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The Impact of Smart Hotel Technology on Guest Satisfaction and Loyalty: A User Competency Perspective

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Abstract

This study investigates the impact of smart hotel technology on guest satisfaction and loyalty by examining the perceptions and experiences of hotel guests. Through a sample of 332 guests staying at smart technology-equipped hotels, Structural Equation Modeling with Partial Least Squares (SEM-PLS) analysis was conducted to explore the relationships between user competency, perceived ease of use, perceived usefulness, satisfaction, and loyalty. The results reveal that user competency significantly influences guests' perceptions of the benefits and convenience of smart hotel technology. Moreover, as reflected in guests' perceptions, the adoption process significantly affects both satisfaction and loyalty levels. These findings underscore the importance of understanding user perspectives and market readiness for successful technology implementation in smart hotels. The study's implications extend to smart hotel managers, highlighting the necessity of ensuring user competency and readiness to maximize technology's potential benefits. Furthermore, this research contributes to developing a comprehensive model for understanding smart hotel guest loyalty, offering a novel user-centric perspective on enhancing guest experiences in the digital tourism era.

Keywords Smart hotel technology; Guest satisfaction; Loyalty; User competency

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Introduction

Technological advances have had a major impact on various industries, and the hotel industry is no exception (Ba et al., 2022). With IoT and artificial intelligence integration, smart hotels have emerged as a game changer in the hospitality sector, creating a smart and comfortable holiday environment for guests (Kim & Han, 2020). By harnessing cutting-edge technology, these establishments strive to enhance operational efficiency while catering to the digital expectations of contemporary travelers (Casais & Ferreira, 2023). The rapid growth of the smart hospitality market is evident, with a projected Compound Annual Growth Rate (CAGR) of 22% from 2021 to 2031, culminating in a market share estimated at $133.68 billion by 2031(Allied Market Research, 2022). This underscores the prevalence of smart hotels, significantly altering the competitive landscape of the already fiercely contested hospitality industry. Since its inception in 2008, the concept of smart hotels has evolved alongside advancements in the information technology industry (Chen & Zhang, 2019; Yang et al., 2021). Aligned with the principles of Industrial Revolution 4.0, which encompasses pillars such as Augmented Reality, Vertical System Integration, IoT, Big Data and Analytics, Simulation, Cloud, Autonomous Systems, IT Security, and Horizontal and Additive Production, efforts have been made to optimize value chains (Bilotta et al., 2021), included in this terminology for the hospitality industry. Smart hotel implementation from the guest's perspective involves touchless and sensor technology categorized as amenity technology (Yang et al., 2021), while on the management side, it includes predictive capabilities for guest needs based on big data and operational platform interoperability (Chen et al., 2021; Kim & Han, 2020; Leung, 2019). Ultimately, these endeavors aim to achieve excellence amidst intensifying competition within the industry.

The hospitality industry uniquely blends tangible and intangible elements to shape residential behavior, aiming to deliver a positive customer experience (Koo et al., 2023). The widespread adoption of smart hotel technology, particularly since the onset of the COVID-19 pandemic, has accelerated changes in guest behavior, with many embracing smart technology (Chang et al., 2022). This trend has spurred scientific inquiries to understand better the adoption process of smart technology across various contexts (Kim & Han, 2022; Kusdibyo et al., 2023). Various studies have revealed that the inclination to share experiences among smart hotel guests is influenced by factors such as technology attachment and experiential relationship quality (Wu & Cheng, 2018), as well as sensory, emotional, and relational experiences (Chen et al., 2021). On the impact front, research conducted by (Elshaer & Marzouk, 2022) highlights the role of smart hotel technology in shaping memorable tourism experiences. Additionally, stakeholder-based studies, such as that by (Leung, 2019), shed light on how smart hotels foster the adoption of customer-centric, employee-centric, and revenue-centric principles in hotel operations.

Smart hotel innovation performance is assessed based on relative benefits, compatibility, complexity, and cost (C.-M. Chen & Zhang, 2019). Despite these metrics, the implementation of smart hotel technology often faces hurdles during user adoption, a topic extensively explored in prior research. While numerous studies have examined performance factors from the supply side and various implementations of smart hotel technology on guest behavior, few have delved into cognitive and affective readiness factors among guests in adopting such technology and how they impact smart hotel satisfaction and loyalty. This gap has prompted speculation regarding the alignment of smart technology with guests' cognitive and affective readiness levels to cater to this adopter segment effectively. This observation is noteworthy as investments in smart hotel technology aim to confer a competitive edge and distinguish one smart hotel from another by enhancing hotel services and fostering loyalty. In addressing this gap, the present study investigates empirical evidence by employing the motivation-ability-opportunity dimensions posited in the MOA Theory (MacInnis et al., 1991) as a fundamental framework for understanding the adoption of smart hotel technology from the guest's perspective. These dimensions are subsequently evaluated for their impact on shaping perceptions of convenience and usefulness (Davis, 1989), which systematically influence guest satisfaction and foster loyalty towards smart hotels. This research aims to provide insights for both academic and industrial audiences into the smart hotel adoption process and its ramifications for the success of hotel businesses.

Literature review

Smart hotels

A Smart Hotel is equipped with intelligent technology, such as IoT and AI, to optimize operational and service models to enhance management efficiency, improve service quality, and cater to diverse operational requirements (Hutabarat et al., 2023). Leveraging the outcomes of technological advancements and digital innovation, smart hotels seek to enhance customer experiences, particularly targeting the preferences of the new generation of guests (Casais & Ferreira, 2023). This is achieved by developing a hotel management system that integrates intelligent terminals, self-service subsystems, and cloud terminal servers to streamline operations and alleviate the workload of hotel staff (Parmar et al., 2019). From the guests' perspective, smart hotels offer a seamless and immersive stay experience by providing personalized services through an integrated network and information system. These services include features of digital hotel platforms, virtual housekeeping services, self-service subsystems, food ordering services, intelligent robot platforms, and smart cloud locks (Cheong & Law, 2023; Kim et al., 2021; Kim & Han, 2022). Smart hotels operate within a specific digital ecosystem that seamlessly interoperates with various platforms. The proliferation of smart tourism technology drives innovation across organizational, procedural, product, and marketing dimensions within these establishments (Elshaer & Marzouk, 2022). As described as a harmonious relationship and interaction among customers, service providers, and other stakeholders, the smart hospitality ecosystem is elucidated in the study (Buhalis & Leung, 2018). Managers perceive the evolution of smart hospitality as integrating human interaction with robotic systems to gain business advantages (Cheong & Law, 2023). This fosters a keen interest in investing in smart hotel operations, especially among establishments previously less inclined towards technology-driven competition. Shareholders and investors adopt a pragmatic stance, viewing smart hospitality as integral to the financial innovation ecosystem, with a focus on the speed of return on investment and capital (Leung, 2019). Smart hotels, particularly in their adoption phase, are regarded as a viable means to achieve excellence and ensure business viability amidst various options for digitalizing hotel operations.

User motivation-ability-opportunity and perceived ease of use-perceived usefulness

The Motivation-Opportunity-Ability (MOA) framework (MacInnis et al., 1991) was originally developed as a theoretical construct within the realm of consumer behavior, elucidating internally driven behavioral factors (ability and motivation) alongside external influences (opportunity). Over time, this framework has been applied to understand the performance behavior of tourist communities engaging with smart technology (Prawira et al., 2022). This application resonates with the typology of hotel guests, which is distinct from traditional consumers. In the hotel industry, customers consume various services at a lodging property, forming an integrated stay experience wherein internal (motivation and ability) and external (opportunity) factors play pivotal roles in shaping guest behavior towards smart hotel technology. Conversely, the Technology Acceptance Model (TAM) (Davis, 1989) is a relevant theory that describes perceptions of technology acceptance. Technology adoption entails a user evaluation process concerning the ease and usefulness of the new technology (Venkatesh & Davis, 2000). The amalgamation of internal (ability and motivation) and external (opportunity) factors forms the basis for assessing the ease and usefulness of a technology. The motivation dimension entails the consumer's desire and preparedness to engage in specific behaviors (MacInnis et al., 1991). Individuals are inherently driven to restore equilibrium in situations of disturbance by responding to specific needs that motivate action (Crompton, 1979). In this context, consumer motivation manifests through encouragement, enthusiasm, and intention, which drive behavior toward completing specific tasks. Regarding technology usage, motivation is the foundation for users' readiness to tackle technical challenges in exchange for economic and technological value (Roy et al., 2020). Higher levels of user motivation directly influence their perceptions of the ease and usefulness of the technology (Prawira et al., 2022).

Ability refers to the extent of an individual's knowledge and resources to accomplish desired outcomes (MacInnis et al., 1991). In the context of technology users, it encompasses a range of functional skills necessary for effective interaction and utilization of technology (Utami Nugrahani & Abdul Wahid, 2021). This perspective acknowledges that technology users possess varying ability levels, and different circumstances may impose distinct limitations on their abilities. An individual's understanding of financial and resource capabilities forms the foundation for readiness to adopt new technology (Parasuraman, 2000). This underscores the significant role of abilities in shaping perceptions of technology adoption, including within smart

hotels. Individuals with proficient abilities are likelier to perceive smart hotel technology as user-friendly and beneficial (Prawira et al., 2022). The adoption process of smart hotel technology is influenced by internal user factors and the availability of tangible and intangible conditions that broaden opportunities for using such technology. MacInnis et al. (1991) underscores opportunity as the condition of individual freedom to engage in certain behaviors. Opportunities encompass situational factors that can either facilitate or hinder an individual's behavior, encompassing both positive and negative aspects related to the availability of resources and barriers to achieving the desired behavior (Roy et al., 2020). Hotel guests with conducive conditions for smart technology will perceive the available technology as user-friendly and beneficial. Based on these logical assumptions, a hypothesis is established:

H1: ability has a significant effect on perceived ease of use
H2: ability has a significant effect on perceived usefulness
H3: motivation has a significant effect on perceived ease of use
H4: motivation has a significant effect on perceived usefulness
H5: opportunity has a significant effect on perceived ease of use
H6: opportunity has a significant effect on perceived usefulness

Acceptance of technology in forming smart hotel satisfaction and loyalty

From the user's perspective, the adoption of smart hotel technology hinges on the benefits received, both technical and non-technical, which result in the exchange of added value (Kim et al., 2020). Users are inclined to embrace new technology because it is perceived as efficient, easy to use, reliable, comfortable, and customizable to meet service performance attributes (Dabholkar, 1996). The perceived usefulness and convenience of smart hotel technology are assessed by testing available features across various usage levels. In hospitality and tourism studies, satisfaction refers to the joy or contentment experienced by guests when a hotel's products and services align with their needs and expectations (Assaker et al., 2020). Previous studies have consistently demonstrated that user satisfaction in adopting this technology is influenced by perceived ease of use and usefulness (Dewi et al., 2020; Nugroho et al., 2023; Wilson et al., 2021). Moreover, investment in smart hotel technology is strategized to attain a competitive edge by offering innovative and distinct services compared to competitors (Chen & Zhang, 2019; Yang et al., 2021). To ensure sustainable returns on investment in smart technology, hotel managers endeavor to leverage this feature to enhance guest satisfaction and foster loyalty. Studies (Assaker et al., 2020) indicate that satisfaction significantly impacts hotel guest loyalty, typically characterized by customers' intentions or actions to repeatedly purchase or patronize a specific product or service from the same brand (Sangpikul, 2018). Based on these logical assumptions, a hypothesis is established:

H7: perceived ease of use has a significant effect on satisfaction
H8: perceived usefulness has a significant effect on satisfaction
H9: satisfaction has a significant effect on smart hotel loyalty

Methods

Data and sample collection

This study employs a survey method, targeting respondents who have stayed at smart hotels within the past year. Smart hotel refers to lodging properties integrating information and communications technology (ICT) to enhance guest experiences and increase operational efficiency. This integration includes smart devices, sensors, and data analytics to create a more personalized and efficient environment for guests (Gretzel et al., 2015; Manembu et al., 2021). A pilot test involving 30 respondents yielded a Cronbach's Alpha value exceeding 0.7, indicating reliable measurement indicators. Subsequently, the questionnaire was distributed via conversational social media platforms. The analysis stage utilized data from 332 respondents, a sample size exceeding the recommended threshold suggested by (Hair et al., 2019). From these activities, a respondent profile was obtained, revealing an age distribution of 53.6% (<28 years), 27.5% (28-41 years), 11.6% (42-57 years), and 7.2% (>58 years). This indicates a predominance of Generation Z and Millennials in the study's data pool. Regarding educational background, 66.7% of respondents held undergraduate degrees, 23.2% had post-graduate qualifications, and 10.1% reported completing high school. Regarding income, 52.2% of respondents reported earning less than 5 million Rupiah per month, 30.4% earned between 5-10 million Rupiah, 13% earned between 10-20 million Rupiah, and 4.3% earned over 20 million Rupiah. Furthermore, based on job profiles, 50.7% of respondents were students, 23.2% were government workers, 17.4% were professionals, and an additional 4.3% identified as freelancers.

Measurement and analysis techniques

The instrument was developed considering the MOA Theory (MacInnis et al., 1991), comprising three dimensions: motivation, ability, and opportunity. Measurement models were adopted and considered (Prawira et al., 2022; Susanto, Rofaida, et al., 2022). These three dimensions were operationalized into four indicators, each for ability and motivation and three for opportunity. Additionally, measurements based on the Technology Acceptance Model (Davis, 1989; Viswanath & Fred D, 1996) were utilized, employing four indicators to measure perceived use and usefulness. The variable of guest satisfaction was adopted from the concept outlined by (Oliver, 1981), as commonly employed in hotel guest studies, with four measurement indicators. Similarly, the measurement of smart hotel loyalty was adopted from studies(Assaker et al., 2020; Wang et al., 2022)

utilizing four measurement indicators. This study adopts a quantitative approach (Creswell & Creswell, 2018) to unveil a model of smart hotel satisfaction and loyalty shaped by individual factors and hotel guests' technology adoption process. To fulfill its objectives, the model is assessed using the PLS-SEM technique, deemed appropriate for models with complex variable constructs, as noted by (Hair et al., 2019) and allows for exploring constructs comprising multiple concepts.

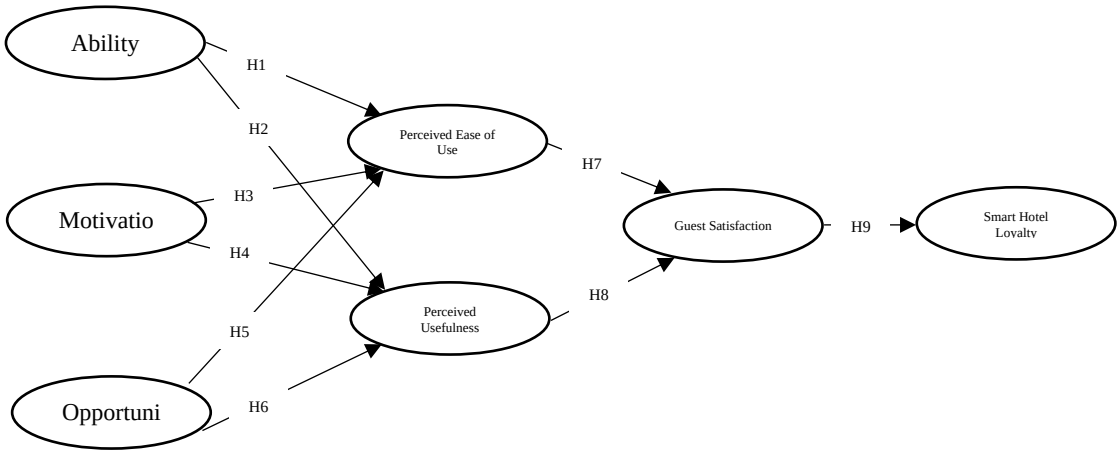

Figure 1. Proposed model framework

Results and discussion

Measurement model

Following guidelines suggested by Hair et al. (2019), this study assesses the quality of measurements through reliability, convergent, and discriminant validity tests. Data processing was conducted using SmartPLS, revealing that all Cronbach's alpha and composite reliability values met the threshold of at least 0.7, indicating good instrument reliability. Detailed test results are presented in Table 1.

Table 1. **Loadings, CA, CR and AVE**

Construct	Loadings	Cronbach Alpha	CR	AVE
Ability		0.915	0.941	0.798
1. Able to operate a smartphone and its features	0.911			
2. I can integrate my smartphone with hotel technology features	0.927			
3. Able to operate smart hotel features (smart room/sensor/digital transactions)	0.895			
4. Able to handle problems that arise in the digital consumption process	0.838			
Motivation		0.839	0.891	0.672
1. I am motivated to use digital technology in my daily activities	0.818			
2. Motivated to make digital reservations for hotel visits	0.755			
3. Motivated to use the smart technological features provided at the hotel	0.859			
4. Motivated to study the smart technological features provided in hotels	0.844			
Opportunity		0.725	0.845	0.645
1. The hotels I visited provided opportunities to use the smart technology they had	0.814			
2. The smart technology at the hotel I visited is accessible to all users	0.804			
3. Smart technology in the hotels I visited provided opportunities to learn new things	0.792			
Perceived Ease of Use		0.850	0.899	0.690
1. The smart technology I use at the hotel is easy to use	0.870			
2. The smart technology I use in hotels is interesting	0.776			
3. The smart technology I use at the hotel can be operated simply	0.837			
4. The smart technology I use in hotels does not add complexity	0.837			
Perceived of Usefulness		0.844	0.896	0.684
1. I feel that the hotel's smart technology makes things easier.	0.856			
2. The smart technology I use in hotels has helped me not get tired	0.798			
3. The smart technology I use in hotels has provided interesting knowledge	0.901			
4. The smart technology I use at the hotel can become content on my social media	0.745			
Guest Satisfaction		0.921	0.944	0.808
1. I was satisfied with my visit to a hotel with smart technology	0.868			
2. I was satisfied with the smart technology features in the hotel I visited	0.905			
3. I was satisfied with the reliability of the smart technology at the hotel I visited	0.932			
I am satisfied with the value I paid for a technology-smart hotel	0.890			
Smart Hotel Loyalty		0.914	0.946	0.853
1. I will always choose the smart hotel brand on tourist visits.	0.912			
2. If available, I will always try to stay in a smart hotel over other types.	0.906			
3. I prioritize my choice of smart hotel brands or services as my main accommodation.	0.952			

Furthermore, convergent validity was confirmed as all loadings and average variance extracted (AVE) exceeded 0.7 and 0.5, respectively. Items with loadings between 0.4 and 0.7 were retained if the AVE exceeded 0.5. The discriminant validity of the construct is depicted in Table 2, where the diagonal entries indicate that the square root of the average variance extracted (AVE) between each pair of factors surpasses the estimated correlation between the factors, thus reinforcing its discriminant validity (Hair et al., 2017).

Table 2. Discriminant validity

	ABI	SHL	MOT	OPP	PEU	POU	SAT
Ability (ABI)	0.894						
Smart Hotel Loyalty (SHL)	0.580	0.924					
Motivation (MOT)	0.265	0.567	0.820				
Opportunity (OPP)	0.569	0.473	0.586	0.803			
Perceived Ease of Use (PEU)	0.660	0.661	0.596	0.734	0.831		
Perceived Usefulness (POU)	0.656	0.853	0.626	0.708	0.727	0.827	
Guest Satisfaction (SAT)	0.581	0.728	0.630	0.581	0.709	0.831	0.899

Structural model

When analyzing structural models, evaluating the model's quality relies on its capability to analyze endogenous constructs. Coefficients of determination (R^2), cross-validated redundancy (Q^2), and path coefficients were utilized to assess the structural model (Hair et al., 2019). R^2 values of 0.75, 0.50, and 0.25 signify substantial, moderate, and weak effects, respectively. The data processing results reveal R^2 values of 0.667 for perceived ease of use, 0.667 for perceived usefulness, 0.704 for guest satisfaction, and 0.523 for perception of smart hotels. This suggests that the exogenous construct moderately influences all mentioned constructs. Additionally, the Q^2 value for all dependent constructs exceeds zero, indicating acceptable predictive power (Hair et al., 2019), as depicted in Table 3.

Table 3. R^2 dan Q^2

	R^2	Q^2
Smart Hotel Loyalty	0.523	0.406
Perceived Ease of Use	0.667	0.456
Perceived Usefulness	0.667	0.427
Guest Satisfaction	0.704	0.554

The structural model elucidated 45.6% of the variance in perceived ease of use and 42.7% in perceived usefulness. Furthermore, guest satisfaction and Smart Hotel Loyalty were explicated by 55.4% and 40.6% of their respective constituent constructs. Subsequent hypothesis testing results revealed significant influences of ability (*β=0.389, t=3.533*), motivation (*β=0.294, t=3.061*), and opportunity (*β=0.340, t=2.231*) on perceived ease of use, leading to the acceptance of H1, H3, and H5. Conversely, ability (*β=0.412, t=3.533*) and motivation (*β=0.365, t=2.801*) significantly affected perceived usefulness, resulting in the acceptance of H2 and H4. However, the influence of opportunity on perceived usefulness was found to be non-significant, leading to the rejection of H6. These results indicate that all AMO Theory factors influence smart technology acceptance, albeit excluding the relationship between usage opportunities and perceived usefulness. Moreover, perceived ease of use (*β=0.222, t=1.908*) and perceived usefulness (*β=0.669, t=5.505*) significantly impacted hotel guest satisfaction, leading to the acceptance of H7 and H8. Ultimately, smart hotel guest satisfaction significantly influenced smart hotel loyalty (*β=0.728, t=8.289*), resulting in the acceptance of H9. Further details of these calculations are provided in Table 4 and Figure 2.

Table 4. Hypothesis testing

Hypothesis	β	T Statistics	P Values
H1:Ability -> Perceived Ease of Use	0.389	3.533	0.000
H2: Ability -> Perceived Usefulness	0.412	3.929	0.000
H3: Motivation -> Perceived Ease of Use	0.294	3.061	0.002
H4: Motivation -> Perceived Usefulness	0.365	2.801	0.005
H5: Opportunity -> Perceived Ease of Use	0.340	2.231	0.026
H6: Opportunity -> Perceived Usefulness	0.259	1.504	0.133*
H7: Perceived Ease of Use -> Guest Satisfaction	0.222	1.908	0.057
H8: Perceived Usefulness -> Guest Satisfaction	0.669	5.505	0.000
H9: User Satisfaction -> Smart Hotel Loyalty	0.728	8.289	0.000

* rejected hypothesis

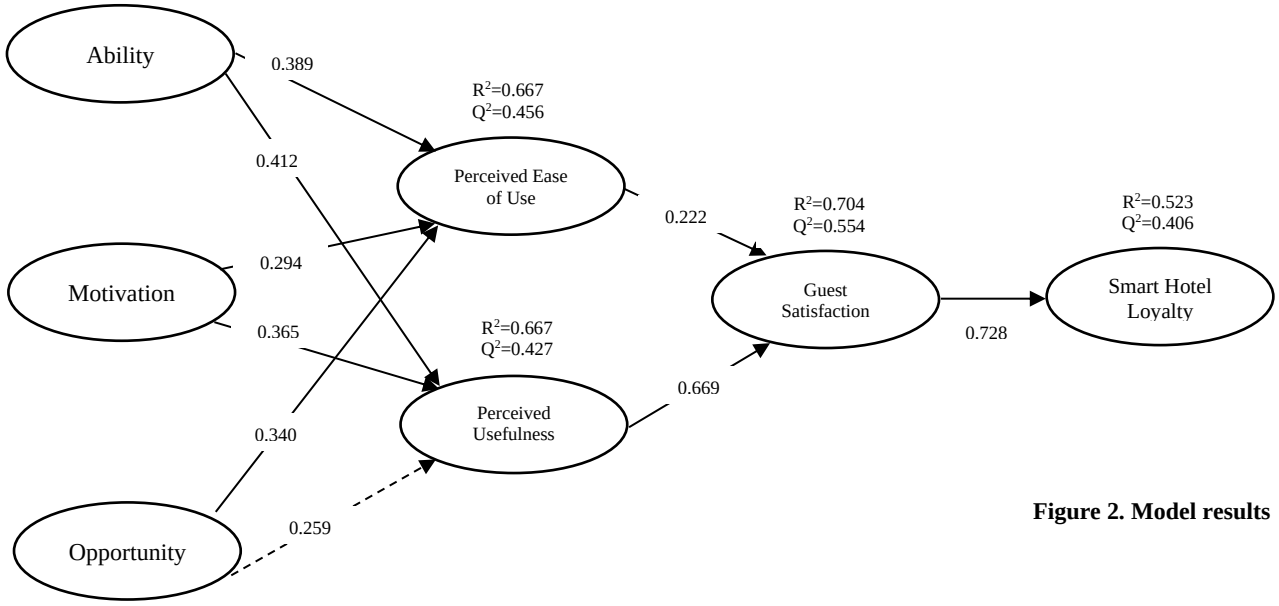

Figure 2. Model results

Discussion

The literature underscores a crucial aspect of the hospitality industry: ensuring guests experience high satisfaction levels. This not only influences their decision to revisit but also fosters loyalty. This study constructs a framework to explore motivation, ability, and opportunity in shaping perceived ease, usefulness, and satisfaction, thereby fostering smart hotel loyalty. Model testing was conducted integratively, incorporating data from smart hotel guests gathered through a review of pertinent literature to construct a theoretical model of these factors. The findings of this study unveil the impact of smart hotel implementation from guests' perspectives, where internal factors play a significant role in the adoption of smart technology, thereby influencing satisfaction and loyalty. Statistically, it was found that internal factors such as motivation and ability significantly influenced the perception of the convenience and usefulness of smart hotel technology. This underscores the pivotal role of these factors in driving the adoption and acceptance of technological advancements in the hospitality industry. These insights offer a nuanced understanding of how internal motivation and capabilities impact guest attitudes and engagement toward smart hotel facilities. These findings align with previous studies (Prawira et al., 2022; Utami Nugrahani & Abdul Wahid, 2021; Wulandari et al., 2023), which suggest that technology is perceived as easy and useful when users possess internal readiness. This readiness is indicated by the Technology Readiness Index (Parasuraman, 2000), which assesses users' competence in facing the challenges of utilizing technology. Thus, these findings emphasize that the success of smart hotel implementation depends not only on technological features but also on the readiness of the target user market for the services provided.

The opportunity aspect in this study was found to have no significant effect on perceived usefulness, indicating that providing smart hotel technology to certain segments may not be perceived as beneficial. This situation may arise if guests perceive that overly advanced technology does not always offer additional benefits and may even be deemed excessive. However, it was observed that opportunity significantly influences perceived convenience. This finding is consistent with previous technology studies (Foster et al., 2021; Sanggramasari et al., 2023), which suggest that the freedom to utilize technology aids in the adoption process by fostering a perception of ease. Additionally, this study revealed that the adoption process of smart hotel technology, perceived as easy and useful, impacts guest satisfaction. This finding aligns with previous research (Nugroho et al., 2023; Susanto, Hendrayati, et al., 2022; Wilson et al., 2021), which indicates that perceptions of technology adoption contribute to satisfaction with technology use. Furthermore, this study convincingly demonstrates that the satisfaction construct, built on internal factors and the technology adoption process, significantly influences the formation of smart hotel loyalty. This finding aligns with previous research (Assaker et al., 2020; Sangpikul, 2018), which suggests that satisfied users of technology-based services are more likely to repeatedly utilize the technology and prefer it over alternative services whenever possible. Smart hotel guests proficiently utilizing the provided features will give favorable evaluations and prioritize smart hotels for their travel accommodations.

Conclusions

This study underscores guest satisfaction as a crucial driver of repeat visit frequency and hotel loyalty. It primarily focuses on how motivation and ability influence perceptions of smart hotel technology, thereby impacting guest satisfaction and loyalty. However, it's important to acknowledge the limitations of this study. Specifically, it primarily emphasizes internal factors while overlooking external influences such as market dynamics or cultural aspects, which may also shape the adoption of smart technologies in the hotel industry. Additionally, it doesn't delve into how these internal factors may evolve, thus limiting a deeper understanding of their long-term impact on guest behavior and satisfaction levels. This research paves the way for future studies to develop a more comprehensive framework encompassing internal and external factors influencing the adoption of smart technology in hotels. Exploring broader market dynamics and cultural influences can provide a more holistic understanding. Furthermore, longitudinal studies could examine how guests' motivations and abilities evolve, shedding light on their ongoing impact on technology adoption and satisfaction levels. From a managerial perspective, this study suggests that hotel management should carefully consider technology features, guest readiness, and external factors influencing technology adoption. Adapting technological advancements to align with guests' motivations and abilities can enhance their satisfaction and loyalty. Additionally, continuous evaluation and adaptation of technology based on evolving guest preferences are crucial for long-term success in the hospitality industry.

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