

## Technology Adoption and Customer loyalty in Hospitality Sector: Mediating Role of Customer Satisfaction and Engagement

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### Abstract

This research endeavours to elucidate the intricate interconnections among customer engagement, satisfaction, loyalty, and technology adoption within the specific milieu of the hospitality industry in Saudi Arabia. The primary objective is to refine existing theoretical frameworks and furnish valuable insights for companies seeking to strategically integrate technology for the enhancement of customer experiences. This is achieved via an assessment of the mediating role played by customer engagement. The data collected for the present research were derived from 279 participants residing in diverse cities of Saudi Arabia, including Alhasa, Dammam, and Riyadh. The methodological approach employed structural equation modelling (SEM) to scrutinize the ties among technology adoption, loyalty, satisfaction, and customer engagement. The research utilizes established scales to assess various factors such as mobile technology usage, online reservation systems, self-service kiosks, smart room technologies, digital concierge services, customer satisfaction, engagement, and loyalty. The findings underscore that the correlations between several parameters of technological adoption (e.g., the utilization of mobile devices, online reservation platforms, and self-service kiosks) and customer satisfaction are significantly mediated by customer engagement. This highlights the pivotal role of actively involving customers through technology to augment overall satisfaction levels. The study holds implications on two fronts. Theoretical contributions include the incorporation of the mediating function of customer engagement, advancing our understanding of implementation technologies in the hospitality sector. From a practical standpoint, the results proffer guidance for businesses in Saudi Arabia, and potentially in analogous cultural settings, on strategically leveraging technology to amplify customer engagement and satisfaction, thereby fostering loyalty. This study is unique

because it incorporates consumer interaction as an essential facilitator in the complex connections connecting technology adoption and customer happiness in the hotel industry. By concentrating on the Saudi Arabian context, the research introduces cultural nuances into the discourse, thereby contributing to the originality of insights and recommendations for businesses operating in this specific market. Consequently, the study provides a nuanced perspective to the evolving literature on customer behaviour in the hospitality sector by considering the unique interplay between technology, engagement, and satisfaction.

**Keywords:** Mobile Technology Usage, Online Reservation Systems, Smart Room Technologies, Customer Loyalty, Customer Satisfaction, Digital Concierge Services-DCS, and Customer Engagement.

## 1. Introduction

In the realms of business and marketing, the concept of customer involvement assumes paramount significance. It pertains to the interactions and transactions that transpire between a consumer and a company, commodity, or service. Customers who harbour emotional investments in a brand not only derive satisfaction from their purchases but also establish a profound sense of connection with it. The formulation and implementation of a robust customer engagement strategy have the potential to yield heightened levels of customer loyalty, advocacy, and enduring relationships. In delving into the discourse on customer engagement, it becomes imperative to customize the strategy in accordance with the unique characteristics of the industry, the target audience, and the overarching objectives of the business. Furthermore, a commitment to staying apprised of prevailing trends and emerging technologies is imperative to craft a dynamic and efficacious customer engagement strategy. According to [Aziz and Ahmed \(2023\)](#), Customer brand engagement significantly shapes purchase intention, primarily propelled by consumer brand recognition. Research has established that mobile applications serve as an efficacious tool for elevating consumer satisfaction and engagement. [Sicilia and Palazón \(2023\)](#)

highlighted is the significance of maintaining consistent communication and synchronizing channels to foster customer participation, particularly within the retail sector. [Yoo, Chen, and Frankwick \(2023\)](#) emphasized the work engagement of frontline employees in sector of hospitality.

Customer engagement transcends being merely a business strategy; it constitutes a foundational element that profoundly moulds the holistic guest experience. A pivotal method involves the provision of tailored and personalized experiences ([Xiang et al., 2017](#)). Through adept utilization of customer data, enterprises can customize their services and promotional initiatives to align with individual preferences and past interactions. Personalization surpasses transactional engagements, encompassing the incorporation of customer names and preferences in communications, thereby nurturing a perception of familiarity and significance. Additionally, a robust digital presence stands as a crucial component for fostering customer engagement within the contemporary hospitality landscape ([Buhalis & Foerste, 2015](#)). Engaging in proactive interactions on social media platforms enables enterprises to establish direct connections with customers, offering timely responses to comments and messages. Disseminating visually captivating and compelling content, including photographs and videos that showcase the property and its offerings, not only captures attention but also augments the overarching image of the brand ([Sigala, 2017](#)). Mobile applications and technological advancements assume a crucial role in facilitating fluid customer engagement. Through the provision of services such as mobile check-in, keyless entry, and in-app messaging, enterprises elevate convenience and efficiency, thereby affording guests a more streamlined experience. Furthermore, the incorporation of technology contributes to fostering a heightened sense of connectedness and interactivity in the relationship between the business and its clientele.

Loyalty programs ([Kim, Ferrin, & Rao, 2009](#)) function as a potent instrument for cultivating enduring relationships with clientele. Through the provision of exclusive discounts, upgrades, or special amenities to recurrent patrons, enterprises

not only incentivize customer loyalty but also convey a genuine sense of appreciation. Consistent communication with members of loyalty programs serves to keep them engaged and well-informed regarding ongoing promotions and events. Additionally, community engagement constitutes another dimension contributing to customer engagement within the hospitality industry. Forging alliances with local organizations, endorsing community causes, and actively participating in local events not only fortifies connections with the community but also elevates the business's standing as a socially responsible entity.

The substantial impact of customer engagement is evident and resulting in heightened levels of customer loyalty (Rather & Sharma, 2016). Customer dedication and satisfaction further contribute to this loyalty, exhibiting a positive correlation within the hotel industry (Rather & Sharma, 2017a). Customer delight may exert a more pronounced influence on customer loyalty than satisfaction, both of which are identified as significant drivers of customer loyalty (Kim, Vogt, & Knutson, 2013). Within the hotel industry, customer loyalty is robustly associated with factors such as hotel image and specific facets of customer satisfaction, food, reception, encompassing housekeeping, and pricing, and beverage (Kandampully & Suhartanto, 2000). Various research endeavours have delved into the factors influencing customer loyalty within the realm of the hospitality sector. Samake, Xiongying, and Muraguri (2023) found that the allegiance of customers is shaped by the amalgamation of service encounter quality, relationships, and perceived value, with service encounter quality emerging as the most paramount factor. Dash, Kaswan, and Mehra (2023) highlighted the importance of extensive data, particularly internet reviews, in shaping consumer satisfaction and overall experience. Trebicka, Tartaraj, and Harizi (2023) found that in international hotels, economic pricing tactics and customer retention are positively correlated. Last but not least, Carvajal Zaera et al. (2023) highlighted how consumer value and pleasure in the retail sector drive loyalty and offered possible ramifications for the hospitality business.

This empirical investigation aims to intricately explore the nexus between technology adoption & customer satisfaction among the hospitality industry. The principal objective is to conduct a comprehensive analysis of the ways in which

various technological components, such as Mobile Technology Usage (MTU), Online Reservation Systems (ORS), Self-Service Kiosks (SSK), Smart Room Technologies (SRT), and Digital Concierge Services (DCS), contribute to or impact customer satisfaction. Specific objectives encompass understanding the function and significance of smartphone technology in guest communication, evaluating the influence of online reservation systems on booking experiences, examining the impact of smart room technologies on guest comfort, and scrutinizing the role of digital concierge services in delivering personalized and satisfactory services.

## 2. Literature Review

### 2.1 Mobile Technology Usage in the Hospitality Industry

Abundant research substantiates the favourable influence of mobile technology usage on customer satisfaction. [Chetioui, Lebdaoui, and Hafid \(2023\)](#) determined that the utilization of mobile banking significantly affects customer satisfaction and attitudinal loyalty, with age, gender, and education serving as moderators in this relationship. [Chen, Jiang, and Xiao \(2023\)](#) additionally demonstrated a positive correlation between the utilization of mobile payments and payment satisfaction, serving as moderating factors. In conclusion, [Al Awadhi, Al Nasser, and El Khatib \(2023\)](#) underscored the enhancement of customer satisfaction through mobile banking by augmenting efficiency and service quality.

[Wu et al. \(2021\)](#) uncovered that app loyalty is primarily influenced by three factors: habit, switching costs, and brand viscosity, with brand viscosity mediating the effects of the former two. The significance of cell phone technology in bridging the link among consumer happiness and trust that was additionally underscored by [Anna, Jordaan, and Rosemary \(2014\)](#), particularly in a semi-urban context. The escalating demand for technology-enabled services in hotels, identified as a means to enhance both customer loyalty and service quality, was acknowledged by [Lee, Barker, and Kandampully \(2003\)](#). [Ozturk et al. \(2016\)](#) identified the significance of convenience, compatibility, and perceived simplicity of use in influencing loyalty intentions in mobile hotel booking, underscoring their role in fostering consumer satisfaction and loyalty. [Puri \(2023\)](#)

highlighted critical characteristics such as exhibit anticipation, effort hope, social influence, libertine motivation, and working environment affecting smartphone application adoption in the hospitality sector. In the telecommunications sector, [Awuku, Agyei, and Gonu \(2023\)](#) emphasized the considerable impact of service innovation methods, including novel concepts, procedures, and emerging technology, on customer loyalty. Additionally, the influence of mobile apps on customer happiness and engagement, and their potential to enhance the overall customer experience, has been emphasized ([Chetioui et al., 2023](#)).

## 2.2 Online Reservation Systems in the Hospitality Industry

According to research by [Sari and Dirbawanto \(2023\)](#), customer satisfaction regarding rail services is profoundly impacted by both the quality of service and the online ticket purchasing mechanism. [Lestari et al. \(2023\)](#) emphasized was the importance of consumers' technological readiness in determining their acceptance or rejection of online hotel booking systems. [Singh et al. \(2023\)](#) observed the key factors that significantly affect the way consumers feel in online retail service excellence are recognised as accuracy, ease of use, user-friendly regulations, solving issues, and security. Additionally, [Li, Chang, and Chen \(2023\)](#) highlighted the importance of information exchange, price, promotions, personalized service, brand awareness, and relational bonding in fostering client loyalty on online hotel booking platforms.

Research in the hotel sector underscores critical elements affecting consumer satisfaction and loyalty in online reservation systems. [Kandampully and Suhartanto \(2003\)](#), asserts that guest loyalty hinges on satisfaction with specific hotel services, including housekeeping, reception, food and beverage, and overall hotel image. [Li et al. \(2023\)](#) finds pricing, promotions, personalized service, brand awareness, and information sharing methods significantly impact consumer loyalty in hotels. [Mariam \(2023\)](#) highlights the role of Customer Relationship Management (CRM), showcasing the effectiveness of an affordable hotel's online CRM program. [Dash et al. \(2023\)](#) underscores big data, particularly internet reviews, as influential in customer satisfaction and experience in travel and hotels. [Nguyen and Ho \(2023\)](#) employs

dynamic topic modelling and Net Promoter Score (NPS) to examine online customer experience, providing a valuable tool for companies to enhance offerings and attract new clients. Cumulatively, these findings suggest a substantial potential for elevating customer satisfaction and loyalty through superior hotel services and a seamless online reservation process.

### 2.3 Self-Service Kiosks in the Hospitality Industry

Research conducted by [Bitner, Ostrom, and Meuter \(2002\)](#) & [Meuter et al. \(2003\)](#) suggest that self-service technologies—such as kiosks—can enhance customer satisfaction by providing control and efficiency in the provision of services. [Zahari et al. \(2023\)](#) emphasized the importance of managing customer expectations and experiences for enhancing self-service kiosk products and customer satisfaction, particularly in the energy industry. Nevertheless, hotel guests still favour self-service kiosks for their convenience and time-saving attributes ([Sykimte, 2023](#)). In the post-pandemic era, the utilization of self-service kiosks has become indispensable, particularly in fast-food establishments, as they facilitate adherence to safety protocols and social distancing measures ([Hekal, Gamal El-den, & Al-latif, 2023](#)).

[Moon, Lho, and Han \(2021\)](#) emphasised the influence of kiosk excellence on client retention and happiness within the airline industry. Research in the hotel sector consistently shows a positive effect of self-service kiosks on patron satisfaction and loyalty. The user interface and experience significantly influence customers' satisfaction and intention to continue using them, according to recent research by [Xavier, Putra, and Anita \(2023\)](#) and [Kim, Yang, and Lee \(2023\)](#). [Kim et al. \(2023\)](#) proceeds to underscore the significance of kiosk features in creating a lasting impression on patrons, subsequently influencing their inclination to revisit the restaurant. According to [Sykimte \(2023\)](#) and [Zahari et al. \(2023\)](#), Self-service kiosks afford hotel guests and residential clients convenience, time-saving benefits, and empowerment, respectively. [Zahari et al. \(2023\)](#) observed that bridging the disparity between customer expectations and actual experiences, especially concerning aspects such as security, design, and ease of use.



## 2.4 Smart Room Technologies in the Hospitality Industry

For recent insights on smart room technology and client satisfaction, explore current research in the hotel or related industries. Numerous studies consistently indicate that the implementation of robots and smart features in hotel rooms enhances customer satisfaction (Cobanoglu et al., 2011; Dalgic & Birdir, 2020; Özen & Özgül Katlav, 2023). In addition to enhancing the visitor experience, these technologies also contribute to cost reduction and enhance service effectiveness (Dalgic & Birdir, 2020). Furthermore, a significant strategy for elevating customer satisfaction levels involves transitioning to fully functional smart hotels that leverage advanced information technology for direct interpersonal communication with guests (Petrevska, Cingoski, & Gelev, 2016). According to Kaewkamol and Chen (2023), the satisfaction of clients in a smart hotel is predominantly contingent upon factors such as infrastructure, location, dining alternatives, value proposition, and services. Özen and Özgül Katlav (2023) emphasized the advantageous impacts of technology on customer satisfaction, particularly concerning the augmentation of traditional hotel offerings and the implementation of robotic systems. Cheong and Law (2023) emphasized the advantages of smart hotels and the potential of advanced technology to enhance service delivery and guest experience, particularly in the context of the COVID-19 pandemic. A smart system for monitoring and managing electronic amenities in budget hotel rooms was developed by Hutabarat et al. (2023).

Studies have shown that the integration of smart room technology within the hotel industry significantly influences customer satisfaction and loyalty. Both Joshi et al. (2022) and Lee et al. (2003) highlight the potential of technology to enhance customer loyalty and service quality, with particular emphasis on the utility of AI and machine learning in managing customer feedback and refining service offerings. Özen and Özgül Katlav (2023) highlights the enhancement of customer satisfaction through technology-enabled products and services, particularly in the context of smart hotels. In a similar vein, Kaewkamol and Chen (2023) established that crucial factors affecting customer satisfaction in smart hotels encompass intelligent amenities, value creation, location, infrastructure, dining facilities, and services. Zhang, Tavitiyaman, and Tsang (2023) underlined once more how crucial technological amenities are in determining how satisfied visitors are and what they plan to



do. [Dawson, Kauffman, and Wiese \(2023\)](#) expanded on this topic by pointing out how smart patient rooms in rehabilitation centres could enhance the patient experience.

## 2.5 Digital Concierge Services in the Hospitality Industry

Positive effects have been shown in studies relating to client happiness and digital concierge services. According to [Richardson et al. \(2023\)](#) research, IHG Hotels & Resorts' deployment of digital concierge chatbots significantly enhances guest satisfaction and experience. In a similar vein, [Ilham et al. \(2023\)](#) and [Deryana et al. \(2023\)](#) uncovered that customer satisfaction is positively influenced by both digital marketing and digital service innovation. Further highlighting the value of convenience in digital services, [Kashif, Waqas, and Azhar \(2023\)](#) found that consumer satisfaction in home delivery services is highly impacted by decision, access, and transaction convenience.

Research conducted within the hospitality sector has consistently underscored the importance of customer satisfaction and image as pivotal factors in fostering customer loyalty ([Kandampully & Suhartanto, 2000, 2003](#)). This holds particular significance in the realm of digital concierge services, where the provision of prompt and personalized assistance can significantly enhance customer satisfaction. Additionally, research underscores the importance of service quality and recovery in maintaining customer happiness and loyalty ([Liat et al., 2017](#)). Moreover, findings reveal that customer commitment plays a pivotal role in determining loyalty, as commitment is nurtured through satisfaction ([Rather & Sharma, 2017b](#)). In the hotel industry, the implementation of digital concierge services, including chatbots, has been found to significantly enhance guest satisfaction and experience ([Richardson et al., 2023](#)). Consequently, there may be a rise in client loyalty ([Samake et al., 2023](#)). Hotels should optimize their digital marketing strategies, including active participation in social media & effective search engine optimization, to enhance customer satisfaction and foster loyalty ([Bhandari & Sin, 2023](#)). Furthermore, hotels can augment customer satisfaction and loyalty by comprehensively discerning and meeting customer expectations through the utilization of data analytics, particularly in the examination of online reviews ([Dash et al., 2023](#)).

### 3. Hypothesis

**H1:** Customer engagement mediates the relationship between mobile technology usage and customer satisfaction.

**H2:** Customer engagement mediates the relationship between online reservation system and customer satisfaction.

**H3:** Customer engagement mediates the relationship between self-service kiosk and customer satisfaction.

**H4:** Customer engagement mediates the relationship between smart room technologies and customer satisfaction.

**H5:** Customer engagement mediates the relationship between digital concierge services and customer satisfaction.

**H6:** Customer satisfaction positively influence customer loyalty.

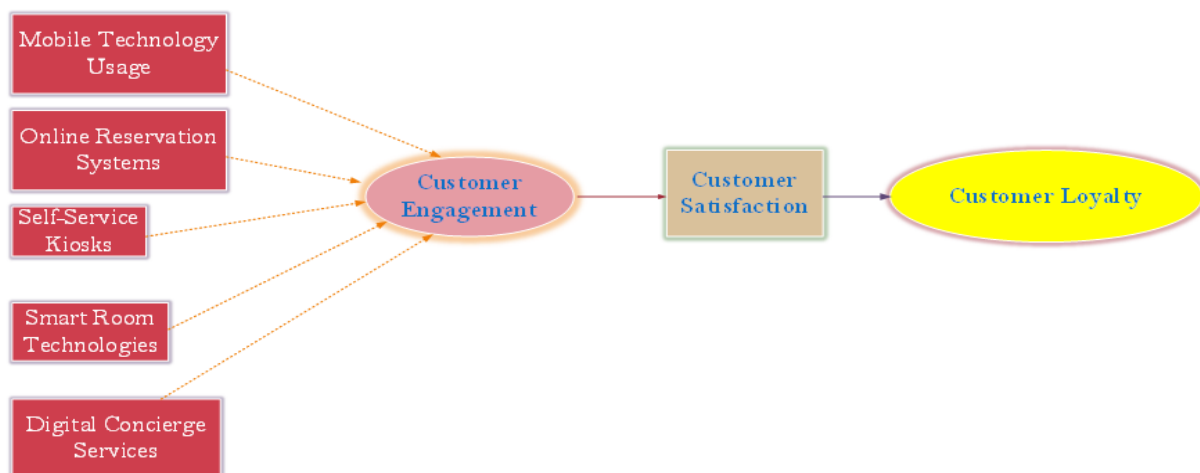


Figure 1: Proposed Framework.

### 4. Methodology

This research investigates the association between technology adoption and customer loyalty in the hospitality sector, with a specific focus on examining customer satisfaction and engagement as potential mediators. The study includes 279 participants from Alhasa, Dammam, and Riyadh, Saudi Arabia, selected through a multi-stage sampling process. Initial city selection aimed to represent diverse geographic regions, followed by random sampling to ensure demographic diversity within each city. Participants, selected based on recent hospitality service experiences, provided opinions relevant to the research objectives.

Structured surveys were administered online and in-person according to participant preferences, covering topics such as hospitality technology adoption, satisfaction, engagement, and loyalty to the service provider. Employing a cross-sectional research design, the study captured participants' perspectives and experiences at a specific moment. Regression & SEM with Amos-16 were applied for correlation and mediating effect analyses, offering a comprehensive understanding of the interrelationships among technology adoption, customer satisfaction, engagement, and loyalty. Informed consent was obtained from participants, ensuring the ethical conduct of the research, and data management adhered to established research ethics guidelines, maintaining confidentiality of responses. This meticulous methodology sheds light on the intricate dynamics of how technology adoption, customer satisfaction, and engagement collectively influence customer loyalty in the hospitality sector of Saudi Arabia.

## 5. Reliability and Validity

The principal components of the study were assessed through factor loadings, convergent validity, internal consistency metrics, and reliability. To scrutinize the role of implementing hospitality technology on customer satisfaction, engagement, and loyalty. Convergent Validity underwent testing using AVE, while CR assessed the model's composite reliance. Internal consistency evaluation employed Cronbach's Alpha ( $\alpha$ ).

Results indicated that Mobile Technology Usage exhibited a CR value exceeding 0.70, with an AVE of 0.53, affirming its presence in convergent validity. It also demonstrated high levels of internal consistency with  $\alpha = 0.792$ , suggesting commendable reliability. Similar outcomes were observed for Online Reservation Systems, as reflected in reliable CR values and satisfactory convergent validity based on their average variance extracted quantity.

SSKs exhibited similarly robust dependability rates, surpassing the permissible threshold and displaying credibility compared to standard measures, making them suitable for further statistical calculations. Digital Concierge Services displayed scores in close proximity, indicating commendable performance, although they showed somewhat less internal consistency and statistical significance, warranting deeper exploration with robust retesting procedures.

Notably, factors related to CE demonstrated satisfactory and desirable units, affirming observed beliefs regarding absorption enthusiasm and significantly reducing attrition-related issues. The absence of obfuscated portions in the pre-run testing stage highlights their virtually non-existent presence, contributing to a better understanding of selectively personalized attention in such delicate minutiae.

In conclusion, Table 1 provides compelling quantitative indications regarding measurement apparatus, elucidating the simulated models' relative usefulness across multiple domains. It goes further to outline features, considering their statistically relevant aspects, thus affirming the successful study in producing sound descriptions of technology adoption, customer satisfaction, engagement, and loyalty within the hospitality services domain.

Table 1: Reliability of Factor Loadings and Convergent Validity.

	CR	AVE	$\alpha$
Mobile Technology Usage- MTU	0.76	0.53	0.792
Online Reservation Systems-ORS	0.74	0.61	0.801
Self-Service Kiosks-SSK	0.86	0.57	0.866
Smart Room Technologies-SRT	0.79	0.53	0.793
Digital Concierge Services-DCS	0.84	0.62	0.807
Customer Satisfaction-CS	0.77	0.60	0.811
Customer Engagement - CE ( <b>Absorption and Enthusiasm</b> )	0.70	0.58	0.764
Customer Loyalty-CL	0.84	0.55	0.731

## 6. Validity of Discriminant

Table 2: Validity of Discriminant.

	1	2	3	4	5	6	7	8
<b>MTU</b>	<b>0.51</b>							
<b>ORS</b>	0.31*	<b>0.52</b>						
<b>SSK</b>	0.28	0.32*	<b>0.57</b>					
<b>SRT</b>	0.31*	0.24	0.42	<b>0.63</b>				
<b>DCS</b>	0.29*	0.38*	0.24**	0.43*	<b>0.56</b>			
<b>CS</b>	0.18	0.40	0.34**	0.39*	0.38*	<b>0.49</b>		
<b>CE</b>	0.16*	0.16*	0.17**	0.23**	0.44*	0.41*	<b>0.50</b>	
<b>CL</b>	0.24*	0.27**	0.14**	0.40	0.36*	0.11**	0.28**	<b>0.54</b>

Note: The values of AVE on the diagonal are greater than the squared correlation values.

†  $p < 0.100$ ; \*  $p < 0.050$ ; \*\*  $p < 0.010$ ; \*\*\*  $p < 0.001$

## 7. Reliability of the Scale

Table 3: Scale of the Reliability.

<b>"Name of the Variable</b>	<b>Internal Consistency</b>
Mobile Technology Usage- MTU	0.792
Online Reservation Systems-ORS	0.801
Self-Service Kiosks-SSK	0.866
Smart Room Technologies-SRT	0.793
Digital Concierge Services-DCS	0.807
Customer Satisfaction-CS	0.811
<b>Customer Engagement - CE (Absorption and Enthusiasm)</b>	0.764
Customer Loyalty-CL	0.731

Notes for the Model

## 8. Measurement Model FIT

The precision and applicability of the model in delineating the interrelationships among the variables are assessed through various fit indices:

- CFI: 0.91 (Acceptable)

This score, meeting the required threshold of  $\geq 0.90$ , signifies an acceptable CFI rating. The proposed measurement model exhibits a satisfactory fit to the data, supported by an Adjusted Goodness-of-Fit Index (AGFI) of 0.83. The AGFI score surpasses the minimal criterion of  $\geq 0.80$ , indicating agreement between the observed data and the model.

- RMSEA: 0.016 (Acceptable)

The RMSEA value=0.016 falls below the allowable threshold of  $\leq 0.08$ , indicating a satisfactory match. This suggests that the model effectively approximates the population covariance matrix.

- CMIN/df: 2.34 (Strongly Advised)

This ratio, falling within the recommended range ( $\leq 3$ ), assesses the model's suitability considering both fit and complexity.

- TLI: 0.93 (Satisfactory)

The TLI score=0.93, exceeding the recommended threshold of  $\geq 0.90$ , signifies a successful match and measures fit improvement over null.

- Incremental Fit Index (IFI): 0.92 (Acceptable)

The IFI score=0.92, meeting the  $\geq 0.90$  criteria, indicates acceptable fit improvement over independence.

The results indicate a good fit between the measurement model and the data. Adequate values for IFI, RMSEA, AGFI, CMIN/df, TLI, & CFI affirm that the proposed model accurately captures the connections between the variables in the study. These fit indices contribute to enhancing the validity and reliability of the measurement model employed in the study to assess the components and their interrelationships.

## 9. Structural Model Fit

These fit indices serve as indicators of how effectively the structural model elucidates the data. The outcomes for each fit measure are as follows:

- CFI: 0.93 (Acceptable)

The CFI= 0.93 is deemed acceptable, meeting the recommended standard of  $\geq 0.90$ . This signifies that the structural model adeptly fits the data, accurately depicting the relationships among variables.

- AGFI: 0.86 (Acceptable)

The AGFI= 0.86 is deemed satisfactory, surpassing the minimal threshold of  $\geq 0.80$ . This indicates that the structural model effectively accounts for variability in the data.

- RMSEA: 0.011 (Acceptable)

The RMSEA= 0.011 falls below the acceptable threshold of  $\leq 0.08$ , indicating a commendable fit. This suggests that the structural model aptly approximates the population covariance matrix.

- CMIN/df: 1.66 (Acceptable)

The CMIN/df ratio of 1.66 is considered acceptable ( $\leq 3$ ), evaluating the structural model's fit in relation to its complexity.

- TLI: 0.95 (Acceptable)

The TLI= 0.95 surpasses the suggested level of  $\geq 0.90$ , affirming that the structural model outperforms a null model and fits well.

- Incremental Fit Index (IFI): 0.94 (Acceptable)

The IFI score of 0.94 is satisfactory, meeting the standard of  $\geq 0.90$ . IFI serves as an indicator of fit improvement over an independence model, confirming the efficacy of the structural model.

In summary, Table 4 indicates that the structural model adeptly fits the data. Acceptable values IFI, AGFI, CFI, CMIN/df, RMSEA, TLI, and CFI suggest that the proposed structural model effectively elucidates the relationships among variables in the study. These fit indices contribute to the structural model's capacity to explicate the intricate relationship between technology adoption, customer satisfaction, engagement, and loyalty in the hospitality context.

Table 4: Overview of Impacts.

Variables	Direct Effects	Indirect Effects	Total Effects
MTU → CE	0.341	0.568	0.909
ORS → CE	0.248	0.500	0.748
SSK → CE	0.339	0.647	0.986
SRT → CE	0.210	0.599	0.809
DCS → CE	0.218	0.487	0.705
CS → CE	0.190	0.387	0.577
CE → CL	0.460	----	0.460

## 10. Outcome of Analyses and Hypotheses

The analysis of the study and the output of hypothesis testing are present in Table 5. This provides information on the acceptance or rejection of hypotheses, along with corresponding t-values and p-values. The threshold for testing of hypothesis significance is set at  $p < 0.05$ , where a t-value exceeding 1.96 is considered statistically significant.

## 11. Overview of Findings

In H1,  $t\text{-value}=3.24$  & a  $p\text{-value}=0.014$ , the interpretation aligns with expectations. The findings indicate that client interaction serves as an intermediary factor in the association connecting the utilisation of mobile technologies and client happiness. The t-value exceeding 1.96 and the p-value below 0.05 support this interpretation, leading to the acceptance of H1.

Similarly, in H2, the mediation of consumer involvement in the association between online reservation systems and customer happiness is confirmed, with a significant t-value ( $> 1.96$ ) and p-value ( $< 0.05$ ). Consequently, H2 is validated.

H3 exhibits analogous results, indicating that consumer involvement significantly mediates the connection between self-service kiosks and customer happiness. The t-value ( $> 1.96$ ) and p-value ( $< 0.05$ ) support the acceptance of H3.



For H4, where the t-value=3.97 and p-value= 0.018 and, the evidence suggests that customer involvement act as a substantial facilitating role in the link among smart room technology and customer happiness. Thus, H4 is endorsed.

In H5, the t-value exceeding 1.96 and the p-value below 0.05 indicate a strong mediation effect of Customer Engagement in the relationship between Digital Concierge Services and Customer Satisfaction. H5 is substantiated with a t-value=3.66 and p-value=0.024.

H6 is validated, emphasizing the significant connection between customer pleasure and loyalty. The t-value ( $> 1.96$ ) & p-value ( $< 0.05$ ) confirm the acceptance of H6.

These outcomes consistently support the conceptual model, illustrating that customer engagement serves as a mediator and customer happiness is significant within the hospitality sector.

Table 5: Outcome of Hypothesis Testing and Analyses.

	<b>Hypotheses</b>	<b>P-value</b>	<b>t-value</b>	<b>Accept or Reject</b>
H1	Customer Engagement mediates the relationship between Mobile Technology Usage and Customer Satisfaction.	0.014	3.24	Accept
H2	Customer Engagement mediates the relationship between Online Reservation Systems and Customer Satisfaction	0.010	2.69	Accept
H3	Customer Engagement mediates the relationship between Self-Service Kiosks and Customer Satisfaction	0.001	4.25	Accept
H4	Customer Engagement mediates the relationship between Smart Room Technologies and Customer Satisfaction	0.036	4.01	Accept
H5	Customer Engagement mediates the relationship between Digital Concierge Services and Customer Satisfaction	0.018	3.97	Accept
H6	Customer Satisfaction would significantly leads to Customer Loyalty	0.024	3.66	Accept

p-value  $< 0.05$  (Hair et al., 2007), t-value  $> 1.96$  (Bhatti & Sundram Kaiani, 2015)''

## 12. Discussion

The study's results reveal a substantial impact of technology adoption, including mobile usage, online reservation systems, self-service kiosks, smart room technologies, and digital concierge services, on customer satisfaction. This impact is mediated by customer engagement, emphasizing the pivotal role of customer satisfaction in fostering heightened client loyalty within the hospitality sector.

These results emphasise the need of incorporating and optimizing technological solutions in the hospitality industry to enhance customer engagement, satisfaction, and ultimately, loyalty. Hospitality establishments that adeptly leverage technology to actively engage customers have the potential to elevate satisfaction levels and, consequently, strengthen loyalty. This underscores the interconnectedness of technology, customer engagement, and relationships in the contemporary hospitality landscape. In summary, each hypothesis in the study points to unravel the intricate link among technology adoption, customer engagement, loyalty, and satisfaction within the hospitality sector. The results derived from testing these hypotheses offer significant insights into the nuanced dynamics of customer behaviour and the impact of technological interventions.

The study's results confirm hypothesis H1, indicating that customer involvement serves as an intermediary in the connection involving mobile device adoption and customer happiness. The findings suggest that actively using handheld devices has a favourable impact on client happiness within the hospitality sector. H1 proposes that the impact of mobile technology usage on customer satisfaction operates not directly but through the intermediary factor of customer engagement. It suggests that customers actively using mobile technology are more likely to engage with services, leading to heightened satisfaction.

The research findings support H2, indicating that customer engagement acts as an intermediary in the connections across online reservation systems and customer satisfaction. Active participation in online reservation systems positively influences overall satisfaction with hospitality services. Similar to H1, this hypothesis posits that the connection between online reservation systems and customer satisfaction is not direct but influenced by customer engagement. Customers utilizing online reservation

systems are expected to exhibit higher interaction levels with hospitality services, contributing to enhanced satisfaction.

The analysis substantiates H3, suggesting that customer engagement functions as an intermediary in the connections across self-service kiosks and customer satisfaction. Frequent utilization of self-service kiosks in hospitality settings correlates with elevated satisfaction levels. H3 proposes that the impact of self-service kiosks on customer satisfaction is moderated by the degree of customer engagement. Customers employing self-service kiosks are anticipated to experience higher satisfaction compared to those not utilizing these self-service options.

The investigation supports H4, indicating that customer engagement acts as a mediator in the relationship between smart room technologies and customer satisfaction. The application of intelligent room technology positively impacts consumer engagement and, subsequently, satisfaction. H4 suggests that the impact of smart room technologies on customer satisfaction is not immediate but influenced by customer engagement. Smart room technologies are expected to enhance consumer interaction, leading to heightened satisfaction with the hospitality experience.

The inquiry finds that the study validates H5, which suggests that customer engagement acts as an intermediary in the connection entre digital concierge services and customer satisfaction. Enhancing customer happiness within the hospitality sector correlates positively with active involvement in digital concierge services. H5 proposes that the connection between digital concierge services and customer satisfaction is influenced by customer engagement. Increased utilization of digital concierge services is expected to elevate satisfaction levels as clients engage more extensively with the provided services.

According to the investigation that was completed, it is clear that H6 is substantiated, signifying that customer happiness is vital in cultivating consumer loyalty. This discovery underscores the significance of ensuring client contentment as a critical catalyst for cultivating loyalty in the hotel industry. H6 posits a causal association among customer pleasure and customer loyalty., suggesting that content clients are more likely to demonstrate loyalty to the hospitality service provider.

Customer happiness is widely recognized as a pivotal factor in fostering client loyalty within the hotel industry.

### **13. Implications**

This research advances the current knowledge base concerning technology adoption in the hospitality industry by introducing consumer engagement as a mediating factor. This sophisticated approach refines existing models of technology adoption by considering the dynamic interplay among consumer engagement, technology utilization, satisfaction, and loyalty. The inclusion of customer engagement as a mediator sheds light on its influential role in shaping consumer behaviours and perceptions. Thus, this study contributes to the scholarly discourse on customer engagement theory in the nexus between technology adoption and its impacts on loyalty and customer satisfaction.

The implications of these findings can be strategically leveraged by hospitality enterprises to guide the integration of technology. Prioritizing mobile technology, the implementation of self-service kiosks, online reservation systems, smart room technologies, and digital concierge services can effectively enhance consumer engagement, leading to elevated levels of satisfaction and loyalty. Recognizing the mediating role of customer engagement underscores the paramount importance of actively involving consumers in technological interactions. Enterprises possess the capability to develop and deploy captivating, user-centric technologies with the aim of fostering positive interactions, ultimately enhancing overall customer contentment. According to the study, customer engagement emerges as a pivotal determinant of satisfaction. Hospitality providers can formulate targeted strategies that promote and enhance customer engagement through tailored technological interfaces, incentives, and personalized interactions.

### **14. Limitations and Future Research Directions**

Prudence is recommended when generalizing the outcomes of this study to diverse cultural or regional contexts, as the findings may be contingent on the specific context and distinctive to Saudi Arabia. The cross-sectional nature of the investigation

precludes the establishment of causal relationships. To augment the dependability and validity of insights concerning the temporal dynamics of technology adoption, engagement, and satisfaction, future inquiries might consider incorporating longitudinal designs.

A comprehensive exploration of the influence of cultural factors on consumer behaviour in the hospitality industry could contribute to a deeper understanding of how cultural nuances influence technology adoption, engagement, and satisfaction. Subsequent studies might explore the implications of new advanced technologies (AI & VR) on consumer engagement, loyalty, and satisfaction within the hospitality sector. Comparative analyses conducted across diverse industries or geographical regions have the capacity to offer relevant observations on specific determinants influencing the adoption, degree of engagement, and contentment with technology in varied settings.

## 15. Contribution

The empirical investigation offers significant contributions to the realm of hospitality management, spanning theoretical and practical dimensions. The theoretical advancements encompass a deepened understanding of the technology adoption process and the mediating role played by consumer engagement. On a practical level, the study furnishes hospitality establishments with actionable insights into strategically leveraging technology to enhance consumer engagement, loyalty, and satisfaction. The nuanced findings contribute meaningfully to the ongoing discourse on consumer behaviour within the dynamic landscape of the hospitality industry.

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## Appendix 1: Measurement Scales

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### Mobile Technology Usage

1. Mobile tracking on customer progress system will enable the hospitality department to get the information of the customer quickly.
2. The mobile tracking on customer progress system allows the hospitality department to follow up the customer feedback.
3. Mobile tracking on customer progress system is useful in the rapid retrieval of information from the customer.
4. Mobile tracking on customer progress system will save the time of hospitality department.
5. Using mobile technology would improve customer tracking

Abu-Dalbouh (2013).

### Online Reservation Systems

1. I intend to purchase a ticket using online reservation systems in the near future. (next three months)
2. I think it would be very good to use the internet for purchasing a ticket in addition to traditional methods.
3. I expect to purchase a ticket using online reservation systems in the near future. (next three months)

Manzari (2008).

### Self-Service Kiosks

1. Service quality delivered by self-service kiosks.
2. I believe that the overall service quality at the self-checkout (information kiosk) is excellent.
3. I think the overall service I usually receive from the self-checkout (information kiosk) is of a high quality.
4. The overall quality of the service at the self-checkout (information kiosk) is generally a high standard of service.
5. Most of time, I consider the overall service quality at the self-checkout (information kiosk) to be superior.
  - o Retail service quality
  - o Personal interaction
  - o Reliability
  - o Problem solving
  - o Retail patronage intentions
6. The probability that I will shop at this store again is.
7. The likelihood that I would recommend this store to a friend is
8. If I had to do it again, I would still shop at this store

Lee, Fairhurst, and Lee (2009).

### Smart Room Technologies

#### Intention to use Smart Technology

1. Assuming that smart technology is available in hotels, I intend to use it.
2. Given that I have access to smart technology, I predict I would use it.

#### Attitude towards using Smart Technology

1. I think it would be very good to use smart technology to receive service from hotels.
2. In my opinion it would be very desirable to use smart technology to receive service from hotels.
3. It would be much better for me to use smart technology to receive service from hotels.

Han et al. (2021).

### Digital Concierge Services

#### Concierge Tools and Technology

1. I have valid training needed to do my job.
2. I have tools needed to assist me while I do my job.
3. I have technology needed to assist me while I do my job.
4. My hotel has implemented new technology to help me serve my guests.

Ivanišević (2023).

#### Effort of concierge

1. I use my own personal connections to meet guest requests more than before.
2. I have to do more at my job as a concierge due to reduction in staffing.
3. At my hotel we have the proper staffing at the concierge desk to efficiently provide service.
4. I use my personal smart phone a great deal to meet guest requests.

#### Customer Satisfaction

1. I completely satisfied in using the mobile tracking on customer satisfaction.
2. I feel very confident in using the mobile tracking on customer satisfaction.
3. I found it easy to share information about the customer condition using mobile tracking on customer satisfaction.
4. I can accomplish the task quickly using this procedure.
5. I believe that from using mobile tracking on customer satisfaction system will increase the quality of hotel and hospitality industry

Abu-Dalbouh (2013).

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**Customer Engagement**

**Absorption**

1. When I am interacting with this hotel, I forget everything else around me.
2. Time flies when I am interacting with the hotel.
3. When I am interacting with hotel, I get carried away.
4. When interacting with the hotel, it is difficult to detach myself.
5. In my interaction with this hotel, I am immersed.
6. When interacting with the hotel intensely, I feel happy.

**Enthusiasm**

1. I am passionate about this hotel.
2. I am enthusiastic about this hotel.
3. I feel excited about this hotel.
4. I love this hotel.
5. I am heavily into this hotel.

Rather and Sharma (2017a).

**Customer Loyalty**

1. I would recommend this hotel to someone who seeks my advice.
  2. I would encourage friends and relatives to do business with this hotel.
  3. I would say positive things about this hotel to other people.
  4. I would do more business with this hotel in the next few years.
  5. I am a loyal customer of this hotel.
  6. I am willing to maintain my relationship with this hotel.
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