaining a significance level of 0.001, thus supporting H1, H3, and H5. Similarly, perceived novelty (β=0.236), perceived efficacy (β=0.211), and perceived compatibility (β=0.249) exhibit different levels of positive impact on accommodation intention, thus supporting H2, H4, and H6. Moreover, perceived value (β=0.238) significantly and positively affects accommodation intention, validating H7.

Table 6: **Outcomes of the path analysis**

Hypothesis	Path	Path coefficients (	T-values	P-values	Supported?
H1	PN -> PV	0.212	3.240	0.001	Yes
H2	PN -> ADI	0.236	3.505	0.000	Yes
H3	PE -> PV	0.318	4.150	0.000	Yes
H4	PE -> ADI	0.211	2.710	0.007	Yes
H5	PC -> PV	0.419	5.171	0.000	Yes
H6	PC -> ADI	0.249	2.673	0.008	Yes
H7	PV -> ADI	0.250	2.306	0.021	Yes

Note: PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention.

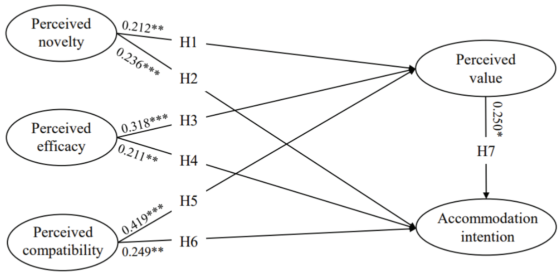
Next, we examined the significance of the indirect effects of the independent variables (perceived novelty, perceived efficacy, perceived compatibility) on the dependent variable (accommodation intention) through the mediator variable (perceived value) using bootstrapping. Table 7 outlines these indirect effects and their 95% confidence intervals. The results indicate that perceived value acts as a mediator between perceived novelty, perceived efficacy, perceived compatibility, and the intention to adopt smart hotels.

Table 7: **Bootstrapping indirect effects and 95% confidence intervals (C.I.)**

No.	Mediation	Indirect effect	95% Bootstrapping C.I.	Supported?
1	PN→ PV→ ADI	0.053	(0.004, 0.107)	Yes
2	PE→ PV→ ADI	0.080	(0.006, 0.161)	Yes
3	PC→PV→ ADI	0.105	(0.010, 0.205)	Yes

Note: PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention.

Figure 2: **Results of the structural model**



3.3. Results of fsQCA

Subsequently, we employed fsQCA to identify the combinations of factors that may lead travelers to perceive high value and have the intention to stay in smart hotels. The analysis comprised two parts. Initially, only endogenous factors were considered to create potential configurations of conditions, with travelers' perceived value from using smart hotels as the outcome variable. Subsequently, we examined the entire research model, treating the interaction of consumers with RAISA technology and the value gained from its use as potential conditions leading to the intention to stay.

Fuzzy-set Qualitative Comparative Analysis (fsQCA) is a method based on set theory that helps in discerning the relationships between constructs (Fiss, 2011). This technique employs values of set membership to classify different scenarios, setting it apart from conventional linear regression and Structural Equation Modeling (SEM). Utilizing Boolean algebra, fsQCA is categorized as an asymmetrical analysis method (Prentice, 2020). By conducting both symmetrical and asymmetrical analyses, researchers pivot from assessing the impact of independent variables on dependent variables to exploring how combinations of independent variables, referred to as "conditions," influence dependent variables.

Data calibration and necessary condition analysis are critical steps in fsQCA. The process of data calibration is essential prior to conducting fsQCA (Rihoux & Ragin, 2008), as it converts the data into a set with values ranging from 0 to 1. A score of 1 denotes full membership, while 0 denotes non-membership. The most uncertain membership point is at 0.5 (Rihoux, 2006). This study employs commonly accepted percentile thresholds (the 75th, 50th, and 25th percentiles) to define full membership, crossover points, and non-membership for each construct (Gligor & Bozkurt, 2020). After calibrating the data into fuzzy sets, necessary condition analysis is conducted (Kang & Shao, 2023). A condition is considered necessary if its consistency is above 0.9 (Rihoux & Ragin, 2008). According to Table 8, no antecedent conditions reach the 0.9 consistency level, whether the dependent variable is perceived value or accommodation intention. This indicates that these conditions are not necessary. Therefore, these factors are aggregated for sufficiency condition analysis to explore configurations that lead to high perceived value and high accommodation intention.

Initially, our research focused on the sufficient conditions for perceived value, considering perceived novelty, efficacy, and compatibility as antecedents. Following Pappas and Woodside's (2021) criteria, three types of solutions were deemed feasible: intermediate, complex, and parsimonious. We opted for the intermediate solution due to its enhanced completeness and interpretability, as argued by Rihoux and Ragin (2008). We identified three configuration patterns that lead to high perceived value among travelers, detailed in Table 9. Pattern 1 depends entirely on a strong perception of efficacy, accounting for 69.7% cases with a consistency of 0.760. Pattern 2 combines high levels of perceived novelty and compatibility, accounting for 39.6% cases with a consistency of 0.854. Notably, Pattern 1 covers more cases than Pattern 2, indicating it explains a larger number of responses. The overall coverage, at 0.775, and the overall consistency, at 0.762—both exceeding their respective thresholds of 0.1 and 0.6 (Fiss, 2011)—suggest that the two sets of configuration patterns possess strong explanatory power and consistency in creating high perceived value for travelers.

Table 8: **Necessary conditions for PV and ADI**

Condition	High PV	Low PV	High ADI	Low ADI
	Consistency	Consistency	Consistency	Consistency
PN	0.694	0.532	0.696	0.538
~PN	0.407	0.613	0.407	0.595
PE	0.697	0.538	0.712	0.494
~PE	0.455	0.682	0.420	0.673
PC	0.569	0.380	0.584	0.363
~PC	0.553	0.797	0.536	0.789
PV			0.754	0.552
~PV			0.378	0.615

Table 9: **Antecedent conditions for PV**

Model	Antecedent conditions			Coverage		Consistency	Solution	
	PN	**PE**	**PC**	**Raw**	**Unique**		**Coverage**	**Consistency**
1		●		0.697	0.379	0.760	0.775	0.762
2	●		●	0.396	0.078	0.854		

Note: ● indicates high membership; ○ indicates low membership; The rest indicates I don't care; PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value.

Table 10: **Antecedent conditions for ADI**

Model	Antecedent conditions				Coverage		Consistency	Solution	
	PN	PE	PC	PV	Raw	Unique		Coverage	Consistency
1	○		●	○	0.133	0.048	0.860	0.511	0.838
2	●	○	●		0.225	0.052	0.823		
3		●	●	●	0.406	0.025	0.874		

Note: ● indicates high membership; ○ indicates low membership; The rest indicates I don't care"PN: Perceived novelty; PE: Perceived efficacy; PC: Perceived compatibility; PV: Perceived value; ADI: Accommodation intention.

Our examination of the sufficient conditions that lead to a strong intention to stay focused on perceived novelty, efficacy, compatibility, and value as antecedents. Table 10 outlines three configuration patterns that yield a high intention to stay among customers. Pattern 1 is characterized by low perceived novelty, high perceived compatibility, and low perceived value, with a coverage of 0.133 and a consistency of 0.860. Pattern 2 includes high perceived novelty, low perceived efficacy, and high perceived compatibility, with a coverage of 0.225 and a consistency of 0.823. Pattern 3 features high perceived efficacy, compatibility, and value, with the highest coverage of 0.406 and a consistency of 0.874, suggesting it accounts for more cases. The overall coverage and consistency are 0.511 and 0.838, respectively, both exceeding the thresholds of 0.1 and 0.6, which indicates these configurations are highly explanatory and consistent.

CONCLUSION AND DISCUSSION

Using concepts from DOI and IPPA, we built a research model to understand how perceived novelty, efficacy, compatibility, and value impact travelers' intention to stay in smart hotels. Results from both PLS-SEM and fsQCA analyses reveal that perceived novelty, efficacy, and compatibility directly encourage travelers to stay in smart hotels and can also indirectly affect their intention through perceived value. Furthermore, three distinct attribute configurations were identified, which prompt travelers to show a high intention to adopt smart hotels.

Firstly, travelers' perceived value is positively influenced by perceived novelty, perceived efficacy, and perceived compatibility to different extents (H1, H3, and H5). Specifically, these factors enhance the appeal of smart hotels, indicating that these establishments offer unique features or technologies that capture travelers' interest. This novelty can spark curiosity and excitement among travelers, increasing their attraction to smart hotels, consistent with previous research on consumer responses to new products or services (Karjaluoto et al., 2019; Zhang et al., 2021). Additionally, customers with high self-efficacy confidently use hotel technologies, enhancing satisfaction and value by easily exploring advanced services. This aligns with research on self-efficacy and perceived value (Nguyen et al., 2023; Cao et al., 2022). Lastly, the services and amenities offered by smart hotels meet travelers' expectations and preferences, fostering positive attitudes toward these establishments, consistent with previous research on the influence of innovative technology on consumer values and experiences (Jiang et al., 2021 Adapa, 2020).

Furthermore, perceived novelty, perceived efficacy, perceived compatibility, and perceived value have varying degrees of positive impact on travelers' adoption of smart hotels (H2, H4, H6, and H7). Firstly, when travelers perceive smart hotels as novel, they are more inclined to choose to stay in them. This novelty may manifest in the application of smart technology, innovative service designs, or unique environmental atmospheres, consistent with past findings showing that customers' perception of novelty influences their adoption of technology (Rogers, 2004). Secondly, Consumers with high perceived efficacy are confident in navigating new technologies in smart hotels and believe these innovations will enhance their accommodation experience, aligning with research on the impact of perceived efficacy on technology adoption (Jokisch et al., 2020). Also, when travelers see that smart hotels meet their personal needs and expectations, they're more likely to adopt them. This compatibility might be evident in personalized services, facilities that suit their habits, or amenities that cater to specific needs, in line with past research showing that perceived compatibility affects consumers' adoption of smart products (Adapa, 2020). Lastly, travelers' perceived value of smart hotels positively influences their choice. This value might be seen in innovative services, efficient processes, or amenities that match their needs, consistent with past research indicating that consumers' perception of value directly impacts their intentions (Grewal et al., 1998; Wang et al., 2023).

The fsQCA analysis revealed three configurations contributing to enhancing travelers' intention to stay in smart hotels, which involve multiple factors meeting accommodation needs. Patterns 1, 2, and 3 in Table 10 show that combining perceived novelty, efficacy, compatibility, and high perceived value is crucial for boosting intention to stay. It is noteworthy that perceived compatibility must be included in any combination. Furthermore, Both high and low perceived novelty (Pattern 2 and Pattern 1) as well as high and low perceived efficacy (Pattern 3 and Pattern 2) can result in high intention to stay. Pattern 3, with the highest coverage rate, suggests that travelers' positive perception of smart hotels' value largely influences their choice behavior, consistent with PLS-SEM results. However, Patterns 1 and 2 indicate that lacking high perceived value may still result in high intention to stay. In conclusion, the results of fsQCA reinforce the findings of PLS-SEM and offer insights for hoteliers to develop smart hotels.

Theoretical implications

This study aimed to understand the factors influencing travelers' adoption of smart hotels and how these factors combine to influence adoption rates. It drew upon innovation diffusion and information processing theories to construct a research model. Traditional theories like the Technology Acceptance Model focus on individual factors like self-efficacy, while this study broadens the scope to include social and cultural aspects. Perceived novelty, efficacy, and compatibility are key factors considered. Novelty refers to travelers' perception of the uniqueness of smart hotels, which can attract them even without direct experience. Efficacy includes self-efficacy as well as perceptions of social interaction and security. Compatibility assesses whether smart hotels align with travelers' values, lifestyles, and individual needs.

The concept of information processing of product attributes emphasizes that travelers' adoption of smart hotels may not solely depend on individual attributes but rather on the comprehensive value derived from multiple attributes. Therefore, this study combined PLS-SEM and fsQCA methods to analyze the attributes influencing travelers' adoption of smart hotels and the configuration of these attributes. The application of fsQCA enabled us to predict travelers' adoption of smart hotels from combinations of attributes and helped explain the heterogeneous effects of various attributes on travelers' intentions to adopt smart hotels. Thus, our findings from fsQCA contribute to the current knowledge of travelers' adoption intentions of smart hotels. Specifically, any attribute combination leading to high intention to stay among travelers needs to include perceived compatibility. In addition, the majority of travelers' choice of smart hotels depends on the comprehensive value derived from multiple attributes such as novelty, efficacy, and compatibility.

Practical implications

The study's findings have important implications for accommodation providers aiming to promote smart hotels. Both SEM and fsQCA analyses suggest that providers should focus on coordinating various aspects of smart hotels like novelty, efficacy, and compatibility to boost adoption rates among travelers. In the fsQCA analysis, we found that travelers' perceived value can be enhanced either by individually improving efficacy or by combining novelty and compatibility. Furthermore, increasing travelers' perceived compatibility while simultaneously enhancing novelty or efficacy can further boost adoption rates. These fsQCA research findings offer valuable insights for hoteliers to develop marketing strategies that attract more travelers. For example, combining novelty and compatibility can lead to marketing strategies based on co-creation and customization (Casais & Ferreira, 2023). Co-creation refers to the process where businesses and customers jointly participate in designing and improving products or services. Smart hotels can continuously enhance their intelligent facilities and service processes by gathering customer feedback and preferences. This approach not only strengthens customer engagement and a sense of belonging but also makes products and services more aligned with customer needs. Customization involves tailoring products or services to meet customers' personalized needs. Smart hotels can use big data and artificial intelligence to analyze customer preferences and offer personalized services, such as customized room settings, exclusive service packages, and tailored experiences. Similarly, the combination of self-efficacy and compatibility can also support the development of various marketing strategies. For instance, tiered service and personalization marketing (Kim & Han, 2020) could cater to customers with high self-efficacy by offering more self-service and highly intelligent service options. For customers with low self-efficacy, simplified and more intuitive services could be provided, along with appropriate human support, ensuring that all customers can easily use and enjoy the smart hotel's technology.

Limitations and Future Research

This study, while enriching the literature on smart hotel adoption, has several limitations that pave the way for future research. First, the small sample size constrains the generalizability of the findings. Future studies should therefore employ larger sample sizes to validate our results. Second, the study reflects only the perspectives and intentions of Taiwanese travelers. Given the potential impact of cultural differences on smart hotel adoption, future research should expand to include diverse countries. Third, the application of mixed methods like SEM and fsQCA is relatively novel, and future research could investigate additional antecedent variables, such as personality traits, to deepen the understanding of travelers' decisions to choose or reject smart hotels.

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DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In preparing this paper, the author(s) used ChatGPT and Copilot for improving the readability and language of the manuscript. Following the use of this tool/service, the author(s) have reviewed and edited the content as necessary and take full responsibility for the content of the published article.

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