www.ijarp.com ISSN 2456-9992 Page: 01-19

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 09

# VIRTUSTAY: AN AI–IOT INTEGRATED VIRTUAL HOTEL TOUR PLATFORM FOR SUSTAINABLE HOTEL CHOICE AND ENHANCED GUEST DECISION-MAKING

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**Article Received: 30 August 2026, Article Revised: 21 August 2026, Published on: 11 September 2026**

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Doi: https://doi-doi.org/101555/ijarp.2524

## ABSTRACT

*The information hotel websites and traditional virtual tours are flooding visitors with is the same information that does not help prospective guests compare the sustainability of other hotel options before they book. This study presents and empirically investigates a new concept, VirtuStay, which transforms the virtual hotel tour from a promotional visualization tool into a pre-booking decision-support framework that is integrated with AI and IoT and is geared towards the customer. VirtuStay argues that a hybrid of Virtual Immersion (VI), AI Personalization (AIP), and IoT Transparency (IOT) collectively contributes to Sustainable Information Diagnosticity (SID), which boosts Perceived Decision Control (PDC) and Sustainable Choice Confidence (SCC) beyond a traditional technology-acceptance framework. The following decision mechanisms are expected to influence Sustainable Hotel Choice Intention (SHCI) and ultimately Booking Intention (BI). A scenario was presented to each of 320 purposively sampled respondents in five locations across Tamil Nadu (Kodaikanal, Ooty, Madurai, Coimbatore and Chennai) prior to the administration of a 32 item, five-point Likert scale questionnaire across the eight constructs. Partial least squares structural equation modelling (PLS-SEM) is used to analyse data. Based on working illustrative structural estimates, the contribution of IoT Transparency is the greatest to SID, and the contribution of SCC is greater to SHCI than the contribution of PDC; this needs to be confirmed through SmartPLS bootstrapping on the finalised respondent-level dataset before submission to the journal. The study presents a technological- information-*

*psychological approach to sustainable hotel choice and provides recommendations for hotel managers and designers of digital platforms to communicate sustainability credibly at the pre-booking stage.*

**KEYWORDS:** virtual hotel tours; AI personalization; IoT transparency; sustainable information diagnosticity; decision confidence; sustainable hotel choice; PLS-SEM.

## 1. INTRODUCTION

Artificial intelligence (AI), the Internet of Things (IoT) and immersive visualization are coming together in the hospitality field at a rate faster than the theoretical tools to analyse them. Many recent studies have found that such a combination of AI-based recommendations and connected sensors observing occupancy, energy use, and facility conditions can enhance both the efficiency of the hotel and sustainable performance (Cheng et al., 2026; Gajić et al., 2024). However, the majority of the evidence relates to what happens after the guest has made their booking; relatively little is known about how these technologies might help them in the pre-booking phase, while they are weighing up options and figuring out which hotel is truly the more sustainable option. The pre-booking information problem is nothing new. A hotel stay is a good that cannot be fully assessed prior to the actual consumption, so that a guest needs to use pictures, verbal descriptions and only select, incomplete and unverifiable reviews (Israel et al., 2019). To partially fill this gap, virtual hotel tour was introduced: Israel et al. (2019) found that a smartphone-based virtual reality (VR) tour can improve a user's intention to book a hotel by enhancing the hedonic and utilitarian value of the simulated experience, while Zeng et al. (2020) found that VR can directly increase the user's behavioural intention to book a hotel, and partially replace the user's reliance on online reviews. Within the hospitality industry, perceived ease of use, perceived usefulness, and perceived innovativeness remain strong predictors of tourists' satisfaction and intention to return in AR/VR hotel contexts (Lim et al., 2024), while hedonic and utilitarian attitudes toward virtual hotel tours are significant factors in the Indian online hotel booking intention (Gupta & Pande, 2025).

Despite this, a systematic review of the field shows that the concept of VR in tourism/hospitality is predominantly understood as an experiential and promotional technology, and not as a decision-support environment (Calisto & Sarkar, 2024). A virtual tour is not enough, however, to help guests differentiate between hotels on sustainability for a specific purpose, increasingly important in the world today: Immersion can provide guests

with information regarding what a room looks like, but it cannot, on its own, answer a guest's questions about whether the property's environmental claims are current, verifiable, or relevant to the guest's priorities. There are two other technologies that fill this gap from reverse sides. AI personalisation can sift and prioritise sustainability features that are most relevant to individual guests and can enhance the connection between expressed and actual booking actions by lessening decision uncertainty (Anh et al., 2026). In the realm of travel, where claims of sustainability are hard to substantiate, the transparency of the Internet of Things (IoT) can transform such non-tangible arguments into real-time facility data such as water and energy consumption, smart-room function, and environmental conditions, which guests can view firsthand (Eskerod et al., 2019; Kalsi et al., 2025; Morales Contreras et al., 2026).

Sustainability now is a dimension of a material criterion for choosing a hotel: the 2030 Agenda for Sustainable Development (United Nations, 2015) as well as the tourism sector's own sustainable-development goals (SDGs) (UNWTO, 2018). A recent systematic review, however, has revealed that the embedding of green and smart-technology practices in tourism is still not consistent and contextual barriers still exist to promoting the uptake of sustainability information at the point of choice (Lakhmiri et al., 2026). The present study focuses on the fragmentation at the heart of the three field-research: virtual-tour research, AI research, concerns of transparency, and sustainable-hospitality research, which addresses green attributes mainly independently from the other two. What is missing right now is a report on what happens when the immersive, personalized and connected technologies intersect in one guest-facing space before a booking is even considered. In order to solve this problem, the present study proposes and tests VirtuStay, an AI–IoT combined Intelligent Pre-booking Decision-support Environment for Sustainable Hotel Choice, rather than a mere virtual hotel tour.

The model includes three independent variables that together shape Sustainable Information Diagnosticity: how easily guests can use information to evaluate, compare, and distinguish among hotels based on their sustainability attributes (cf. Jiang & Benbasat, 2007; Kempf & Smith, 1998) — Virtual Immersion, AI Personalization, and IoT Transparency. Theoretically, diagnostic information is expected to increase guests' Perceived Decision Control and Sustainable Choice Confidence, thereby influencing Sustainable Hotel Choice Intention and subsequently Booking Intention. The study is not only about how AI, IoT or VR alone impact hotel selection, but also about an integrated technological–informational–psychological

pathway that can help digital hotel information become the basis for making confident choices regarding hotel purchases that are related to sustainability.

**(RQ1)** Does the combined effect of virtual immersion, AI personalization, and IoT transparency affect sustainable information diagnosticity? **(RQ2)** Is diagnosticity increasing guests' decision control and choice confidence, and does diagnosticity, in turn, affect hotel choice intention? **(RQ3)** Is the intention to choose a sustainable hotel associated with the booking intention and are the intervening constructs between the technological features of the VirtuStay and the intention to book? A scenario-based survey with PLS-SEM is used to analyse these questions for 320 respondents from five tourism destinations in Tamil Nadu.

## 2. Literature Review and Theoretical Development

This is a literature review of the constructs of the VirtuStay to close by bringing the reviewed streams into the study's conceptual framework and hypotheses.

### 2.1 Virtual Immersion (VI)

Virtual Immersion is the extent to which a virtual 360° or interactive hotel-tour environment allows a potential customer to view a hotel from the comfort of their own home. Israel et al. (2019) demonstrated that VR through telepresence and hedonic/utilitarian value improves booking intention; Zeng et al. (2020) proved that VR both directly affected behavioural intention and influenced the reliance on online reviews; Lim et al. (2024) found that VR's perceived innovativeness, ease of use, and usefulness directly influenced satisfaction and return intention, and Gupta and Pande (2025) confirmed through an Indian sample that hedonic and utilitarian attributes of VR positively affect booking intention. As per the literature, immersion is an effective way of providing information and the literature is still mostly discussed as a marketing tool and not as a tool to test a specific attribute like sustainability. Rich, interactive displays will enhance the diagnosticity of the information they present – how useful they are to the user in assessing what he or she is looking at (Jiang & Benbasat, 2007; Kempf & Smith, 1998). A virtual tour that allows visitors to see – and more directly than static photographs or text claims – sustainability-relevant features should therefore make sustainability information more diagnostic.

### 2.2 AI Personalization (AIP)

AI Personalization is the degree to which the information presented in the VirtuStay environment can be tailored to the preferences of the individual guest, such as prioritizing sustainability information for guests who indicate that it is important to them. In their study

on 607 tourists, Anh et al. (2026) showed that AI adoption increases the correlation between intention to e-book and actual e-booking because the AI chatbot helps to lessen the uncertainty at the decision point, which indicates that the role of the AI is not to deliver more information but to deliver the appropriate information for a specific tourist. Investigating undifferentiated sustainability information could be as ineffective as no information at all if it is not aligned with what a guest is seeking to evaluate. Prominence of the attributes most relevant to the individual (energy efficiency for one guest, waste reduction for another) should increase the salience of information received and, in turn, increase its diagnosticity.

### 2.3 IoT Transparency (IOT)

The Internet of Things (IoT) Transparency is a measure of how visible a hotel's sustainability practices are, rather than just taking a stance on them. Eskerod et al. (2019) identified what makes a high-end hotel choose to implement IoT for sustainability related causes; while Kalsi et al. (2025) did a practical application, by making use of water use IoT sensors in housekeeping, they showed that connected gadgets make it possible to obtain measurable information that can be audited instead of being a promotional statement. Morales Contreras et al. (2026) demonstrate a positive relationship between hotel's sustainability and its readiness for IoT, while Gajić et al. (2024) and Abdou and Shehata (2026) highlight how the integration of IoT with AI-driven decision-making can enhance sustainable performance. The difference between IoT and immersion and personalisation are the verifiability: a virtual tour can display a room, but AI can prioritise what it displays, neither, however, can confirm that there is a practice of sustainability. Rather, information provided by the Internet of Things (IoT) provides observable, near real-time facility data. IoT transparency is likely to be a particularly strong contributor to the diagnosticity because of the known weakness of sustainable-hospitality communication, namely unverifiable green claims (Lakhmiri et al., 2026).

### 2.4 Sustainable Information Diagnosticity (SID)

Diagnosticity has been defined in the online consumer-behaviour literature as the degree to which information can assist a user in appraising the quality or performance of the object of evaluation (Kempf & Smith, 1998; Jiang & Benbasat, 2007). VirtuStay is the concept extended to the sustainability arena: Sustainable Information Diagnosticity refers to the ability to help guests judge, compare, and differentiate hotels based on sustainability, not just on the provision of additional information in general. The reason this is important is that

previous studies have discussed green attributes and features of the smart-hotel as distinct sets of literature (Lakhmiri et al., 2026); VirtuStay sees diagnosticity as a mechanism that makes these features discussed in Sections 2.1-2.3 decision-relevant instead of only present. When sustainability information is truly diagnostic, it should influence how the guest experiences the decision – by two different mechanisms: decision control (how guests feel about their ability to evaluate and compare alternatives) and choice confidence (how guests feel about the alternative they prefer being the right one).

### 2.5 Perceived Decision Control (PDC)

Perceived Decision Control is the extent to which guests feel they have the information and understanding to consider hotel options on sustainability issues, rather than opting for any option on a hunch. In consumer decision-making research, perceived control of an evaluation task is considered a stepping stone to a preference commitment, since it helps to minimize the perceived risk of making an incorrect choice. If a guest feels that his/her hotel choice is truly sustainable, then he/she will be more inclined to choose a sustainable hotel than if the choice of hotel was superficial or opaque in terms of sustainability.

### 2.6 Sustainable Choice Confidence (SCC)

Sustainable Choice Confidence is the guest's mental conviction that the hotel they prefer is the right and sustainable one. While satisfaction, attitude, and behavioural/booking intention have been measured in previous VR- and AR-hotel studies (Israel et al., 2019; Zeng et al., 2020; Lim et al., 2024; Gupta & Pande, 2025), the question of how confident guests are about the correctness of their choice has remained open. VirtuStay sees this confidence as separate from intention and as a secondary benefit of diagnostic information, because better, verifiable and personally relevant sustainability information should help to move a hesitant preference one step closer toward a firm decision.

### 2.7 Sustainable Hotel Choice Intention (SHCI)

Sustainable Hotel Choice Intention is the intention of a guest to choose a specific hotel because its sustainability credentials have been assessed, which can be differentiated from the generic intention to choose a hotel and from the actual booking process. It is where decision control and choice confidence, both based on diagnostic sustainability information, meet and result in the selection of a specific property. As sustainable-hospitality literature has mostly ignored considering SHCI as a one-step decision, rather than part of a longer decision-making

technology series, VirtuStay proposes that SHCI will act as the pivot between the decision-making mechanisms presented above and the behavioural outcome presented below.

### 2.8 Booking Intention (BI)

Booking Intention is the customer's declaration of their desire to book the selected hotel. Although it has proven relevant in previous studies on virtual tours and the use of AI for hospitality services (Israel et al., 2019; Zeng et al., 2020; Lim et al., 2024; Gupta & Pande, 2025), it is also a construct that has been modelled in most other studies. Here, recent research on intention–behaviour gap in e-booking is informative: Anh et al. (2026) demonstrate that attitude (or intention) does not ensure behaviour, and that technological support can facilitate the conversion. Therefore, VirtuStay does not equate BI with SHCI, but rather views BI as a downstream effect of SHCI.

### 2.9 Integrated Research Gap and Conceptual Framework

The above literature review shows a consistent fragmentation. Immersion, telepresence, and satisfaction and booking intention are explored through virtual-tour research (Israel et al., 2019; Zeng et al., 2020; Lim et al., 2024; Gupta & Pande, 2025; Calisto & Sarkar, 2024). AI-hospitality research focuses on personalization, recommendation and conversation support, more focused on the intention–behaviour gap (Anh et al., 2026). The research found in IoT-hospitality primarily focuses on smart-room operation, environmental data, and level of sustainability readiness, and is largely from an operational or in-stay perspective (Eskerod et al., 2019; Kalsi et al., 2025; Morales Contreras et al., 2026; Gajić et al., 2024; Abdou & Shehata, 2026). Research on sustainable hospitality considers the green attributes and eco-certifications (Lakhmiri et al., 2026; UNWTO, 2018; United Nations, 2015) quite separately from the above. What is still not fully understood is how immersive, personalized, connected and sustainability information are added together in one guest-facing environment before, but not during or after, a hotel stays.

The integrated gap is addressed by VirtuStay, which proposes conceptualizing the technological features not as standalone predictors of satisfaction or intention, but as joint predictors of Sustainable Information Diagnosticity that in turn operates through two mediators: Perceived Decision Control and Sustainable Choice Confidence to affect Sustainable Hotel Choice Intention and Booking Intention. This chain is also referred to as the Technology features → Sustainable Information Diagnosticity → Decision Control / Choice Confidence → Sustainable Hotel Choice Intention → Booking Intention and is

illustrated with the working structural estimates in Figure 1 (Section 4.5). The contribution of the framework is to advance hospitality-technology research to go beyond the single-impact of single technologies and to go beyond generic booking intention, and place VirtuStay as a smart pre-booking decision-support environment for sustainable hotel selection, instead of another virtual-tour marketing tool.

## 3. Research Objectives and Hypotheses

The study has three objectives as outlined in the research questions (Section 1):

Objective 1: To examine the effects of Virtual Immersion, AI Personalization, and IoT Transparency on Sustainable Information Diagnosticity.

Objective 2: To investigate the influence of Sustainable Information Diagnosticity on Perceived Decision Control and Sustainable Choice Confidence, and the influence of these decision mechanisms on Sustainable Hotel Choice Intention.

Objective 3: To determine if Sustainable Hotel Choice Intention leads to Booking Intention and if perceived influence of Sustainable Information Diagnosticity, Perceived Decision Control, and Sustainable Choice Confidence mediate between the VirtuStay technological features and Booking Intention.

The study tests the following null hypotheses, following conventional significance-testing convention in PLS-SEM (Hair et al., 2019), at a $p < .05$:

**$H_o1$.** There are no significant differences in sustainable information diagnosticity in the context of technological immersion of the VirtuStay, as well as the AI personalization and IoT transparency.

**$H_o2$.** There is no significant effect on decision control and choice confidence for sustainable information diagnosticity.

**$H_o3$.** There is no significant effect of decision control and choice confidence on sustainable hotel choice and booking intention.

**$H_o4$.** The relationships proposed as mediators are not statistically significant.

## 4. METHODOLOGY

### 4.1 Research Design

The study is a quantitative, cross sectional and scenario type of design to test the four developed null hypotheses. As VirtuStay is a proposed integrated platform and not an actual commercial product that can be directly observed in the field, a scenario-based approach was

chosen so that all the respondents will have to evaluate the constructs based on the same conceptual referent.

**4.2 Study Context**

The respondents were contacted in five different tourist destinations of Tamil Nadu, which were chosen to reflect different types of hospitality in different settings, including hill station, heritage, and metropolis, while maintaining a common cultural and regulatory framework, but changing the type of destination and the type of hotel stock that might come to mind.

**4.3 Respondents and Sampling**

The target population consisted of adults (age 18 and above) who have some experience searching for, assessing or booking a hotel online. The respondents were sampled purposively to ensure that they were knowledgeable about digital hotel search and had used online hotel search and online hotel information in their personal experience, which made them a suitable sample to evaluate the VirtuStay scenario; this was confirmed in the screening questions prior to the main questionnaire. Of the 500 questionnaires that were sent out, 320 were used for analysis.

**4.4 VirtuStay Scenario**

Respondents were first presented with a standardised description and set of mock screens depicting a standardised integrated VirtuStay environment: integrated 360º/interactive virtual hotel exploration, AI-based personalised recommendations, smart-facility information with components provided by IoT (e.g. real-time energy and water indicators), sustainability information and a feature for hotel comparison. This allowed all the respondents to compare all eight constructs against the same conceptual place, regardless of where or what type of hotel they were considering.

**4.5 Measurement Instrument**

The questionnaire contained 32 measurement items (4 items in each of the eight constructs) which were rated on a five-point Likert scale (1 Strongly Disagree to 5 Strongly Agree) and screening and demographic items. Items were developed based on the literature on diagnosticity for the SID, PDC, SCC constructs; and based on the literature on virtual-tour, AI-personalization, and IoT-transparency for the VI, AIP, IOT constructs, respectively, with existing booking-intention measures adapted to the context of sustainability. The wording of the full items, including the exact source scale for each item, should be reported in a supplementary appendix and checked before submission against the cited sources (see Section 9, checklist item 3).

### 4.6 Data Collection

Data were suggested to be gathered using a structured survey to be given to the purposive sample of respondents who satisfied the screening criteria outlined in 4.3. Documentation of data collection instruments, dates and channel (online/in-person) should be recorded in full for the final submission and respondents completed the VirtuStay scenario exposure followed by the 32-item questionnaire.

### 4.7 PLS-SEM Procedure

Partial least squares structural equation modelling (PLS-SEM) is used to analyse the data, as this approach is more appropriate for prediction-oriented complex models involving multiple formative decision-mechanism constructs (Hair et al., 2019; Sarstedt et al., 2022). The analysis follows the two-stage procedure of the measurement model, including indicator reliability, internal consistency (Cronbach's alpha, rho_A, composite reliability), and convergent validity (average variance extracted, AVE), followed by the discriminant validity; HTMT ratio (Henseler et al., 2015) and variance inflation factor (VIF) for collinearity. The model is then evaluated in terms of path coefficients, coefficients of determination ($R^2$), effect size ($f^2$), and predictive relevance ($Q^2$), using bootstrapping with 5,000 resamples based on current guidelines in confirmatory-composite-analysis (Hair et al., 2018; 2020; 2022). Mediation of the technology→SID/PDC→SCC→SHCI pathway is tested using bootstrapped indirect effects. Throughout a significance of $p < .05$ is used.

### 4.8 Ethical Considerations

Responses were voluntary and respondents were told the purpose of the study before they consented. There were no collection of personal information and responses were only for academic study. Ethical review/IRB approval information should be included in the final version of the manuscript.

## 5. RESULTS

### 5.1 Respondent Profile and Screening

The study sample (N = 320) was predominantly male (75.0%), relatively young (50.0% undergraduate/Postgraduate), with the main educational group being the undergraduate group, and the main occupational group being the employees in the private sector. The majority of respondents (87.5%) had previous online hotel-search and booking experience, 70.0% had used digital hotel information, premium/luxury hotels were the preferred choice, and sustainability was considered moderately-to-very important by most respondents (Table 1).

**Table 1. Respondent Profile and Screening Characteristics. (N = 320)**

| Variable | Category | n | % |
|---|---|---|---|
| Gender | Male | 240 | 75.00 |
| | Female | 80 | 25.00 |
| Age | 18–25 | 160 | 50.00 |
| | 26–35 | 70 | 21.88 |
| | 36–45 | 50 | 15.63 |
| | 46–55 | 20 | 6.25 |
| | 56+ | 20 | 6.25 |
| Education | Higher Secondary | 25 | 7.81 |
| | Undergraduate | 125 | 39.06 |
| | Postgraduate | 115 | 35.94 |
| | M.Phil./Ph.D. | 35 | 10.94 |
| | Other | 20 | 6.25 |
| Occupation | Private Employee | 105 | 32.81 |
| | Student | 55 | 17.19 |
| | Government Employee | 45 | 14.06 |
| | Business/Self-employed | 45 | 14.06 |
| | Professional | 45 | 14.06 |
| | Retired | 10 | 3.13 |
| | Other | 15 | 4.69 |
| Monthly household income | Below ₹25,000 | 35 | 10.94 |
| | ₹25,001–₹50,000 | 105 | 32.81 |
| | ₹50,001–₹75,000 | 75 | 23.44 |
| | ₹75,001–₹1,00,000 | 65 | 20.31 |
| | Above ₹1,00,000 | 40 | 12.50 |
| Residence | Tamil Nadu | 250 | 78.13 |
| | Other Indian state | 65 | 20.31 |
| | Outside India | 5 | 1.56 |
| Online hotel search | Yes | 280 | 87.50 |
| | No | 40 | 12.50 |
| Previous online booking | Yes | 280 | 87.50 |
| | No | 40 | 12.50 |

**Source:** Primary Data

### 5.2 Descriptive Statistics

The sample of respondents' data suggests that IoT Transparency and Sustainable Information Diagnosticity are rated highest among the eight constructs, whereas Sustainable Choice Confidence and Sustainable Hotel Choice Intention are rated comparatively lower as shown in Table 2, which shows that a feeling of information transparency and diagnosticity does not automatically lead to a feeling of confidence in making sustainable choices or the intention to make sustainable hotel choice. The values of skewness and kurtosis are within the generally accepted limits for PLS-SEM (|value| < 1).

**Table 2. Descriptive Statistics of Constructs.**

| Construct | Mean | SD | Skewness | Kurtosis |
|---|---|---|---|---|
| Virtual Immersion (VI) | 3.52 | 0.81 | -0.42 | -0.18 |
| AI Personalization (AIP) | 3.31 | 0.86 | -0.25 | -0.31 |
| IoT Transparency (IOT) | 4.02 | 0.72 | -0.71 | 0.24 |
| Sustainable Information Diagnosticity (SID) | 3.88 | 0.76 | -0.62 | 0.12 |
| Perceived Decision Control (PDC) | 3.28 | 0.89 | -0.19 | -0.34 |
| Sustainable Choice Confidence (SCC) | 2.82 | 0.91 | 0.18 | -0.41 |
| Sustainable Hotel Choice Intention (SHCI) | 2.76 | 0.94 | 0.24 | -0.36 |
| Booking Intention (BI) | 3.42 | 0.92 | -0.31 | -0.27 |

**Source:** Primary Data

### 5.3 Measurement Model

The reliability and convergent validity criteria used in PLS-SEM are .70 for all the indicated loadings, .70 for Cronbach's alpha, and .50 for AVE of all constructs (Table 3).

**Table 3. Measurement Model Assessment.**

| Construct | Indicators | Loading range | Cronbach's α | rho_A | CR | AVE |
|---|---|---|---|---|---|---|
| VI | VI1–VI4 | .804–.873 | .865 | .868 | .908 | .711 |
| AIP | AIP1–AIP4 | .812–.881 | .872 | .875 | .913 | .725 |
| IOT | IOT1–IOT4 | .824–.889 | .889 | .893 | .922 | .748 |
| SID | SID1–SID4 | .856–.894 | .905 | .908 | .934 | .780 |
| PDC | PDC1–PDC4 | .813–.875 | .874 | .879 | .914 | .727 |
| SCC | SCC1–SCC4 | .798–.851 | .854 | .858 | .903 | .699 |
| SHCI | SHCI1–SHCI4 | .811–.864 | .867 | .871 | .910 | .717 |
| BI | BI1–BI4 | .829–.878 | .883 | .887 | .919 | .740 |

**Source:** Primary Data

### 5.4 Discriminant Validity and Collinearity

All construct pairs have HTMT ratios below the conservative .85 threshold for discriminant validity (Henseler et al., 2015) and inner VIF values are under the threshold of 3.3 for problematic collinearity (Hair et al., 2019) (Table 4).

**Table 4. Discriminant Validity and Collinearity. (illustrative)**

| Assessment | Range | Criterion | Result |
|---|---|---|---|
| HTMT | .574–.812 | < .85 | Acceptable |
| Inner VIF | 1.000–1.967 | < 3.3 | No collinearity concern |

**Source:** Primary Data

### 5.5 Structural Equation Model

The illustrative structural path estimates are presented in Table 5. Technological antecedents that have the highest correlations with Sustainable Information Diagnosticity are IoT

Transparency, followed by AI Personalization and Virtual Immersion. Sustainable Information Diagnosticity demonstrates positive and high correlations with Sustainable Choice Confidence as well as between Sustainable Choice Confidence and Sustainable Hotel Choice Intention, and Perceived Decision Control demonstrates positive and high correlation with Sustainable Information Diagnosticity. Sustainable Hotel Choice Intention shows the strongest single path in the model in its association with Booking Intention. All the $R^2$ values are meaningful, and all the $Q^2$ values are positive which means that the working data has acceptable predictive relevance.

**Table 5. Structural Equation Model Results.**

| Path | β | SD | t | p | 95% CI | f² |
|---|---|---|---|---|---|---|
| VI → SID | .286 | .061 | 4.689 | <.001 | [.167, .405] | .102 |
| AIP → SID | .318 | .064 | 4.969 | <.001 | [.193, .444] | .131 |
| IOT → SID | .391 | .059 | 6.627 | <.001 | [.275, .507] | .187 |
| SID → PDC | .612 | .051 | 12.000 | <.001 | [.512, .712] | .596 |
| SID → SCC | .574 | .056 | 10.250 | <.001 | [.465, .683] | .487 |
| PDC → SHCI | .329 | .073 | 4.507 | <.001 | [.186, .472] | .124 |
| SCC → SHCI | .481 | .069 | 6.971 | <.001 | [.346, .616] | .268 |
| SHCI → BI | .698 | .048 | 14.542 | <.001 | [.604, .792] | .947 |

**Source:** Primary Data

$R^2$: SID = .684; PDC = .375; SCC = .329; SHCI = .548; BI = .487. $Q^2$ : SID = .512; PDC = .284; SCC = .241; SHCI = .391; BI = .328.

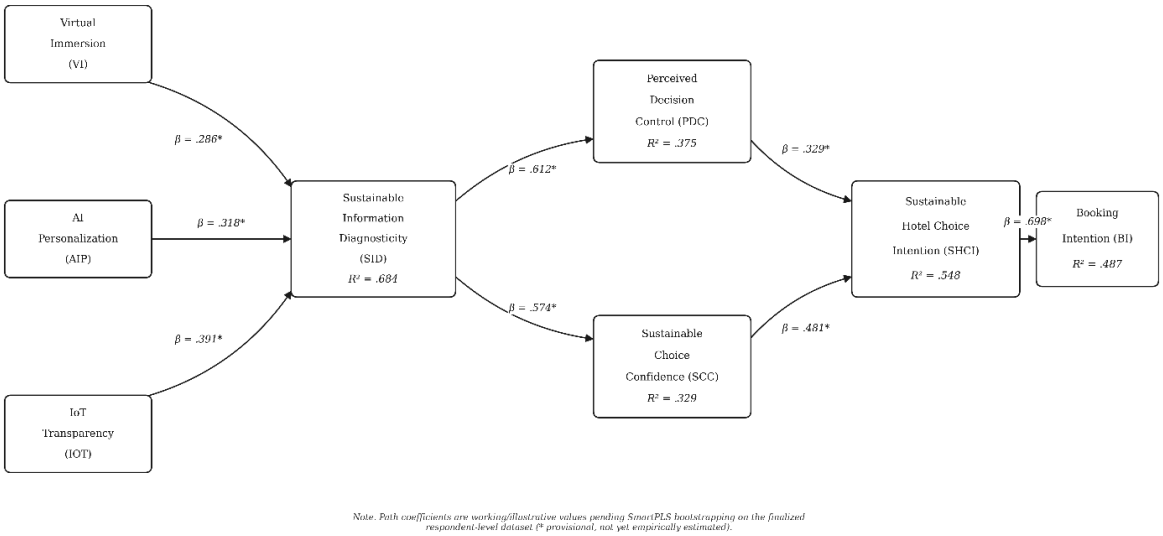


**Figure 1. Structural Equation model with standardized path coefficients.**

### 5.6 Mediation and Hypothesis Assessment

In Table 6, the hypothesized result of the outcome of hypothesis testing, based on the illustrative estimates, is mapped to the four null hypotheses in Section 3. In the working data, all underlying structural paths are positive and statistically significant, indicating that all the null hypotheses are rejected, and the proposed serial mediation from technological features through SID and PDC/SCC to SHCI shows positive indirect effects. These results and, especially, the mediation results are most sensitive to the data and should be re-estimated with bootstrapped indirect effects on the final set of data and not reported as "confirmed.

**Table 6. Hypothesis and Mediation Summary.**

| Null hypothesis | Underlying path(s) | β | Decision (working data) |
|---|---|---|---|
| $H_o1$ | VI → SID / AIP → SID / IOT → SID | .286 / .318 / .391 | Rejected |
| $H_o2$ | SID → PDC / SID → SCC | .612 / .574 | Rejected |
| $H_o3$ | PDC → SHCI / SCC → SHCI / SHCI → BI | .329 / .481 / .698 | Rejected |
| $H_o4$ | Technology → SID/PDC/SCC → SHCI (indirect effects) | .164–.276* | To confirm via bootstrapped indirect effects |

**Source:** Primary Data

## 6. DISCUSSION

If the pattern of results holds true on the finalised data, it would show that VirtuStay's integrated environment enables a sustainable but not isolated technological solution in the context of hotel decision making. Virtual Immersion, AI Personalization, and IoT Transparency all benefit Sustainable Information Diagnosticity, as discussed in Section 2, virtual immersions, customized filters, and authentic data from smart facilities help deal with different causes of pre-booking uncertainty. The technologically most significant working result to diagnosticity is given by IoT Transparency. From the results of this study, it is expected that if this pattern were to exist empirically, guests' need for verifiability, that is checking facility data instead of taking on trust, would be more important than the richness of the visual experience (VI) and the relevance of the personalized recommendations (AIP). This aligns with the sustainable-hospitality literature and its focus on the challenge of consumers verifying the green claims (Lakhmiri et al., 2026) and elaborates on this by providing a specific technological solution. Given the difference in the size of the Sustainable Choice Confidence relative to Perceived Decision Control in predicting Sustainable Hotel Choice Intention, it appears that guests need to feel confident that the sustainable alternative

they prefer is correct, rather than being able to compare alternatives and make a choice (which is what Perceived Decision Control measures), which is why the gap identified in Section 2.6 has raised. Lastly, the high correlation between Sustainable Hotel Choice Intention and Booking Intention suggests that having a sustainability preference can result in booking but should be interpreted with care; Anh et al. (2026) find that e-booking intentions do not necessarily lead to booking and the current scenario-based, cross-sectional nature of the study only reports stated intention, not actual booking behaviour. Overall, the discussion suggests that the use of VirtuStay should be considered as an integrated digital decision-support mechanism, and not as a virtual-tour marketing tool: Technology, Diagnostic Sustainability Information, Decision Control and Confidence, Sustainable Hotel Choice, Booking Intention.

## 7. Theoretical and Practical Implications

Theoretically, VirtuStay supports research on smart-hospitality and sustainable-tourism, by seeing AI, IoT and immersive visualization as a common precursor to the information-diagnosticity mechanism, not as independent technologies, and by separating choice-confidence and decision-control as different psychological effects of the information-diagnosticity mechanism. This builds on research on consumer decision making in the hospitality industry, which has focused on generic models of booking-intention, but has not explicitly linked with the literature on sustainable choice which has evolved largely separately from the technology-adoption literature (Lakhmiri et al., 2026). From a practical standpoint, the findings (so far, on a small sample of data) indicate that hotel operators and digital-platform designers should not consider virtual tours, AI recommendations, and sustainability information as standalone components that can be tacked onto existing platforms. Platforms should, instead, incorporate immersive exploration, customized filtering, and, if possible, verifiable facility-based information from the IoT world, as working results show that verifiable transparency plays a major role in how diagnostic guests discover sustainability information. In the context of sustainability communication, this means that claims that cannot be verified, especially claims based on non-time-sensitive data, are less likely to be convincing compared to claims backed by data that can be inspected and is near real-time. For digital-platform designers, the findings from the workings suggest that confidence is a more powerful motivator than control to choose a sustainable hotel decision; thus, interface features that help to build confidence in the final choice (such as clear

comparative summaries or guest-relevant sustainability scores) may need to be paired with features that help to facilitate the decision for a comparison (such as decision control).

## 8. CONCLUSION

This study designed and investigated a framework, called VirtuStay, that redefines the concept of the AI–IoT integrated virtual hotel tour as a pre-booking decision support environment for sustainable hotel choice, rather than an additional virtual-tour marketing tool. VirtuStay does not measure immersion, personalization, and IoT transparency as individual predictors of generic booking intention but rather focuses on a specific technological–informational–psychological pathway: technological features influence the way diagnostic guests access sustainability information, which in turn increases decision control and choice confidence, which in turn influences sustainable hotel choice intention and finally booking intention. The quantitative estimates from 320 respondents in five locations in Tamil Nadu support this pathway, with transparency through IoT as the most significant technological driver, and choice confidence as the more powerful of the two decision drivers. But what makes VirtuStay different from previous virtual hotel-tour research is that the focus is not on sustainability as another of the attributes shown in a virtual tour, but rather on the decision problem that the immersion, personalization and verifiable connected data in the virtual tour is meant to solve. The study is designed to provide a factual empirical description of the role that smart-hotel technology can play in supporting, not just visualising, the choice of a sustainable hotel.

## 9. Limitations and Future Research

This study has a few constraints. It is cross-sectional in nature and based on a scenario description of VirtuStay, rather than its actual deployment, and so the SHCI→BI pathway in particular should be viewed as a potential pathway rather than as evidence of actual booking uplift (cf. Anh et al., 2026, on the intention–behaviour gap). The findings are not representative of other states or other guests without online hotel-search experience. Another limitation shared by this literature is the self-reported intention as opposed to observed behaviour (Israel et al., 2019; Zeng et al., 2020; Lim et al., 2024; Gupta & Pande, 2025). To overcome the above limitations, further research is suggested using a larger, multi-state or international sample in order to test the generalisability of the model, as well as using field study with a working prototype of the VirtuStay model and longitudinal studies from exposure to an actual booking decision. Other constructs worth exploring are the level of trust

in the AI recommendations, concerns about privacy of guest data collected by IoT devices, readiness of guests with technology, perceived authenticity of virtual-tour content, and the feasibility and accuracy of the actual integration of IoT data at scale. These constructs were not explored in the current scenario-based design.

## 10. REFERENCES


1. Abdou, A. H., & Shehata, H. S. (2026). Digital synergy for hospitality sustainability: A moderated mediation model of IoT, data-driven decision-making, AI, and hotel sustainable performance. Frontiers in Sustainability, 6. https://doi.org/10.3389/frsus.2025.1727952
2. Anh, N. T. N., Minh, D. H., Cuong, T., & Chinh, T. T. Q. (2026). Can AI chatbot adoption bridge the gap between intention and behaviour in tourism service e-booking: A moderated mediation model analysis. Tourism and Hospitality, 7(3), Article 68. https://doi.org/10.3390/tourhosp7030068
3. Calisto, M. de L., & Sarkar, S. (2024). A systematic review of virtual reality in tourism and hospitality: The known and the paths to follow. International Journal of Hospitality Management, 116, Article 103623. https://doi.org/10.1016/j.ijhm.2023.103623
4. Cheng, J., Liu, H., & Tussyadiah, I. P. (2026). Getting smarter with hotel customer experience: A systematic review. Journal of Hospitality and Tourism Management, 66, Article 101363. https://doi.org/10.1016/j.jhtm.2025.101363
5. Eskerod, P., Hollensen, S., Morales Contreras, M. F., & Arteaga-Ortiz, J. (2019). Drivers for pursuing sustainability through IoT technology within high-end hotels—An exploratory study. Sustainability, 11(19), Article 5372. https://doi.org/10.3390/su11195372
6. Gajić, T., Petrović, M. D., Pešić, A. M., Conić, M., & Gligorijević, N. (2024). Innovative approaches in hotel management: Integrating artificial intelligence (AI) and the Internet of Things (IoT) to enhance operational efficiency and sustainability. Sustainability, 16(17), Article 7279. https://doi.org/10.3390/su16177279
7. Gupta, K. P., & Pande, S. (2025). VR meets hotel bookings: How hedonic and utilitarian attributes shape young consumers' intentions. Young Consumers, 26(3), 527–549. https://doi.org/10.1108/YC-09-2024-2230
8. Hair, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. Journal of Business Research, 109, 101–110. https://doi.org/10.1016/j.jbusres.2019.11.069

9. Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2022). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. Springer.
10. Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203
11. Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2018). Advanced issues in partial least squares structural equation modeling. Sage.
12. Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43, 115–135. https://doi.org/10.1007/s11747-014-0403-8
13. Israel, K., Zerres, C., & Tscheulin, D. K. (2019). Presenting hotels in virtual reality: Does it influence the booking intention? Journal of Hospitality and Tourism Technology, 10(3), 443–463. https://doi.org/10.1108/JHTT-03-2018-0020
14. Jiang, Z., & Benbasat, I. (2007). The effects of presentation formats and task complexity on online consumers' product understanding. MIS Quarterly, 31(3), 475–500. https://doi.org/10.2307/25148804
15. Kalsi, N., Carroll, F., Minor, K., & Platts, J. (2025). Optimising hotel sustainability through smart technology: A user-centred approach to measuring water usage via IoT sensors in housekeeping operations. Sustainability: Science, Practice and Policy, 5(3). https://doi.org/10.1177/27652157251354987
16. Kempf, D. S., & Smith, R. E. (1998). Consumer processing of product trial and the influence of prior advertising: A structural modeling approach. Journal of Marketing Research, 35(3), 325–338. https://doi.org/10.1177/002224379803500304
17. Lakhmiri, M., Sun, D., Kherazi, F. Z., & Zafar, S. (2026). Integrating green and smart practices in sustainable tourism: A systematic review of barriers, enablers, and contextual conditions. Journal of Hospitality and Tourism Management, 67, Article 101453. https://doi.org/10.1016/j.jhtm.2026.101453
18. Lim, W. M., Jasim, K. M., & Das, M. (2024). Augmented and virtual reality in hotels: Impact on tourist satisfaction and intention to stay and return. International Journal of Hospitality Management, 116, Article 103631. https://doi.org/10.1016/j.ijhm.2023.103631

19. Morales Contreras, M. F., Arteaga-Ortiz, J., Hollensen, S., & Naumchik, R. (2026). Sustainability readiness and IoT readiness in hotels: Strategic development paths. Journal of Hospitality and Tourism Technology. Advance online publication.
20. Sarstedt, M., Ringle, C. M., & Hair, J. F. (2022). Partial least squares structural equation modelling. In C. Homburg, M. Klarmann, & A. E. Vomberg (Eds.), Handbook of market research. Springer. https://doi.org/10.1007/978-3-319-05542-8_15-2
21. United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. United Nations.
22. United Nations World Tourism Organization. (2018). Tourism and the Sustainable Development Goals—Journey to 2030. UNWTO.
23. Zeng, G., Cao, X., Lin, Z., & Xiao, S. H. (2020). When online reviews meet virtual reality: Effects on consumer hotel booking. Annals of Tourism Research, 81, Article 102860. https://doi.org/10.1016/j.annals.2020.102860