Article
Development and Validation of the Smart Tourism Experience Scale
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Abstract: Smart technology has been introduced in the tourism industry for several decades. Nature-based tourism destinations contribute to environmental education and sustainable tourism. Tourism experiences have been extensively assessed in past research; however, no studies have clarified the conceptualization and research instruments of smart tourism experiences, especially in nature-based tourism contexts. To fill this research gap, the present study aimed to develop a valid scale to evaluate the smart tourism experience of nature-based tourists. In study 1, a 32-item research instrument was developed using a mixed approach. In study 2, overall, 897 valid questionnaires were obtained, and confirmatory factor analysis was employed to examine a reliable and valid 29-item scale. In study 3, this scale was cross-validated with 662 respondents for the calibration sample and 674 respondents for the validation sample. The criterion-related validity was also assessed by examining the correlations among five dimensions of the smart tourism experience and overall satisfaction and loyalty. When tourists visit a smart tourism destination, they are more likely to respect the natural environment and use smart technology applications, which provide useful information to plan itineraries and identify diverse and entertaining recreation experiences. Consequently, these applications increase their satisfaction and loyalty, thus assisting in the development of sustainable tourism. The present study extends the theoretical framework of smart tourism experiences to managerial implications by providing a conception and measure, filling the research gaps, and contributing significantly to the tourism literature.

Keywords: cross-validation; criterion-related validity; mixed method; nature-based tourism; scale development; smart tourism experience

1. Introduction

As information and communication technology (ICT) grows rapidly, the tourism industry has begun using it to improve management effectiveness and efficiency, and consequently tourists’ experience [1]. In the destination context, managers construct ICT infrastructures to make destinations smart. These ICT applications can be beneficial for managing destination resources [2], developing marketing strategies [3], innovating experience environments [4], and providing sharing platforms [5]. By providing online information, the industry can enable tourists to obtain relevant information about destinations and easily make suitable travel planning decisions and thereby enhance their tourism experience [6]. Accordingly, ICT can enable vital innovations in the tourism industry.

The tourism experience can be defined as tourists’ impressions of their entire trip [7]. It influences tourists’ satisfaction [8], affective commitment [9], and loyalty [10], and therefore has drawn attention in destination marketing [11]. From a sustainable tourism development perspective, the tourism experience enables tourists to obtain knowledge and empathy resources, which in turn may support environmental conservation [12]. Accordingly, the tourism experience is an important antecedent of tourists’ attitudes and behavioral intentions.
Smart tourism emerged from smart cities based on information services provided by ICT that enhance tourist satisfaction [13]. Through homepages, smart devices, Wi-Fi infrastructure, and apps, tourists may make travel plans while avoiding redundancy, share pictures of and feelings about the trip with friends and family at any time, and search for guidance immediately if they have problems while traveling [1,2]. Moreover, some destinations have actively introduced smart technology to enhance tourism experiences, such as augmented reality (AR), virtual reality (VR) [14–16], and intelligent guide systems [1,16].

Smart tourism differs from traditional tourism in travel planning, information searching, on-site experience, and posttrip memory sharing on social media and may provide different tourism experiences than traditional tourism [17]. In Taiwan, several nature-based tourism destinations have recently introduced ICT to improve the tourism experience and enhance the effectiveness of environmental education [15,16]. Although ICT has been widely applied in city tourism [13] and museum tourism [18], it remains heavily neglected in nature-based tourism. An examination of the attributes of smart tourism in the nature-based tourism context is thus warranted.

Identifying the elements of smart tourism experiences is meaningful for the following reasons. First, smart tourism provides smart technology applications for tourists’ on-site experiences (e.g., AR, VR, intelligent guide systems), so assessing the smart tourism experience can help smart device service providers precisely assess their service quality. Second, the perception of the smart tourism experience may influence tourists’ satisfaction [8] and future behavior [10], which are important. Third, for destination managers and marketers, identifying the elements of smart tourism experiences can enable them to focus on these elements to enhance tourists’ experience and satisfaction. Fourth, to evaluate the effectiveness of environmental education based on learning experience and environmental reflection, identifying the elements of the smart tourism experience in nature-based tourism contributes to sustainable tourism development. However, smart tourism is an innovative type of tourism, and there is limited research on its elements. Therefore, it is necessary to conceptualize the smart tourism experience and develop a research instrument.

The present study thus aims to conceptualize and develop a reliable and valid research instrument to measure the smart tourism experiences of nature-based tourists via three studies. Study 1 conceptualizes and develops a measurement using a mixed approach, study 2 tests the research instrument using reliability and construct validity, and study 3 uses two samples to examine the cross-validation and criterion-related validity of the research instrument.

2. Theoretical Framework

2.1. Research on the Smart Tourism Experience

The tourism experience is regarded as tourists’ complex interactions with destinations. It constitutes their holistic evaluation [19], which in turn influences their behavioral intention [7]. Pine and Gilmore [20] proposed that economic experience could be used to examine attributes of customer experiences (i.e., entertainment, educational, escapist, and esthetic) that have also been introduced as attributes of tourism experiences, such as feeling delight, learning something new, protecting the environment, and being immersed in tourism activities [7]. Several scholars have considered Pine and Gilmore’s [20] work to examine cruise passengers’ experiences [7], memorable tourism experiences [21], and lodging experiences [22].

Schmitt [19] proposed the concept of experiential marketing and identified five types of experiences, i.e., sensory, affective, cognitive, behavior, and social identity, which have been applied to brand experiences [23], low-carbon tourism experiences [24], and wildlife tourism experiences [25]. Schmitt [19] provided a theoretical framework for environmental education; when tourists come into contact with flora and fauna, their senses are aroused. Affective experience evolves to empathy, and cognitive experience makes tourists reflect on themselves, which in turn leads them to engage in environmentally responsible behavior [25].
Smart tourism uses many types of ICT to provide explicit information to stakeholders and offer unforgettable experiences for tourists [14]. To enhance tourism experiences in the smart tourism context, several studies have suggested tourism product recommendation systems (e.g., TripAdvisor) [5], VR/AR applications [4], social media [3], and search engines [26]. These smart technology applications provide useful information for tourists to plan their travel and have unforgettable on-site recreation experiences. By doing so, they increase tourists’ satisfaction and loyalty, which is crucial for destinations’ economic sustainability [7]. Although scholars have suggested that smart tourism improves the tourism experience and increase satisfaction and loyalty [1,13,18], a research instrument for the tourism experience using these ICT applications has not been the conceptualized and developed. Thus, investigating the attributes of smart tourism experiences is warranted.

Smart tourism introduces advanced smart technology into the tourism industry, which implies that its attributes may differ from those of the traditional tourism experience. Law et al. [27] reviewed smart tourism research and found that most used the technology acceptance model (TAM) [28]. Weaver and Moyle [29] argued that tourist dissonance is an obstacle to familiar smart innovation in the tourism industry. Perceptions of the usefulness and ease of using new technology affect its usage and tourists’ experience [30]. To create an excellent smart tourism experience, destination managers must consider the usefulness, ease of use, enjoyment, and interactivity of a smart system [18]. Thus, an overview of the concept of orientation-related smart tourism experiences is crucial. The proposed dimensionality of the smart tourism experience is addressed below.

2.2. Conceptualization of the Smart Tourism Experience

Smart tourism experiences involve tourism and smart technology application experiences; thus, drawing on the theoretical frameworks of the experience economy [20], experiential learning cycle [31], the experiential marketing [19], and the TAM [28], the attributes of smart tourism experience include aesthetics, VR/AR presence, usefulness, ease of use, hedonic experience, trust, and learning experience, which are described below.

2.2.1. Aesthetics

Aesthetics refers to tourists’ perceptions of the beauty and artistic value of tourist destinations [32]. Aesthetics has been widely debated with regard to recreation experiences including cruise passengers’ recreation experiences [7], experiential value [33], island-based tourism experiences [34], and nature-based tourism experiences [32]. Although aesthetic experience is crucial and has received considerable attention, empirical studies assessing the aesthetic experience of smart tourism are lacking.

Scholars have suggested that the aesthetic environment may affect tourists’ satisfaction [7,32,35], attitudes [12,34], and behavioral intentions [7,36]. In nature-based tourism, natural resources such as beautiful scenery could become the main tourist attraction. Through applications of ICT, tourists may be attracted by the visual appeal of homepages or platforms to have aesthetic experiences, which in turn arouse their emotions to form recreation satisfaction and loyalty toward the destination [32,36].

2.2.2. VR/AR Presence

VR refers to interactive images or videos that allow individuals to fully explore 360 degrees of a scene to experience a virtual environment in a unique and immersive way that connects them to it. Technological innovations have transformed the consumer retail experience [37], and new technology innovations, such as VR, can further enhance consumers’ physical and online shopping experience [38].

AR involves the application of computer technologies to generate a combination of virtual objects and a real-world environment and simulates individuals’ physical presence in the environment, allowing them to explore it [39]. Through VR/AR presence, tourists can exist in real and virtual environments at the same time [14,39].
Tourists can have more cognitive and affective responses when using VR/AR devices, which in turn increases their environmental knowledge and behavioral intentions [40]. Tourists who engage in VR/AR activities may improve their tourism experience, attitude, and overall behavioral intentions [14]. Overall, applying ICT technology in tourism will effectively improve the tourism experience. Thus, an examination of the dimension of VR/AR presence in smart tourism experiences is warranted.

2.2.3. Usefulness

Perceived usefulness refers to an individual’s use of a particular technology and the outcome (e.g., service quality and satisfaction) of the consumer experience in terms of inducing favorable feelings and interest [41]. In the tourism context, usefulness represents tourists’ perception that using the smart system at the destination will enhance their travel experience [28,36]. Based on the TAM [28], scholars have suggested that tourists adopt new technology when they perceive that it improves their experience [42]. In the ecotourism context, Lee and Jan [30] discovered that tourists’ perception of useful environmental knowledge will encourage them to engage in ecotourism behavior. By using ICT applications (e.g., recommendation systems, homepages, social media), tourists may solve problems or obtain information while traveling, which enhances their tourism experience, satisfaction, and behavioral intention [36]. Orden-Mejia and Huertas [43] indicated that the important attributes of smart technology applications should include providing useful information for tourists, which will influence tourist satisfaction. As such, the dimension of usefulness is significant in the smart tourism experience.

2.2.4. Ease of Use

Ease of use refers to tourists’ perception that using a smart system at the destination will be effortless [28,36]. Similar to usefulness experience, based on the TAM, ease of use is one of the factors that affects tourists’ adoption of new technology [28]. Tourists who perceive the interfaces of ICT applications (e.g., homepages, QR codes, self-guided interpretation) as easy to use may feel free to enjoy the applications, which in turn improves their experience, satisfaction, and behavioral intention [36]. Ease of use involves friendly interfaces for tourists to fully experience natural resources, which promote tourists to have a positive attitude toward the ICT applications and destinations [18]. The dimension of ease of use has been assessed in destination online platform experiences [36], 3D virtual world experiences [44], augmented reality experiences [45], and mobile hotel booking experiences [46]. Scholars have suggested that destination managers should ensure that smart technology applications are ease to use, which will lead to tourist satisfaction and loyalty [47]. Accordingly, ease of use is crucial in the smart tourism experience.

2.2.5. Hedonic Experience

Hedonic experience involves sensations of fun and pleasure derived from interactions with products [48]. In the tourism context, hedonic experience indicates that tourists perceive enjoyment while using ICT applications at the destination. It can typically be considered a component of recreation experiences in tourism, such as the entertainment experience in cruise tourism [7] and community-based tourism [12], hedonic experiences in service experiences in tourism [49], enjoyment in entertainment tourism [50], and hedonism in memorable tourism experiences [21]. Accordingly, hedonic experience is an important attribute of the tourism experience. ICT applications such as VR/AR activities and self-guided interpretation use interactive processes to increase tourists’ psychological enjoyment and satisfaction; thus, a hedonic experience is generated [18]. The findings of tourists’ enjoyment of VR confirms that smart tourism creates a hedonic experience for tourists [51]. Consequently, hedonic experience could be a crucial dimension of the smart tourism experience.
2.2.6. Trust

Trust can be defined as an individual’s attitude that contributes to his or her assessments of trustworthiness when buying an object [52]. Based on the trust-building model [53], consumers’ online transaction intention depends on their trust in the platform and the vendor. In the tourism realm, the trust experience refers to tourists’ perception of the reliability, ability, integrity, and honesty of ICT applications, which involves online service and data exchange. Recently, breaches of personal data security have drawn considerable attention [54]. Trust, which also applies to information on the platform and recommendation service provision, results from being reliable and meeting tourists’ needs on time, which may lead tourists to make suitable decisions [36]. The dimension of trust has been widely elucidated with regard to Airbnb platforms and hosts [55], and destination platforms [36]. Trust makes tourists and other stakeholders perceive themselves as safe in their tourism experiences [56]. As privacy concerns grow, tourists are limiting personal information disclosure while using smart technology applications; thus, trustworthy smart technology applications are vital [57]. Accordingly, the trust factor is essential to effectively conceptualize the smart tourism experience.

2.2.7. Learning Experience

Learning experience refers to tourists learning new information by using ICT applications while traveling. Based on experiential learning cycle theory, behavior change can occur when a person experiences, reflects, thinks, and acts [31]. According to the experience economy [20] and experiential marketing [19], since a tourism destination attracts tourists who want to learn something new, tourists’ cognitive response is a crucial part of the tourism experience, such as education in cruise experiences [7] and nature-based tourism experiences [34], low-carbon tourism experiences [24], and reflective engagement in wildlife tourism experiences [25, 58]. In nature-based tourism, prompting learning experiences for tourists will lead to enhanced tourists’ site-specific environmentally responsible behavior [34]. Through ICT applications such as platforms and recommendation systems, tourists acquire useful knowledge and new ideas online that influence their future behavioral intention [59]. Smart tourism can create a knowledge-seeking experience for a tourist and consequently an enhanced customized learning experience [60, 61]. The learning experience is an important factor in changing a tourist’s behavior (e.g., adapting a smart tourism mode). Learning experience is thus an important part of the smart tourism experience.

Based on the above theoretical background, we conduct three empirical studies to effectively conceptualize the smart tourism experience and develop a measurement scale, which is described below.

3. The Empirical Study

3.1. Study 1: Conceptualization and Development of the Research Instrument

3.1.1. Methods

First, according to suggestions by DeVellis [62], and Lee and Jan [24], this study developed valid measurement items for the smart tourism experience using constructs (and measurement items) of smart tourism experiences that were obtained from the relevant literature via various databases and academic journals. Relevant papers were collected using keywords such as smart tourism, smart tourism experience, sustainability, aesthetic experience, social experience, trust experience, VR/AR experience, hedonic experience, utilitarian experience, prestige experience, economic experience, and smart tourism consciousness.

Second, to ensure and reconfirm that the concepts and measurement items were suitable for the smart tourism experience, a focus group was convened [63]. Six experts in smart tourism were recruited and invited to participate in a focus group from 15:00–16:30 on 25 September 2020, to discuss their theoretical and practical opinions on the smart tourism experience with regard to the dimensions and measurement items.

Third, the importance and appropriateness of the obtained measurement items were assessed using the Delphi approach [64]. A fuzzy Delphi questionnaire survey was con-
ducted to elucidate the concept and items of the smart tourism experience. Using fuzzy set theory can improve the traditional Delphi approach by effectively avoiding distortion in different expert opinions and clearly expressing the semantic structure of the predicted measurement items [65]. Eleven experts (including five professors, three managers, three government officials interested in smart tourism and three tourism managers) were selected to complete the fuzzy Delphi survey between October and November 2020. All the consensus values were identified by two triangular fuzzy numbers [66].

3.1.2. Results

Based on an intensive search for the abovementioned keywords, 50 academic papers with relevant content were collected that were suitable for the conceptualization and measurement of the smart tourism experience. Overall, 76 items were obtained; 36 items were removed due to similar meanings, unsuitability to Taiwanese culture, or unrelated tourism experience attributes, leaving 40 items. Considering the measurement items that belonged to the original construct and were characteristic of the smart tourism experience, these 40 items were classified into seven constructs: aesthetics, VR/AR presence, usefulness, ease of use, hedonic experience, trust, and learning experience.

Based on the results of the focus group by investigator triangulation, seven constructs with 40 measurement items were confirmed. Twelve items were discussed and revised to improve their comprehensibility. Three items were removed based on the experts’ suggestions in response to the analytical results of the first round of the fuzzy Delphi survey. Since seven items could not achieve consensus, a second round of fuzzy Delphi surveys was performed. In the second round, three items were dropped due to the lowest consensus values determined by the scree plot. To ensure that tourists could easily access the smart tourism experience services provided by nature-based destinations, we conducted a field survey by interviewing several tourists and managers of nature-based destinations. Based on the field survey, two items were deleted. Consequently, the research instrument for study 2 comprised 32 items.

3.2. Study 2: Reconfirming and Examining the Research Instrument

3.2.1. Methods

Study area—First, to acquire representative samples of smart tourism, information on 53 nature-based tourism destinations was studied. Based on providing smart tourism experiences through fan pages on Facebook, mobile applications, AR, VR, beacons, robot applications, automated tourism services, the application of big data, e-shopping, and QR code scanning to connect to a website, six nature-based destinations with more than seven smart tourism devices were identified. Next, field studies regarding the operational status of these smart tourism devices and services were conducted to reconfirm that they generated smart tourism experiences. To assess the research instrument obtained by study 1, the Sun-Moon-Lake National Scenic Area (SMLNSA) was selected as the study site for data collection. The SMLNSA (23°51′4″ N, 120°54′8″ E), located in the central part of Taiwan, is an internationally famous tourism destination, and most Taiwanese have visited it at least once. It is an attractive and typical nature-based tourism destination in Taiwan and offers diverse smart tourism opportunities for visitors (see also Figure 1).

Research instrument—A pilot study was performed at the SMLNSA on 20 and 21 November 2020, using the 32 items obtained in study 1. Overall, 131 useful questionnaires were obtained using a systematic sampling method (every 10th tourist was sampled) [67]. All the questionnaire items were assessed by item analysis. Based on comments from ten tourists, five items were revised. Finally, according to suggestions by four experts, three items were removed because they did not meet the criteria for item analysis or were not suitable. Six measurement items were revised to further clarify their meanings. Accordingly, a 29-item scale was developed. The formal questionnaire consisted of seven dimensions: aesthetics (4 items), VR/AR presence (4), usefulness (4), ease of use (3), hedonic experience (7), trust (3), and learning experience (4). Responses to the questionnaire items were...
assessed by a seven-point Likert scale, with “completely disagree” recorded as one and “completely agree” recorded as seven.

Figure 1. Location map of study areas and survey sites.

Data collection—The data collection was conducted between late November 2020 and early January 2021 by eight trained research assistants. The sampling site was at Xiangshan Visitor Center, which has several smart tourism experiences and frequent visitors. Employing a systematic sampling method, every 10th visitor was sampled between 10:00 and 17:00. In total, 897 useful questionnaires were collected.

Statistical analysis—The Cronbach’s alpha scores for the dimensions of aesthetics, VR/AR presence, usefulness, ease of use, hedonic experience, trust, and learning experience were 0.911, 0.925, 0.931, 0.905, 0.956, 0.875, and 0.913, respectively. All the scores exceeded the benchmark of 0.70, illustrating that the research instrument had acceptable internal consistency to evaluate the items with the same latent variables [62]. Confirmatory factor analysis (CFA) using LISREL 8.80 for Windows was employed to assess the reliability and validity of the overall measurement model. Competitive models analyzed by CFA were carried out to evaluate the model’s effectiveness. The measurement model was evaluated by testing the model fit, composite reliability, convergent validity, and discriminant validity of the constructs.

3.2.2. Results

Validity of the measurement model—The chi-square ($\chi^2$) value was 1435.34 (d.f. = 354, $p < 0.05$), suggesting that the measurement model and the data did not fit well because of the large sample size, which may affect the $\chi^2$ value. Other model fit indices were employed to
evaluate the measurement model, including a $\chi^2/df$ of 4.05, adjusted goodness of fit index (AGFI) of 0.88, non-normed fit index (NNFI) of 0.99, comparative fit index (CFI) of 0.99, root mean square error of approximation (RMSEA) of 0.058, and standardized root mean square residual (SRMR) of 0.044. Accordingly, the measurement model fit the sample [68].

Table 1 illustrates the factor loading ($t$-value), the average variance extracted (AVE) values, and the composite reliability (CR) for the seven dimensions. All the CR values exceeded 0.6, suggesting that this measurement model had acceptable internal consistency. The measurement achieved convergent validity at the item level since all the factor loading values exceeded 0.5 and reached the significance level ($t > 1.96, p < 0.05$), thereby providing acceptable convergent validity [68]. All the intercorrelations ranged from 0.53 to 0.82, which were less than the criterion of 0.85 and below the values of the square root of the AVE, thus suggesting that the model had acceptable discriminant validity Table 2 [69].

<table>
<thead>
<tr>
<th>Latent Variables</th>
<th>Factor Loading</th>
<th>AVE</th>
<th>CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The design of the smart platform looks aesthetic</td>
<td>0.64</td>
<td>0.68</td>
<td>0.89</td>
</tr>
<tr>
<td>This smart tourism experience is full of charm with its landscape resources</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience inspires my curiosity about natural scenery</td>
<td>0.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience inspires my imagination of natural scenery</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VR/AR presence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel like I was actually there in the VR environment</td>
<td>0.84</td>
<td>0.75</td>
<td>0.92</td>
</tr>
<tr>
<td>I felt as though I was physically present in the VR environment</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It seemed as though I actually took part in the action of the VR things that I do</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt as if I am part of the virtual environment</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usefulness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the smart platform enables me to find the information more quickly</td>
<td>0.80</td>
<td>0.76</td>
<td>0.93</td>
</tr>
<tr>
<td>Using the smart platform enhances my travel effectiveness</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the smart platform makes my journey smoother</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The smart platform is useful during the journey</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ease of use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is easy to use the smart platform</td>
<td>0.87</td>
<td>0.76</td>
<td>0.91</td>
</tr>
<tr>
<td>This smart platform is easy to learn how to use</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is easy to get the smart platform to do what I want it to do</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedonic experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience is nice</td>
<td>0.89</td>
<td>0.76</td>
<td>0.96</td>
</tr>
<tr>
<td>This smart tourism experience is fun</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience makes me very happy</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoy the smart tourism experience</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience is exciting</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience is immersive</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The smart platform looks trustworthy</td>
<td>0.85</td>
<td>0.72</td>
<td>0.89</td>
</tr>
<tr>
<td>I can use this smart platform to control the quality of my travel</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I trust the reliability of information found on this smart platform</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive/Learning Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learned something new during this smart tourism experience</td>
<td>0.80</td>
<td>0.73</td>
<td>0.91</td>
</tr>
<tr>
<td>This smart tourism experience allows me to keep up with new ideas and innovation</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This smart tourism experience enables me to come up with new ideas</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am being educated and informed effectively through this smart tourism experience</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All the $t$-value of factor loadings larger than 1.96. AVE: Average variance extracted = $(\Sigma \lambda^2)/[(\Sigma \lambda^2 + \Sigma \theta)]$. CR: Composite reliability = $(\Sigma \lambda^2)/[(\Sigma \lambda^2 + \Sigma \theta)]$ [63].
Table 2. Correlation matrix of the seven dimensions.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aesthetics</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. VR/AR presence</td>
<td>0.79</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Usefulness</td>
<td>0.64</td>
<td>0.52</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ease of use</td>
<td>0.61</td>
<td>0.53</td>
<td>0.82</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Hedonic experience</td>
<td>0.74</td>
<td>0.72</td>
<td>0.70</td>
<td>0.75</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Trust</td>
<td>0.69</td>
<td>0.61</td>
<td>0.75</td>
<td>0.77</td>
<td>0.76</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>7. Cognitive/Learning</td>
<td>0.69</td>
<td>0.66</td>
<td>0.67</td>
<td>0.68</td>
<td>0.76</td>
<td>0.79</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Diagonal values indicated the square root of average variance extracted of each dimension.

3.3. Study 3: Cross-Validation and Criterion-Related Validity

3.3.1. Method

Study areas—Two study areas (i.e., the SMLNSA and Yangmingshan National Park (YNP)) were chosen because they are famous nature-based tourism destinations with diverse smart tourism experiences. The SMLNSA is described in study 2, while the YNP is described below.

Located in northern Taiwan, the YNP (121°33′52″ E, 25°10′00″ N; elevation 200–1120 m a.s.l.) is famous internationally for its wealth of unusual volcanic features and topography. It is a popular tourist attraction that features diverse natural resources, recreation opportunities, and various smart tourism opportunities for nature-based tourists. The YNP Visitor Center and Lengshuikeng Recreation Area are the most popular attractions and are famous for their natural resources and interpretation services (see also Figure 1).

Research instrument—The research instrument from study 2 was used. To test the criterion-related validity of this smart tourism experience scale, overall satisfaction and loyalty were also recorded. Based on Lee [70], satisfaction was measured by a single-item seven-point rating scale (from 1 for “completely unsatisfactory” to 7 for “completely satisfactory”) by asking the respondents to evaluate their overall satisfaction with these smart tourism experiences. According to the findings of Kyle et al. [71], loyalty was assessed by a two-item seven-point rating scale by asking the respondents to indicate their revisit and recommendation willingness (from 1 for “very low” to 7 for “very high”). Another item asked, “In a typical year, how many times do you visit this nature-based destination?”, which was graded on a 7-point Likert scale from 1 for “one time” to seven for “seven times or above”.

Data collection—Questionnaire surveys were conducted between 16 January and 31 January 2021, at the SMLNSA and between 28 February and 18 April 2021, at the YNP. Eight trained assistants conducted the questionnaire survey. The sampling sites were the SMLNSA’s Xiangshan Visitor Center and the YNP’s Visitor Center and Lengshuikeng Recreation Area, which have several smart tourism experiences and large numbers of visitors. Visitors were sampled by a systematic sampling method (i.e., every 10th visitor was sampled) during daylight hours. In total, 662 valid questionnaires were obtained in the SMLNSA, and 674 valid questionnaires were obtained in the YNP.

Data analysis—To evaluate the cross-validation of the research instrument found in study 2, we tested the two samples (i.e., the SMLNSA and the YNP). The SMLNSA respondents were the calibration sample, and the YNP respondents were specified as the validation sample. The statistical procedure was described in study 2.

To assess the criterion-related validity of the smart tourism experience, this study applied overall satisfaction and loyalty, which have a positive correlation with the smart tourism experience [8,10]. Thus, the criterion-related validity was evaluated by testing the relationship between each dimension of the smart tourism experience and satisfaction and loyalty.

3.3.2. Results

Using the loose, moderate, and tight strategies, the contributions to the χ² for the cross-validation models were 47.64%, 47.61%, and 47.97%, respectively (Table 3), indicating that replication between the calibration and validation models could be examined.
Table 3. Model fits of the cross-validation model for the calibration (SMLNSA) and validation (YNP) samples in study 3.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Minimum Fit Function χ² (df)</th>
<th>Normal Theory Weighted Least Square χ² (df)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>ECVI</th>
<th>Contribution to Chi-Square %</th>
<th>Minimum Fit Function χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose Replication</td>
<td>2066.45 (712)</td>
<td>2097.85 (712)</td>
<td>0.91</td>
<td>0.054</td>
<td>1.81</td>
<td>984.43 (712)</td>
<td>47.6</td>
</tr>
<tr>
<td>Moderate Replication</td>
<td>2083.90 (741)</td>
<td>2114.67 (741)</td>
<td>0.91</td>
<td>0.053</td>
<td>1.78</td>
<td>992.23 (741)</td>
<td>47.6</td>
</tr>
<tr>
<td>Tight Replication</td>
<td>2237.52 (791)</td>
<td>2271.23 (791)</td>
<td>0.90</td>
<td>0.053</td>
<td>1.82</td>
<td>1073.26 (791)</td>
<td>48</td>
</tr>
</tbody>
</table>

The Δχ² value for the models when moving from loose replication to moderate replication was 17.50 (d.f. = 29, p > 0.05), suggesting that the two samples had equivalent factor loadings. Based on the fit indices (SRMR and ECVI), moderate replication resulted in a better model fit to the data than loose replication. The Δχ² value between moderate replication and tight replication was 153.57 (d.f. = 50, p < 0.05), indicating significant differences between the two samples. Furthermore, the fit indices (GFI and ECVI) illustrated moderate replication and revealed a better model fit to the data than tight replication. Accordingly, cross-validation with moderate replication was adopted.

The influence analysis results indicated that aesthetics, ease of use, hedonic experience, trust, and learning experience were significantly related to overall satisfaction directly and to loyalty indirectly and VR/AR presence and usefulness were not (Figure 2). Moreover, the squared multiple correlation was 0.41 for overall satisfaction, suggesting that 41% of the variance of overall satisfaction may be attributed to the smart tourism experience, while the squared multiple correlation was 0.56 for loyalty, indicating that 56% of the variance in loyalty may be attributed to the smart tourism experience and satisfaction. Thus, the criterion-related validity of the smart tourism experience scale was confirmed.

Figure 2. The relationships among smart tourism experience, satisfaction, and loyalty.
4. Discussion

4.1. Theoretical Implications

Following the studies by Dedeoğlu et al. [72], DeVellis [62], Ghosh and Mandal [73], Guan et al. [74], and Zhang et al. [75], the smart tourism experience was conceptualized by a literature review and focus group, and its scale was developed using the fuzzy Delphi approach. Two empirical surveys with 2233 respondents (i.e., study 2: 897; study 3: 1336) were analyzed to identify the convergent validity, discriminant validity, cross-validation, and criterion-related validity. Thus, the conceptualization, scale development, and validation of the smart tourism experience were rigorous and provide deep insight into the theoretical implications of smart tourism from the perspective of nature-based tourists.

This study’s findings generate a first-order seven-factor model consisting of a 29-item scale to assess the smart tourism experience, extending knowledge of economic experience [20], experiential marketing [19], the TAM [28], technological innovations transforming the consumer retail experience [36], the trust-building model [53], and experiential learning cycle theory [31]. Developing the understanding of the smart tourism experience is of great value to academic research and extends the knowledge in the smart tourism literature.

The tourism experience involves the interaction between tourists and a set of tourism elements (e.g., destination environment, infrastructures, and activities) [76]. In other words, different sets of tourism elements may shape different tourism experiences [7]. For example, in wildlife tourism in an environmental education context, managers aim to arouse more environmental attitudes and behavior among tourists, and reflective engagement is crucial [25]. Unfortunately, although ICT has been increasingly introduced in the tourism industry, the attributes of the smart tourism experience have not been identified. ICT enables tourists to have novel interactions by exploring the environment, infrastructure, and activities of destinations. These smart technological applications include social media, VR/AR applications, QR codes, and recommendation systems, which may provide different experiences from traditional tourism.

Based on the attributes of the smart tourism experience, monitoring and managing ICT could contribute to tourists’ experience and assist in destination management (e.g., electronically guarded entrances, tourist-flow monitoring, and crowd handling) [1]. This study is a first attempt to present concepts, validate constructs, and measure the smart tourism experience in nature-based tourism destinations, which is beneficial to the management of these destinations. By conceptualizing and developing a scale for smart tourism experiences, the present study fills research gaps and potentially contributes to the literature.

Nature-based tourists who appreciate natural resources using ICT can enhance their perception and enjoyment of natural resources’ beauty, which is similar to aesthetics and entertainment (i.e., hedonic experience) in the experience economy [20] and cruise tourism [7]. Through smart technology applications (e.g., beacons, QR codes, online ecological interpretation), tourists may experience online environmental services while visiting nature-based tourism destinations, which helps them obtain environmental knowledge and subsequently fosters their reflection and new ideas (i.e., learning experience).

The learning experience is crucial in environmental education [30], consistent with the cognitive component of experiential marketing [19], low-carbon tourism experiences [24], and wildlife tourism experiences [25,58]; thus, it is crucial in environmental education for smart tourism. Moreover, smart tourism involves novel technology, and tourists evaluate technology’s ease of use and usefulness while traveling, which may affect their tourism experiences [18]. Smart tourism that introduces novel experiences (e.g., AR, VR) via VR/AR presence experience could affect tourists’ behavioral intentions [14]. Finally, the trust experience of smart tourism experiences relates to the system’s integrity, reliability, and ability, which influence tourists’ perceived value and future behavioral intentions [36]. Consequently, this study’s examination of the smart tourism experience involves both traditional and novel technology tourism experiences, contributing a better understanding of smart tourism experiences to the literature.
Most research instruments for conceptualizing and measuring the tourism experiences of tourists have been developed in Western countries \cite{7,73,77,78}. Because cultural and racial differences affect individuals’ tourism experiences \cite{79}, developing a research instrument to assess smart tourism experiences among nature-based tourists in Eastern countries is a priority. Taiwan’s nature-based destinations, such as the SMLNSA and the YNP, provide diverse opportunities for smart tourism experiences, and conceptualizing and developing a research scale is thus crucial to address current tourism issues \cite{15,16,80}. Nature-based tourists can have smart tourism experiences by actively participating in the creation of smart tourism destinations. Consequently, this study assessed samples at the SMLNSA and the YNP in Taiwan to show that conceptualizing and developing a scale for the smart tourism experience is valuable to fill the research gap and extend the theoretical framework of the smart tourism experience.

4.2. Managerial Implications

The applications of smart technology in tourism have expanded recently, forcing destinations to introduce ICT to attract tourists and manage and market destinations. Identifying smart tourism experiences can help managers design appropriate marketing and sustainable development strategies \cite{7,12,13,34}. By using this 29-item scale framework, managers and marketers may identify tourists’ perceived value of smart technology provided by destinations, which may provide references to evaluate tourism development in the future.

Because smart technology relies on serviceable devices, managers should ensure that all smart technology devices at destinations (e.g., homepages, social media, VR/AR, QR codes) work smoothly, providing tourists with excellent smart tourism experiences. If these smart devices do not work correctly, visitors may not be able to promptly find information or participate in VR/AR activities, which may negatively affect their smart tourism experience. Moreover, without this information, this environmental knowledge, and these activities, tourists may not have a positive smart tourism experience, which will decrease their satisfaction and loyalty and subsequently have a negative effect on the promotion of sustainable tourism \cite{13}.

To promote environmental education in nature-based tourism destinations, managers may apply ICT to design self-guided interpretive systems to replace personal interpreters. Moreover, in some remote areas, using ICT for self-guided interpretive systems and emergency systems is crucial and cost-saving \cite{81}.

To promote and market smart tourism destinations, managers can apply the smart tourism experience scale in the present study to design attractions that offer unique aesthetics, VR/AR presence, usefulness, ease of use, hedonic experience, trust, and learning experiences. Smart tourism can be a future development trend. Ultimately, generating a sense of these smart tourism experiences will benefit tourism development for destinations. Managers and markets of nature-based destinations can utilize the seven-dimension 29-item scale of smart tourism experience to establish smart tourism experience programs as destination attractions and develop a new model of tourism opportunities.

Enhancing the tourism experience to increase tourist satisfaction and loyalty has been assessed as an effective marketing strategy for tourism \cite{7}. In addition, according to this study’s influence analysis for criterion-related validity, tourists’ smart tourism experience may be a crucial precedent of satisfaction and loyalty. Managers may thus provide aesthetic platforms to showcase natural resources with bright colors, layouts, and icons, which may increase tourists’ appreciation of natural resources and delight \cite{36}. Moreover, delivering trustworthy information, protecting personal information, and ensuring online transaction security will encourage tourists’ positive emotions toward destinations \cite{54,55}. Additionally, designing a friendly system interface (e.g., ease of use) to help tourists become immersed in natural resources will drive tourists’ satisfaction and loyalty \cite{18,36}.
4.3. Conclusions

Although tourism experiences have been extensively assessed in past research [12,19,20,24,25], no studies have clarified the conceptualization and research instruments of smart tourism experiences. The present study rigorously developed and tested a 29-item reliable and valid scale of smart tourism experience using mixed methods. By applying the current study’s theoretical framework, researchers and managers of tourism destinations can focus on smart tourism experiences to promote sustainable tourism. The current study thus contributes significantly to the academic literature on tourism.

When tourists visit a smart tourism destination, they are more likely to respect the natural environment and use smart technology applications, which provides useful information to plan their itineraries and identify diverse and entertaining recreation experiences (such as aesthetics, ease of use, hedonic experience, trust, and learning experience). As a result, these applications increase their satisfaction and loyalty, thus helping develop sustainable tourism. Consequently, the findings of this study extend the theoretical framework for smart tourism experiences into the operational realm of tourism management by rendering smart tourism experiences perceptible and assessable, which represents a potentially significant contribution to the academic literature.

Although this study is a first attempt to conceptualize the smart tourism experience in nature-based tourism and develop a research instrument to evaluate it effectively, knowledge of the precedents and antecedents of the smart tourism experience remains limited. When applying this study’s theoretical framework, future research is strongly recommended to develop theoretical frameworks for how technology attachment [82], authentic experience [83], tourism image [84], and environmentally responsible behavior [85] relate to the smart tourism experience by employing long-term consequence approaches. Our development of the theoretical framework for smart tourism experiences to extend the understanding of smart tourism will assist in developing sustainable tourism. Moreover, examining how tourists’ smart tourism experiences impact sustainability is strongly encouraged in addition to assessing how smart tourism experiences impact the carbon footprint [85] and the low-carbon tourism experience [24]. That is, can the smart tourism experience contribute to environmental sustainability, and how should the promotion of smart tourism experiences relate to tourists’ low-carbon experiences and environmentally responsible behavior to contribute to sustainable tourism?

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