

## Article

# Tourist Motivations to Adopt Sustainable Smart Hospitality: An Innovation Resistance Theory Perspective

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**Abstract:** This study aimed to assess the neglected conceptualization of smartness in the context of tourism and its probable consequences. Specifically, this study focused on investigating the relationships between sustainable smartness, usage barriers, value barriers, risk barriers, traditional barriers, image barriers, and tourists' behavioral intentions regarding their stay in smart hotels. The conceptual model of this study is constructed based on innovation resistance theory. By engaging structural equation modeling (SEM) in Smart-PLS 3.2.8, we calculated data from 672 valid respondents. The findings demonstrate that smartness significantly affects usage, value, risk, and traditional and image barriers. Furthermore, we unearthed a significant effect of all barriers on tourists' behavioral intentions.

**Keywords:** IRT; smartness; sustainable smart hospitality; PLS-SEM



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## 1. Introduction

In the current era of a rapidly growing and changing atmosphere, people's living standards and consumption behaviors have greatly developed tourism worldwide. Consequently, antagonism in the hospitality industry has increased, and innovation in services has become integral for hotels to attract more customers [1]. The latest technology has restructured and shifted the hospitality industry into an intelligent era [2]. From this perspective, Leung [3] argued that smart hospitality is evolving as a "trend." Smart hospitality refers to the employment of advanced technologies to enhance operational efficiency and guest experiences, and deliver customized services in hotels. With the help of cutting-edge technology, smart hospitality may create a comfortable and pleasant atmosphere for tourists while also improving their experience of staying in hospitality settings [4].

Perceptions of smart hospitality have often been explored in tourism management. This involves examining how tourists behave in situations where smart hospitality is present [5]. Despite its significance, research on the effects of smartphones is lacking. There is probably insufficient research on this topic because several academicians consider "smart technologies" and "smart hospitality" to be interchangeable terms, even though they are fundamentally distinct concepts. Typically, the term "smart technologies" pertains to tangible products and services, while "smartness" relates to an intangible idea that emphasizes tourists' experiences of receiving accurate and automated services including the use of smart technologies [6]. The notion of smartness goes beyond technological encroachment. It entails employing diverse technologies, such as the Internet of Things and mobile applications, to generate customized and smooth experiences for guests. Smart hospitality projects encompass many features, such as smart room keys, automated check-in/check-out processes, tailored suggestions based on visitor preferences, and smart room controls for lighting and temperature. It can also encompass one's behavior, emotions, and objectives. When making reservations for smart hospitality, visitors are interested in the concept of

“smartness.” Once they arrive, they have access to various smart technologies that contribute to their overall smartness. Smartness affects tourists’ perception and experience of objects. This, in turn, affects behavioral intentions. The current study aims to differentiate between “smart technology” and “smartness” and to explain the elements of smartness. Given that a substantial amount of research has been conducted on smart hospitality, we place emphasis on exploring the importance of “smartness” within this sphere.

Generally, “smartness” refers to the idea of incorporating cutting-edge technology and intelligent systems that improve the functionality, convenience, and efficiency of different tools, processes, or systems [7]. From this perspective, “smartness” in the context of hospitality refers to the idea of using the latest technology and intelligent systems that boost convenience for tourists and improve the inclusive performance of the hospitality sector. The literature provides scarce evidence of the role of smartness exclusively in the hospitality context [8]. Shedding light on the role of smartness, ref. [8] reported significant effects of smartness on perceived ease of use (PEOU), perceived usefulness (PU), and image of hotels on tourists’ behavioral intentions. However, previous studies have shown that positive factors alone cannot fully account for the reasons behind consumers’ adoption of new innovations [9–11]. Consumer resistance factors also play a vital role in inhibiting the adoption of innovations, as reported in different contexts, including mobile ticketing applications [11], mobile payments [9,12], buying eco-friendly cosmetics [13], and online travel agencies [14]. This study employs the innovation resistance theory (IRT), which incorporates smartness and argues that smartness might affect the factors of IRT towards tourists’ behavioral intentions.

This study provides several useful insights. First, this particular research stands out, as it is among the first to use IRT to assess the utilization of smartness in the hospitality industry, particularly in Pakistan. The growing significance of technology adoption in Pakistan’s hospitality industry warrants a study of smart hospitality. Pakistan’s growing tourism industry and digitization trends present an ideal opportunity to investigate the effects of smart technologies on visitor experiences, operational efficiency, and the overall competitiveness of the hospitality sector. By examining smart hospitality in Pakistan, this research can provide insightful analysis specific to the region, guiding strategic choices, and assisting the industry’s development in line with international trends. Second, theoretically, this study enriches the results of [8] and the scarce literature on the role of smartness in creating an overall positive cycle in tourism by affecting barriers to tourists’ behavioral intentions. Finally, understanding the relationship between smartness, barriers, and tourists’ behavioral intentions can aid in the expansion and employment of smart tourism initiatives, resulting in a more pleasant and uniform travel experience for tourists, while also supporting the overall success of the tourism industry.

## 2. Theoretical Background and Hypothesis Development

### 2.1. Innovation Resistance Theory (IRT)

Innovation resistance theory (IRT) assists in examining the factors that lead customers to demonstrate resistance-oriented behavior. Consumer resistance is the unwillingness to accept change because of concerns that it can disrupt existing conditions and personal beliefs. This theory marked the first attempt to explain consumer resistance to innovation and formulate appropriate recommendations to overcome it [15]. As described by the IRT, consumers typically encounter five obstacles, which can be categorized as functional and psychological [16]. Functional barriers are influenced by risk, value, and use. However, psychological barriers are caused by traditional and image barriers. Several studies have examined consumer resistance in relation to innovation, providing insights into the importance of understanding resistance and opposition when embracing innovations [9,17]. Given the novelty provided by meta-money, such as virtual financial services, they can also be considered new innovations. A usage barrier refers to the resistance or unwillingness that develops in response to prospective changes caused by an innovation [16]. The intricacy of meta-money can present obstacles to users with little technical expertise

and experience in utilizing virtual financial services. Consumers may also require additional time to adapt to an innovation that contradicts their existing habits or routines [18]. Scholars have observed that usage barriers are negatively associated with m-commerce adoption intentions [19,20]. Value barriers refer to how consumers perceive an innovation's performance in relation to the price they pay compared to alternatives [16]. Innovation is not accepted until it provides better value for money to customers than the current options [21]. If an innovation is not cost-effective and does not offer exceptional performance, consumers are less likely to adopt it [16]. Moorthy and Ling [19] found that the existence of a value barrier has a negative effect on m-commerce adoption. Risk barriers refer to resistance resulting from the volatility associated with innovation [16]. Researchers have examined the negative association between risk barriers and the desire to use various tools, such as online purchasing and m-commerce [19,22]. Traditional barriers appear when consumers undergo cultural transitions [16]. The concept emerges as a result of the transformation of prevailing consumer culture as a result of new innovation [18]. According to Laukkanen [21], this obstacle influences consumers' willingness to adopt a new technology. Moorthy, Ling [19] found a negative relationship between traditional barriers and m-commerce usage in the context of mobile commerce (m-commerce). In contrast, the image barrier refers to consumers' negative perceptions of new innovations [16]. Previous research also suggests that image barriers are adversely related to m-commerce and e-commerce (e-commerce) purchase intentions [19,23,24]. Thus, IRT has contributed to the exploration of the challenges consumers face when adopting new innovations. IRT has been employed by several researchers to explain consumers' reluctance to engage in mobile commerce and e-commerce [14,18,22]. Researchers have recognized that IRT has a significant influence on revealing important insights into barriers and the significance of these barriers in understanding consumers' reluctance to embrace innovations [17]. For the following reasons, IRT is suitable in the current context.

- (1) According to Ma and Lee [15], IRT provides a comprehensive framework for determining users' tendencies to reject innovation. Since smart hospitality is a novel user innovation, current research on traveler resistance and IRT now in existence provides intriguing insights into understanding the barriers to new user innovations [15].
- (2) It aids in assessing the issues that current smart-hospitality users experience, which could serve as a barrier and heighten consumer resistance. IRT has been used to investigate customer resistance to online purchases [18], grocery applications [25], e-commerce, and mobile applications [21].
- (3) The use of IRT adds to the body of literature because the hospitality industry has acknowledged the existence of barriers to smart hospitality [26].

## 2.2. Smartness

The term "smartness" pertains to intelligent features that improve the performance of objects, making them compatible and connected with each other. This enhances user convenience and simplifies their daily routines through automation [27,28]. The concept of 'smartness' is meticulously linked to smart technology. Chervenak [29] suggested that the progress of smartness owes a great deal to technological advancements. Smart technology is essential for achieving sustainable smartness. This technology is designed to detect any alterations in working conditions, such as movement or state, and adjust its performance accordingly [30]. It is commonly accepted that integrating IT, the Internet of Things (IoT), and information and communication technology (ICTs) is crucial for establishing a connected and interoperable system of smart technologies [27,31]. Several researchers have validated the significance of information technology [32,33]. IoT technology enables users to easily access real-time information on their phones via wireless connectivity and sensors. This is made possible by the interconnection of many things and devices [34]. Therefore, it is critical to develop an automated system [35]. Tourists can improve their overall experience with smartphones, wearables, biometric technology, audio-video technology, and other devices by utilizing cutting-edge ICT applications [36,37]. Additionally, the availability of

diverse information search options has impacted the behavior of tourists in the hospitality and tourism industries, leading them to make informed decisions [38].

### 2.3. Hypotheses Development

This study examined the role of smartness in smart hospitality and tourists' behavioral intentions to stay. To explain this phenomenon, the IRT framework was applied because it offers inclusive sympathy for factors that predict visitors' resistance to newly introduced innovations. Under the recommendations of Kushwah and Dhir [39], we examined functional barriers (usage barrier (UB), value barrier (VB), and risk barrier (RB)) and psychological barriers (traditional barrier (TB) and image barrier (IB)) to determine why tourists are resistant to staying at hotels. According to the literature, functional barriers such as UB, VB, and RB play an indispensable role in resistance to adopting new or unacquainted innovations. Tandon and Dhir [40] claim that usage barriers may contribute significantly to consumers' resistance to unfamiliar innovations, such as smart technologies. Similarly, Tandon and Jabeen [41] advocate that, in comparison with its alternatives, consumers evaluate the perceived value of organic products both financially and in terms of their performance. Additionally, Nuttavuthisit and Thøgersen [42] postulated that organic products are perceived as having a high level of risk concomitant with them, affecting purchasing decisions and resulting in consumers' low trust in accreditation and manufacturing processes. This may lead consumers to avoid purchasing green products. Apart from functional barriers, users may also be psychologically affected by barriers such as tradition and image. Kushwah and Dhir [43], in their study, found that consumers have tradition barriers because organic products have a shorter shelf life.

Smart technology plays a vital role in enhancing visitor experience. Tourists' cognitive and emotional reactions to smart devices may also affect their decision making [44]. Tourism-related ratings and reviews influence tourists' decisions on online travel platforms to discover information about intended sustainable smart hospitality [45]. By using robots in hotels, tourists can receive detailed information about tourist destinations and clear introductions [46]. Guests can be reliably and effectively assisted by smart technologies. Rather than solely containing technical functions, these novel and attractive technologies foster guests' participation in creating innovative hotel services by promoting them as co-creators [47]. For example, guests may enjoy the novelty and unique experience of conversing with robots to obtain assistance. In addition, technical performance (e.g., artificial intelligence) will improve, benefiting more guests [48]. Liu and Henseler [8] highlighted that smartness will positively affect the perceived ease of use (PEOU). In view of the fact that the perception of PEOU is analogous to the negative explanation of UB in this study, it is presumed that smartness also has a negative effect on UB. All indications from these sources point to the outlook to oppose innovation being obstructed by smartness, leading to the formation of the following hypotheses:

- H1.** *Smartness in smart hospitality negatively affects the usage barriers of smart hotel applications.*
- H2.** *Smartness in smart hospitality negatively affects the value barrier of smart hotel applications.*
- H3.** *Smartness in smart hospitality negatively affects the risk barriers of smart hotel applications.*
- H4.** *Smartness in smart hospitality negatively affects the traditional barriers of smart hotel applications.*
- H5.** *Smartness in smart hospitality negatively affects the image barriers of smart-hotel applications.*

The complexity of cutting-edge technology may pose difficulties to consumers [16]. The usage barrier refers to the reluctance to adopt a new technology owing to its potential alterations [16]. Essentially, it evaluates the level of resistance consumers encounter when attempting to learn and utilize innovation. Usage barriers are consumer perceptions of the changes required for adapting to new technologies [49]. This is a significant barrier

that prevents consumers from adopting new innovations and occurs when users believe that they will change their habits if they adopt an innovation [16]. Smart technology is considered to be an incremental innovation rather than a radical one. However, changes in tourist habits have yet to be observed. For instance, the successful placement of information technology (IT) projects in airports is frequently hindered by usage barriers [50], hotels [51] and eco-friendly cosmetics [13], among other hospitality contexts. Likewise, Tandon, Dhir [40] suggest that UB may be a significant inhibitor of smart technology, such as smartness. As a result of the preliminary qualitative analysis and theoretical framework of IRT, it can be concluded that usage barriers may increase consumers' unwillingness to use smart technologies. Hence, we propose the following hypothesis:

**H6.** *The usage barrier for smart hotel applications is negatively associated with smart hotel applications.*

The value barrier requires that innovations outperform current options in terms of performance relative to the cost for customers to change their behavior [21]. Customers have no reason to switch if an innovation does not deliver more value than existing products [16]. Travelers are inclined to override adoption barriers to new innovations if they offer relative advantages (i.e., low values) compared to prevailing substitutes [16]. This increases the probability of adopting smartness proportional to the relative advantage. Prior studies have demonstrated that VB is one of the most significant barriers preventing users from accepting new products and innovations [10,39]. For example, in Kushwah et al. (2019b) [43], value barriers were the most effective barriers in deterring individuals from choosing organic foods. Thus, in the milieu of smart hospitality, we argue that VB results in strong resistance among tourists toward smartness. Hence, it can be anticipated that citizens will be inclined to resist using smart technology if they perceive no value. Hence, the following hypothesis is proposed:

**H7.** *The value barrier of smart hotel applications is negatively associated with them.*

Risk barriers refer to the level of inherent risk associated with innovations, including risks related to finance, psychology, physical well-being, and social factors [21]. A risk barrier may be the perception that innovation has a higher risk than alternative products [49]. Innovation is perceived as a riskier proposition when it is associated with a high level of vagueness, which may act as an inhibitor [52]. Huang and Coghlan [53] suggested that consumers may discontinue using hospitality services due to risk barriers. Risk barriers appear to result from a lack of trust in smart technologies [53]. Innovation is perceived as a riskier proposition when there is a high level of uncertainty associated with it, which may act as an inhibitor [52]. Additionally, a new product or innovation is not adopted until it is associated with less risk or uncertainty [9]; consequently, new products are slowly adopted [16]. Huang and Coghlan [53] suggested that consumers may discontinue using hospitality services due to risk barriers. The risk barrier appears to result from a lack of trust in smart technologies [53]. Lower consumer trust in smart technology leads to a lower likelihood of travelers adopting them. Consequently, we contend that RB discourages tourists from using smart technology while staying in hotels. Thus, the following hypothesis is proposed:

**H8.** *The risk barrier of smart hotel applications is negatively associated with them.*

Traditional barriers describe users' insight that accepting a new innovation would alter their way of life compared to using existing alternatives [49]. This has occurred because of changes affecting existing societal norms and consumer values associated with adopting new technology [16]. As the traditional barrier is a component of the psychological barrier, it would be impossible for any new product to be accepted by consumers whose current certainty systems would clash with the new technology [21]. As such, consumers' psychological states determine the traditional barrier, as well as the

fact that smart technology has a “short shelf life” and “low satisfaction” [39] in contrast to conventional technology. The traditional barrier has also been shown to be positively associated with innovation resistance in [54], where, for example, the adoption of hydrogen-electric motorbikes has changed consumers’ current beliefs concerning this technology. Due to the traditional barrier, we propose that hotels equipped with smart technologies would face resistance from consumers as their values and societal norms conflict with those of the hotel. The following hypothesis was formulated based on the above considerations:

**H9.** *The traditional barrier to smart-hotel applications is negatively associated with smart-hotel applications.*

Image barriers can be induced by factors such as the product category with which the invention is related, the country of origin, or associated brands [55]. Image barriers refer to how consumers perceive the difficulty or ease of adopting a new innovation [49]. Innovation is less likely to be adopted if users form negative associations with it [16]. In this case, consumers evaluate the new technology by comparing it with the existing technology [16]. According to Laukkanen and Sinkkonen [56], the IB is chiefly accountable for pouring the rejection of new innovations. Tourists who do not use smart technology while staying in hotels experience trust issues, resulting in negative perceptions of smart technology [16]. In this regard, we argue that the image barrier deters travelers from adopting smart technology during their stay in hotels. Consequently, we hypothesize the following:

**H10.** *The image barrier of smart-hotel applications is negatively associated with them.*

### 3. Methodology

#### 3.1. Instrument Development

The IRT framework was extended to generate a model that forecasted UB, VB, RB, TB, IB, and tourist BI to study the behavioral intentions of travelers while they were staying in hotels (Figure 1). To collect data for this study, we utilized a detailed methodology that used a sample questionnaire accompanied by measures and scales from previous studies. The measurement items for UB, VB, RB, TB, IB, and BI were obtained from [21,57]. Smartness was assessed based on four key components: robots, scene control systems, AV systems, and mobile control systems. The measurement items for smartness were borrowed from [58]. Prior to the data accumulation process, five subject experts were consulted for the face validity of the study scope and objectives. The questionnaire for the pre-test was completed after considering the recommendations and feedback regarding their appropriateness. Through a pilot test, the reliability and validity of the research instrument were assessed. During the pre-test, 30 questionnaires were distributed to tourists who stayed in a smart hotel. A pre-test with 30 questionnaires was considered adequate [59]. The questionnaires were revised based on their feedback to guarantee that all questions were easily understood. A 7-point Likert scale was used to assess the responses, where 1 signified the strongest agreement (strongly agree) and 7 signified the strongest disagreement (strongly disagree). See Appendix A.

#### 3.2. Data Collection

A survey was conducted in an upscale hotel chain in Pakistan. In the hotel lobby, a robot can distribute toothbrushes, razors, and other items requested by guests. Tourists can use mobile devices to switch elevators, guest-room doors, and audiovisual systems. Furthermore, the system is equipped with a scene control system that can be used to vary the status of the lighting, curtains, air conditioning, and sound system at the touch of a button. The sample of respondents was based on a random sampling approach. Tourists over the age of 18 years were considered as the population. A systematic sampling technique was used to select the sample (respondents). For every ten guests, we sent a

questionnaire. Based on 950 survey questionnaires, the study achieved a response rate of 70.7%, and 672 positive comments were received. To confirm the recognized theoretical framework and test the hypotheses, these responses were analyzed to obtain empirical results. The respondents' demographic characteristics are summarized in Table 1.

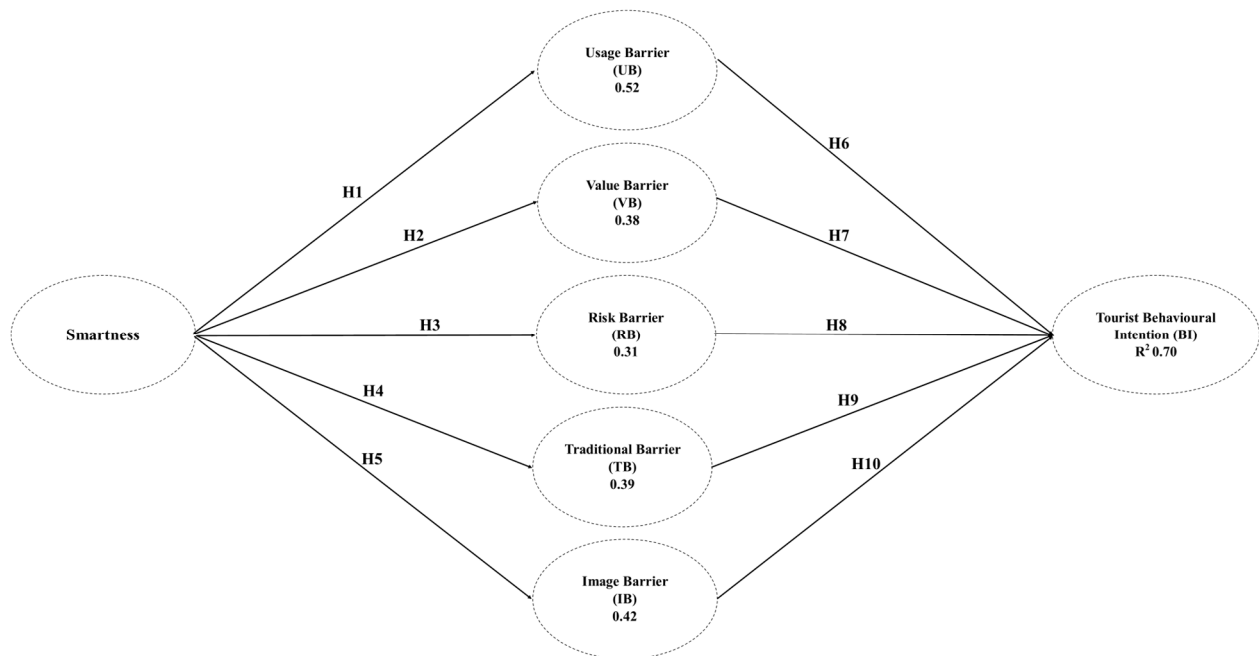


**Figure 1.** Research model and proposed hypothesis.

**Table 1.** Descriptive statistics ( $N = 672$ ).

| Variable         | Group         | Frequency | Percentage |
|------------------|---------------|-----------|------------|
| Gender           | Male          | 269       | 40.0%      |
|                  | Female        | 403       | 60.0%      |
| Age              | 18–30         | 150       | 22.3%      |
|                  | 31–40         | 275       | 41%        |
|                  | 41–50         | 117       | 17.4%      |
|                  | 51–60         | 75        | 11.2%      |
|                  | 60 and above  | 55        | 8.1%       |
| Education Level  | High School   | 200       | 29.8%      |
|                  | Undergraduate | 305       | 45.4%      |
|                  | Graduate      | 99        | 14.7%      |
|                  | Doctorate     | 68        | 10.1%      |
| Number of Visits | 1             | 145       | 21.6%      |
|                  | 2             | 195       | 29.1%      |
|                  | 3             | 215       | 32%        |
|                  | 4             | 63        | 9.3%       |
|                  | More than 4   | 54        | 8.0%       |

## 4. Results

### 4.1. Measurement Model

The suggested model was calculated using the CFA approach [60]. The recommended model was evaluated using composite validity, average variance extracted (AVE), and Cronbach's alpha. The PLS technique was used to determine the external loads on each construct. This table spectacles the composite validity; Cronbach's alpha loadings exceeded the 0.7 thresholds [61,62], and the AVE variance outstripped the threshold of 0.5 [62,63]. According to the CFA results, the loading factor for each item was much higher than 0.7.

Table 2 shows that the CFA results consistently transcend the threshold values for CA, CR, and AVE, which are 0.7, 0.7, and 0.5, respectively. This points to favorable convergent validity [60,64,65]. Similarly, despite the rho indices, a rho index value exceeding 0.7 is more important since it is a measure of internal consistency [66].

**Table 2.** Construct validity.

| Construct                    | Items | FL    | A     | rho_A | CR    | AVE   |
|------------------------------|-------|-------|-------|-------|-------|-------|
| Smartness                    | SMRT1 | 0.853 | 0.907 | 0.909 | 0.928 | 0.684 |
|                              | SMRT2 | 0.897 | -     | -     | -     | -     |
|                              | SMRT3 | 0.864 | -     | -     | -     | -     |
|                              | SMRT4 | 0.787 | -     | -     | -     | -     |
|                              | SMRT5 | 0.785 | -     | -     | -     | -     |
|                              | SMRT6 | 0.766 | -     | -     | -     | -     |
| Usage Barrier                | UB1   | 0.755 | 0.772 | 0.774 | 0.854 | 0.594 |
|                              | UB2   | 0.794 | -     | -     | -     | -     |
|                              | UB3   | 0.748 | -     | -     | -     | -     |
|                              | UB4   | 0.784 | -     | -     | -     | -     |
| Value Barrier                | VB1   | 0.859 | 0.811 | 0.812 | 0.888 | 0.726 |
|                              | VB2   | 0.869 | -     | -     | -     | -     |
|                              | VB3   | 0.827 | -     | -     | -     | -     |
| Risk Barrier                 | RB1   | 0.761 | 0.759 | 0.818 | 0.831 | 0.551 |
|                              | RB2   | 0.751 | -     | -     | -     | -     |
|                              | RB3   | 0.725 | -     | -     | -     | -     |
|                              | RB4   | 0.731 | -     | -     | -     | -     |
| Traditional Barrier          | TB1   | 0.818 | 0.701 | 0.709 | 0.833 | 0.625 |
|                              | TB2   | 0.751 | -     | -     | -     | -     |
|                              | TB3   | 0.801 | -     | -     | -     | -     |
| Image Barrier                | IB1   | 0.817 | 0.814 | 0.814 | 0.877 | 0.641 |
|                              | IB2   | 0.792 | -     | -     | -     | -     |
|                              | IB3   | 0.806 | -     | -     | -     | -     |
|                              | IB4   | 0.788 | -     | -     | -     | -     |
| Tourist Behavioral Intention | TBI1  | 0.852 | 0.879 | 0.884 | 0.912 | 0.674 |
|                              | TBI2  | 0.827 | -     | -     | -     | -     |
|                              | TBI3  | 0.79  | -     | -     | -     | -     |
|                              | TBI4  | 0.871 | -     | -     | -     | -     |
|                              | TBI5  | 0.761 | -     | -     | -     | -     |

Note: SMRT is smartness; IB is the image barrier; RB is the risk barrier; TB is the traditional barrier; UB is the usage barrier; and VB is the value barrier.

We used three methodologies to assess discriminant validity, indicating differences between the measurements of one variable and those of another [67]. The first stage involved assessing the association between variables to determine their degree of relationship with the AVE of each hypothesis [64]. In Table 3, the AVE square root is larger than the corresponding value for all constructs, indicating that the respective construct has decent discriminant validity. With satisfactory reliabilities and convergent validity results, we calculated discriminant validity through the heterotrait–monotrait ratio (HTMT) correlation ratio [67]. The recommended value for the HTMT is less than 0.90 [67]; otherwise, it shows a lack of discriminant validity. All HTMT correlations were less than 0.90, as shown in Table 3, which displays the complete findings of the measurement model. The heterotrait–monotrait ratio (HTMT) was also assessed, in addition to discriminant validity. Table 3 shows a range of values from 0.35 to 0.83, which falls short of the 0.90 thresholds as recommended by [67,68]. This was achieved for all latent constructs (Table 3), demonstrating strong discriminant validity.

**Table 3.** Discriminant validity.

| Construct                          | SMRT   | UB     | VB     | RB     | TB    | IB     | TBI   |
|------------------------------------|--------|--------|--------|--------|-------|--------|-------|
| SMRT                               | 0.827  | -      | -      | -      | -     | -      | -     |
| UB                                 | 0.721  | 0.77   | -      | -      | -     | -      | -     |
| VB                                 | 0.615  | 0.79   | 0.852  | -      | -     | -      | -     |
| RB                                 | 0.559  | 0.628  | 0.685  | 0.742  | -     | -      | -     |
| TB                                 | 0.626  | 0.639  | 0.536  | 0.603  | 0.79  | -      | -     |
| IB                                 | 0.645  | 0.689  | 0.57   | 0.474  | 0.619 | 0.801  | -     |
| TBI                                | −0.492 | −0.705 | −0.825 | −0.622 | −0.41 | −0.475 | 0.821 |
| Heterotrait–Monotrait Ratio (HTMT) |        |        |        |        |       |        |       |
| SMRT                               | -      | -      | -      | -      | -     | -      | -     |
| UB                                 | 0.863  | -      | -      | -      | -     | -      | -     |
| VB                                 | 0.717  | 0.831  | -      | -      | -     | -      | -     |
| RB                                 | 0.611  | 0.694  | 0.755  | -      | -     | -      | -     |
| TB                                 | 0.78   | 0.863  | 0.704  | 0.791  | -     | -      | -     |
| IB                                 | 0.75   | 0.869  | 0.699  | 0.504  | 0.798 | -      | -     |
| TBI                                | 0.547  | 0.845  | 0.972  | 0.624  | 0.511 | 0.557  | -     |

#### 4.2. Structural Model Results

In Figure 2, the majority of theorized relationships concerning latent variables are statistically significant. Smartness was found to affect usage barrier significantly ( $\beta = 0.721$ ,  $p < 0.001$ ), as well as value barrier ( $\beta = 0.615$ ,  $p < 0.001$ ), risk barrier ( $\beta = 0.559$ ,  $p < 0.001$ ), traditional barrier ( $\beta = 0.626$ ,  $p < 0.001$ ), and image barrier ( $\beta = 0.645$ ,  $p < 0.001$ ), which supports H1, H2, H3, H4, and H5. Concerning the correlation between IRT constructs and tourist behavioral intention, UB was found to affect tourist BI significantly ( $\beta = -0.204$ ,  $p < 0.001$ ), and VB ( $\beta = -0.653$ ,  $p < 0.001$ ), RB ( $\beta = -0.142$ ,  $p < 0.001$ ), and TB ( $\beta = 0.149$ ,  $p < 0.001$ ) were found to have a significant positive influence on tourists' behavioral intention, which supports H6, H7, H8, and H9. IB affects tourists' behavioral intention insignificantly ( $\beta = 0.013$ ). The adjusted  $R^2$  values for UB, VB, RB, TB, and IB and intention to use were 0.519, 0.377, 0.311, 0.391, 0.415, and 0.702, respectively. The current findings indicate that the model has significant robustness, clear interpretation, and good forecasting abilities (Table 4).

**Table 4.** Structural model results.

| Hypotheses                    | Path Coefficient ( $\beta$ ) | SD    | T-Value | p-Values |
|-------------------------------|------------------------------|-------|---------|----------|
| H1: SMRT $\rightarrow$ UB *** | 0.721                        | 0.023 | 31.636  | 0        |
| H2: SMRT $\rightarrow$ VB *** | 0.615                        | 0.029 | 20.884  | 0        |
| H3: SMRT $\rightarrow$ RB *** | 0.559                        | 0.03  | 18.867  | 0        |
| H4: SMRT $\rightarrow$ TB *** | 0.626                        | 0.033 | 19.133  | 0        |
| H5: SMRT $\rightarrow$ IB *** | 0.645                        | 0.032 | 19.943  | 0        |
| H6: UB $\rightarrow$ TBI ***  | −0.204                       | 0.061 | 3.334   | 0.001    |
| H7: VB $\rightarrow$ TBI ***  | −0.653                       | 0.067 | 9.812   | 0        |
| H8: RB $\rightarrow$ TBI ***  | −0.143                       | 0.039 | 3.697   | 0        |
| H9: TB $\rightarrow$ TBI ***  | 0.149                        | 0.047 | 3.198   | 0.001    |
| H10: IB $\rightarrow$ TBI     | 0.013                        | 0.043 | 0.292   | 0.771    |

\*\*\* refers to  $p < 0.01$ .

#### 4.3. The Effect Size and Predictive Relevance

We used different criteria to check the relevance and goodness-of-fit of our model. To ascertain the predictive relevance and accuracy of the model,  $Q^2$  values were calculated as recommended by [62].  $Q^2$  is used to assess the predictive relevance of a model and can be measured by cross-validated redundancy or communality. Cross-validated redundancy is generally favored in research analyses. It has been suggested that the path model exhibits reasonable predictive accuracy when the  $Q^2$  value for endogenous latent variables exceeds

zero [69]. The predictive validity of  $Q^2$  is appraised using the blindfolding approach on a large and composite model [70,71]. Chin [72] quantified that “the prediction of observables or potential observables is of much greater relevance than the estimator of what are often artificial construct parameters” (p. 320). Suitably, the  $Q^2$  values for the dependent constructs were 0.28, 0.25, 0.14, 0.22, 0.24, and 0.42, revealing acceptable extrapolative significance for UB, VB, RB, TB, IB, and TBI, indicating satisfactory predictive relevance for the model (Table 5). A  $Q^2 > 0$  value specified that the model was extrapolative [73] and showed a moderate effect size [62,72]. To gauge the strength or magnitude of the relationship between latent variables, the effect size was measured using Cohen’s  $f^2$  coefficient. Cohen’s  $f^2$  was used to determine the influence of an independent variable on the  $R^2$  value. This defines the aid supplied by the dependent variable and evaluates the degree of contribution. Categorically, the  $f^2$  values for all anxious associations lie within the threshold [73]. The exogenous variables’ (i.e., SMRT, SMRT, SMRT, SMRT, UB, VB, RB, and TB)  $f^2$  values confirm the moderate and robust effect size, except with IB.

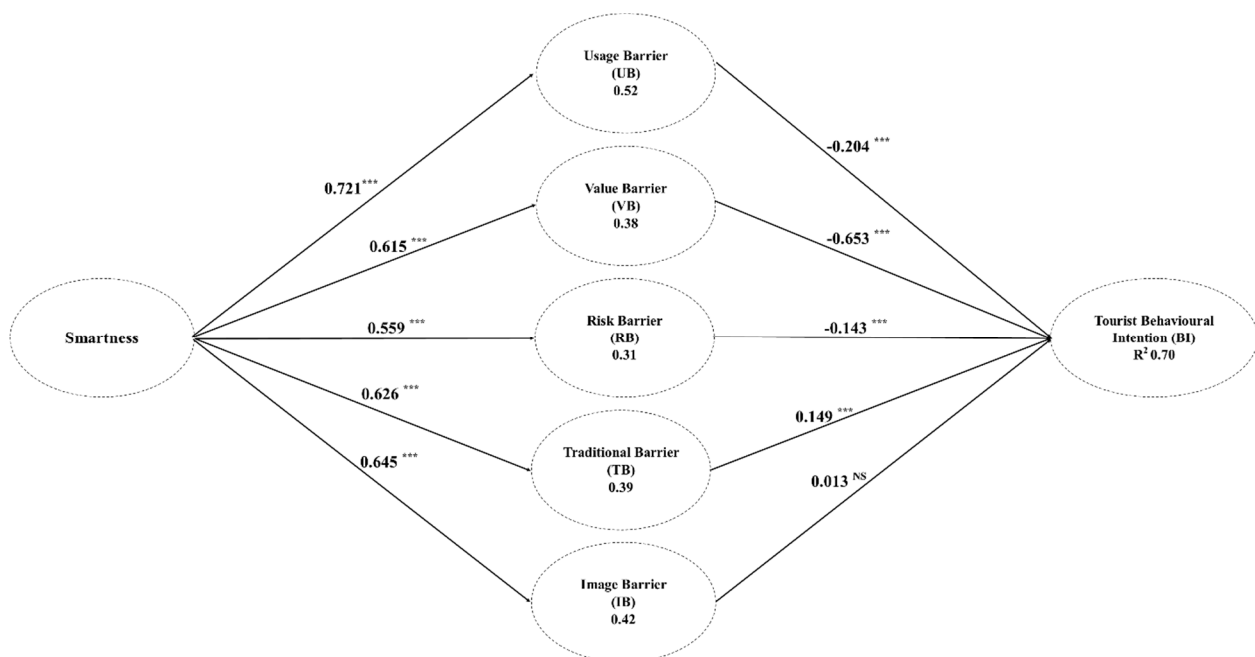


Figure 2. Hypothesized model. \*\*\* refers to  $p < 0.01$ ; NS refers to non-significant.

Table 5. Effect size and predictive relevance.

| Dependent Variables | $Q^2$ | $R^2$ | Independent Variables | $f^2$ |
|---------------------|-------|-------|-----------------------|-------|
| UB                  | 0.28  | 0.52  | SMRT                  | 1.08  |
| VB                  | 0.25  | 0.38  | SMRT                  | 0.61  |
| RB                  | 0.14  | 0.31  | SMRT                  | 0.45  |
| TB                  | 0.22  | 0.39  | SMRT                  | 0.65  |
| IB                  | 0.24  | 0.42  | SMRT                  | 0.71  |
| TBI                 | 0.42  | 0.70  | UB                    | 0.04  |
|                     |       |       | VB                    | 0.45  |
|                     |       |       | RB                    | 0.03  |
|                     |       |       | TB                    | 0.04  |
|                     |       |       | IB                    | 0.01  |

## 5. Discussion and Implications

### 5.1. General Discussion

This study discovered the effect of smartness on tourist BI in the context of smart hospitality. The outcomes of our study add to prior research on the topic, since one of

the earlier studies did not study the effect of smartness using the extended IRT model. Of the ten hypotheses proposed in the model, nine were supported by the results of the data analysis.

In smart hospitality, IRT explained 0.519% of the variance in UB, 0.377% in VB, 0.311% in RB, 0.391% in TB, 0.415% in IB, and 0.702% in tourists' BI. Based on the findings of this research, four prevalent smart devices (i.e., scene control, robots, and mobile control AV systems) were considered smartness criteria in smart hospitality. It is evident from this study's findings that smart devices play a crucial role in defining smartness. Tourists are particularly attracted to AV systems and scene controls because they represent smartness. There is a sturdy link between these results and the proposition that IoT and automatic devices augment tourists' satisfaction and sense of self-service. Several previous studies, including those in [28], reached a similar conclusion. Nevertheless, smartness does not directly influence tourists' behavioral intentions. UB, VB, RB, and TB mediated the relationship between smartness and tourists' behavioral intentions. H1 examined whether UB is negatively linked to tourists' BI. The findings of this study are similar to those of earlier studies in different research contexts [11,13]. Similarly, past research has determined a negative correlation between UB and intentions, and it has a significant relationship with consumer resistance [74] and the discontinuation of many digitization initiatives [75]. Therefore, usage barriers prevent newer innovations from becoming mainstream, as seen in smart travel itineraries. Therefore, smart apps and other service contributors should highlight the ease of use of these apps and services. H2 examined whether value barriers negatively affected tourists' BI. The findings here are consistent with prior research, suggesting that VB negatively affects intention to use [76] and has a significant relationship with user resistance [74]. This may be due to Pakistan's recent shift towards digital technology, which is a significant factor in this finding. These results have led to the development of various applications. Thus, Pakistani users have multiple options for choosing smart technology, which is actively encouraged or even mandated. Therefore, users need to find value in the smart technology that they choose. Users may discontinue or switch from smart technology if the desired technology fails to meet their expectations. In support of H3, this study's findings indicate that RB is negatively related to tourists' BI. Similarly, the present results agree with other research demonstrating that risk barriers negatively affect users' intentions toward numerous innovations [19]. Moreover, the findings follow past studies that have confirmed that consumer resistance to user-driven innovations is positively associated with risk barriers [77]. RB encompasses various uncertainties in the context of user innovation. Academics have argued that a higher level of uncertainty decreases the acceptance of user innovation [16,78]. To alleviate risk-related concerns, service providers must take necessary steps. H4 hypothesized that traditional barriers share a positive significance linked with tourist intention. Similarly, the present results agree with other research demonstrating that traditional barriers positively affect users' intentions toward various innovations [16]. Unlike most prior studies, our results show a significant negative correlation between intentions and behaviors [21,79] and a positive relationship with user resistance [77,80]. Moreover, based on the results of the study, H5 did not show any substantiation of a negative association between image barriers and tourist intention. The results of this study contradict previous findings on IB [19,75]. The degree of technological orientation among users may explain the IB's insignificant role. Participants in the current study were mostly younger travelers who positively perceived technology-driven social and commerce podiums [81]. Consequently, image barriers are unlikely to have a significant impact in these cases.

## 5.2. Theoretical Implications

Specifically, this study investigated an extended model that predicts tourists' intention to adopt smart hospitality in the tourism and hospitality industries. This paper makes an important contribution to smart hospitality theory and discipline in an insightful manner. This study's conclusions provide suggestions for future academic research on tourists' in-

tentions to embrace smart-hospitality practices. According to the authors, this is one of the first studies to examine the bearing of smartness on IRT in the context of Pakistani tourists' resistance to smart hospitality. This study represents the first attempt to examine this topic in the South Asian context, with a particular focus on developing nations. Our study makes a theoretical involvement by affording an enhanced consideration of the conceptual frameworks and empirical research methods of smart hospitality. With this study, it is possible to obtain a healthier consideration of tourists' resistance towards embracing smart hospitality. The profound impacts of many obstacles (such as usage, value, risk, traditional, and image) on visitors' behavioral intentions offer a more profound understanding of the perceived hindrances to technology adoption in the hospitality industry. This comprehension enhances theoretical debates regarding the determinants that impact individuals' adoption behavior. Second, this study aimed to extend the empirical research on smartness by investigating the barriers associated with smart hospitality. Third, this study contributes to the literature by utilizing the conceptual framework of IRT to investigate the barriers tourists face when traveling in a smart-hospitality environment. Finally, the IRT-based research design can be used for future studies investigating the acceptance of smart technology outside the hospitality and tourism industries [82]. By providing valuable insights into tourists' resistance to smart hospitality, this study contributes to the advancement of the research field, which will benefit both practitioners and academicians alike.

### *5.3. Practical Implications*

The impartial goal of this study was to inspect and consider the various advantages that smart services offer to tourists within the context of smart hospitality. Therefore, this study provides insight into Pakistani tourists' behavior toward online travel agencies, travel agents, tour operators, tourism, IT companies, and hospitality planners. Smart services facilitate the development of agile consumer profiles, dynamic customer interactions, and collaborative methods for co-creating customer experiences. Integrating smart technology with hospitality providers can assist in overcoming obstacles to utilization by offering intuitive and user-friendly interfaces. Hospitality providers should allocate resources to enhance user training and assistance to optimize the adoption of these technologies. They highlight the additional advantages of smart hospitality in overcoming obstacles related to value. Attributes such as tailored experiences, ease, effectiveness, and ecological sustainability should be emphasized to allure and maintain customers. Issues pertaining to data privacy, security, and dependability should be resolved to mitigate potential risks. Resilient cybersecurity protocols should be enforced, adherence to data protection regulations guaranteed, and clear details offered regarding the dependability and safety of the proposed technology. Customary inclinations should be acknowledged and honored while implementing cutting-edge technologies. A combination of conventional and smart hospitality services should be provided to accommodate a wide range of guest segments and preferences. The government promotes a conducive regulatory framework to incentivize the implementation of innovative technology in the hospitality industry. Regulations that facilitate innovation, encourage investment in infrastructure, and enhance digital literacy should be formulated to foster the expansion of smart hospitality initiatives. Technology developer companies should create tailored smart hospitality alternatives that target specific obstacles identified in the research, including user interface design, value proposition communication, risk management functionalities, and interaction with conventional hospitality services. Extensive training programs and continuous technical assistance should be provided to hospitality providers to guarantee the efficient adoption and exploitation of intelligent technologies.

## **6. Conclusions and Limitations**

In the current era, there has been an exponential surge in research on smart hospitality, reflecting the rising realization of its revolutionary potential in the hospitality industry. Therefore, perceptions of smart hospitality have often been explored in tourism-

management research. Although the volume of research has increased, surprisingly few studies have examined the impact of smartness. Academicians may consider “smart technologies” and “smart hospitality” interchangeable terms, even though they are fundamentally distinct concepts. This study investigated the neglected conceptualization of smartness in the context of tourism and its probable consequences. Specifically, this study focuses on investigating the relationships between smartness, innovation resistance theory, and five factors: UB, VB, RB, TB, IB, and tourists’ behavioral intentions. Using a questionnaire and systematic sampling technique, data from 672 tourists were obtained and analyzed via smart PLS. The effects of smartness on all five factors of innovation resistance theory and the barriers, except image barriers, on tourists’ behavioral intentions were established to be significant. Based on these results, several theoretical and practical implications are provided. This study has several limitations. First, it examines tourists’ motivations to adopt smart hospitality within the tourism and hospitality industry. Future research could eventually apply these findings to other industries and markets. Second, this investigation was limited to Pakistani respondents; therefore, it is difficult to generalize the results of the tourism and hospitality industry’s use of smart technologies. Establishing general conclusions regarding smart technologies would be beneficial if a more extensive study encompassed multiple countries and diverse backgrounds. Finally, future investigations may include group and partial least-squares analyses based on finite mixtures.

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**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Shenzhen University.

**Informed Consent Statement:** Respondents were presented with a consent form prior to participation.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A

| Study Measures (Reference) | Measurement Items                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------|
| Smartness [58,83]          | The [...] is attractive.                                                                        |
|                            | The [...] is transparent                                                                        |
|                            | The [...] is efficient.                                                                         |
|                            | The [...] is dependable.                                                                        |
|                            | The [...] is stimulating.                                                                       |
|                            | The [...] is novel.                                                                             |
|                            | These six questions are asked in turn for robots, scene control, AV system and mobile control   |
| Usage Barriers [21]        | UB1: Smart hotel application is convenient because the application is clear and understandable. |
|                            | UB2: MPS is convenient because I can use it anytime.                                            |
|                            | UB3: MPS is convenient because I can use it in any situation.                                   |
|                            | UB4: MPS is convenient because it is not complex.                                               |

| Study Measures (Reference)        | Measurement Items                                                                                                   |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Value Barriers [21]               | VB1: Smart hotel applications offer many advantages compared with handling traditional matters in other ways.       |
|                                   | VB2: The smart hotel applications make the tour valuable.                                                           |
|                                   | The value of smart hotel applications is an effective way to travel in Pakistan.                                    |
| Risk Barriers [21]                | RB1: I fear that while I am using smart hotel application services, the connection will be lost.                    |
|                                   | RB2: I fear that while I am using smart hotel application, I might tap out the information of the app wrongly.      |
|                                   | RB3: While using smart hotel application, I am anxious about loss of privacy.                                       |
|                                   | RB4: I am fearful while using smart hospitality services, as third party might get access to my account information |
| Traditional Barriers [21,84]      | TB1: Conventional hotel services are enough for me.                                                                 |
|                                   | TB2: I think that conventional hotel services give a better feeling.                                                |
|                                   | TB3: I find it difficult to get some information about smart hotel application.                                     |
| Image Barriers [21]               | IB1: In my opinion, new technology is often too complicated to be useful.                                           |
|                                   | IB2: I have such an image that smart hotel services are difficult to use.                                           |
|                                   | IB3: I do not feel comfortable while using smart hotel application.                                                 |
|                                   | IB4: I would not feel safe providing information to smart hotel application.                                        |
| Tourist Behavioral Intention [85] | BI1: I expect my use of smart hospitality to increase in the future.                                                |
|                                   | BI2: I intend to use the smart hospitality in the future.                                                           |
|                                   | BI3: If I have an opportunity, I will use the smart hospitality services.                                           |
|                                   | BI4: I will always try to use the smart hospitality services.                                                       |
|                                   | BI5: I plan to use the smart hospitality frequently.                                                                |

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