ENHANCING SUSTAINABLE RELIGIOUS TOURISM THROUGH SMART TOURISM TECHNOLOGIES: EVIDENCE FROM HERITAGE SITES IN PAKISTAN

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Abstract

This paper examines how smart tourism technologies (STTs) can benefit sustainable tourism and enhance the visitor experiences at Pakistani religious heritage sites. The study proposal will attempt to identify tourists' perceptions of new technologies and their effects on visiting Kartarpur, Multan, and Uch Sharif. The questionnaire was planned, and researchers surveyed 499 domestic and international tourists. SAS upheld the original analysis, and the PLS-SEM was used in SmartPLS 4. The results show that tourists are more likely to experience a pleasant stay, learn more about the culture, and enjoy their visit with STTs, which will result in a desire to visit again and suggest the attraction sites to others. According to the research, the greater the positive experience with technology, the more positive the support for sustainable tourism. Nevertheless, future studies must apply different places and procedures, as the outcomes vary with the surveyed areas and the respondents' responses. STTs should be incorporated in the planning and policy of religious tourism in order to make sure that it is sustainable, enhances the satisfaction of the tourists, and aids in the preservation of historic sites. In this instance, the PLS-SEM analysis has facilitated a novel insight into the relationship between sustainability, tourism, and technology in Pakistan.

Keywords: Smart Tourism Technologies, Sustainable Tourism, Religious Heritage, Memorable Travel Experiences, Pakistan, Cultural Tourism

INTRODUCTION

Pakistan is a nation that boasts of various natural sceneries, a myriad of historical sites, and a rich cultural heritage that attracts a lot of tourists. Over the past years, the tourism sector in Pakistan has been performing well, which has positively influenced the country's economy and enabled people to understand the various cultures in the country. Pakistan is also blessed with Himalayan attractions, which start at the Arabian Sea on the southern coast and extend northwards. The presence of the Badshahi Mosque in Lahore and Mohenjo-Daro also adds more value to Pakistan geographically (Raza et al., 2024). This has enabled the tourist industry to continue despite Pakistan's security problems. In 2023, there were nearly 1.9 million foreign tourists, a stable increase over 2022. The country relied heavily on tourism as one of its key sources of earnings since it contributed to its revenue to 1.1 billion dollars. The emphasis on domestic tourism has worked out to the advantage of the business (Hussain et al., 2024). Citizens are travelling to Pakistan in larger numbers than before. By providing support to the government for less popular plans and cultural activities, the government attracts national and international tourists to the numerous unique attractions in Pakistan (Arshad et al., 2018). The tourism industry in Pakistan is keeping up with the world's current technology.

Religious tourism is an essential branch of the economy because both Pakistani and international tourists visit the Data Darbar and Lal Shahbaz Qalandar shrines. Pakistan is embracing smart tourism technology in order to maintain the same traditions and enhance sustainability. Although other nations adopt new technologies in the tourism industry, the application of these technologies in Pakistani religious tourism is insufficiently studied (Ahmed et al., 2022).

This paper evaluates the potential of smart tourism technology to improve the sustainability and repeat visits to the Pakistani religious tourism industry. Chaieb (2025) shows that the integration of the characteristics of STT, i.e., access to information, interactivity, personalisation, and security, can lead to an improved travel experience and the adoption of environmentally friendly strategies. This review discusses the roles played by tourist behaviours, responsiveness to travel, memorable experiences, and technology to maintain a tie with specific destinations. The relationship between smart tourism technology (STT) and sustainability is mediated by using academic sources that demonstrate the adoption and implementation process (Nawaz & Iqbal, 2025). The tastes and experiences of tourists affect this relationship (Sankar & Ilangovan, 2025). This creates questions regarding introducing innovation to religious tourism and the success of new practices in developing cultural awareness and advantages.

Research Question

After reviewing the literature and identifying study gaps, the researcher developed the research question:

i. What are the effects of smart tourism technology towards sustainable tourism?
ii. How does smart tourism technology influence sustainable tourism?
iii. Does technology adoption and implementation mediate the relationship between smart tourism technology and sustainable tourism?
iv. Does perceived enjoyment and implementation mediate the relationship between smart tourism technology and sustainable tourism?
v. How do tourist behaviour and preferences moderate the relationship between smart tourism technology and sustainable tourism?
vi. How does a memorable travel experience moderate the relationship between smart tourism technology and sustainable tourism?

Research Objectives

i. To determine the impacts of Smart Tourism Technologies on sustainable tourism.
ii. To establish how Smart Tourism Technologies affect sustainable tourism.
iii. To determine the mediation by technology adoption and implementation between Smart tourism technologies and sustainable tourism.
iv. To determine the mediation by perceived enjoyment and the implementation of Smart tourism technologies and sustainable tourism.
v. To investigate the moderating effect of tourist behaviour and preferences between Smart Tourism Technologies (STTs) and sustainable tourism.
vi. To examine the moderating effect of memorable travel experiences on the association between Smart Tourism Technologies (STTs).

Review of Literature

Smart Tourism Technologies (STTs)

These digital tools and applications add features to make tourism more enjoyable. For example, big data, AI, mobile technology, AR/VR and social media account for these changes. Neuhofer et al. (2015) explained the basic idea of smart tourism technology by stressing the use of ICTs to create personalised tours. Big data allows the analysis of travellers' preferences and the prediction of demands occurring right now (Baogang, 2020). With help from AI and big data, it is now possible to offer personalised tours and travel services (Gretzel & Zheng, 2020). Nowadays, it is easy for tourists to stay in touch and share experiences using their smartphones at any time, from any place (Kim & Tussyadiah, 2013). Services such as TripAdvisor and social media allow tourists to share and read reviews, which helps influence the image and decisions of travellers. On the other hand, AR and VR make exploring places before and during your trip much more exciting. The authors argued that there are four main parts of STTs: information, being accessible, interactive components and personalised content. Later, certain studies added security to the main elements to be considered (Huang et al., 2017).

Sustainable Tourism

In sustainable tourism, all three areas of economy, society and environment are balanced to meet the needs of both tourism and communities without wasting resources for others to come (WTO, 2005). Today, being sustainable gives tourism businesses an edge over others in the industry (Yan & Jia, 2021). González-Rodríguez and Tussyadiah (2022), prove that mental and emotional activities influence tourists' sustainable actions. The book shows the importance of including sustainability in every decision made in tourism. Basically, the report revealed that 69% of international tourists search for travel choices that have a positive impact on the environment. In Pakistan, OTAs like sastaticket.pk and booking.com join forces with other companies to introduce projects that effectively support the local community (Saleem et al., 2021).

Technology Adoption and Implementation

Though technology adoption looks different in every country, nearly all people now use technology because of the skyrocketing use of the Internet and smartphones (Poushter, 2016). Destinations at the forefront of tourism introduce technology to boost their services and tourism experiences (Huang et al., 2017). Early adopters set positive examples for others, and all groups use technology in their day-to-day travels. The travel business has included smart features for planning, navigating, booking, and real-time communication.

Perceived Enjoyment

Experiencing enjoyment in technology encourages more people to adopt it. According to Davis et al. (1992), the idea of perceived enjoyment involves how enjoyable it is to use technology, no matter how efficiently it works. When self-service kiosks and mobile guides are used in tourism, they improve the level of user enjoyment and satisfaction (Brown & Chalmers, 2003; Chang & Yang, 2008). Goodhue argued in 1988 that there is a lack of emotional elements in information system research, an area that tourism scholars are keen to fill.

Tourist Behaviour, Preferences, and Memorable Experiences

When tourists use STTs, it improves efficiency, helps share information and enhances their satisfaction, leading to better intentions to behave while travelling (Carbonell & Rodriguez Escudero, 2015). An MTE is an experience that leaves a strong impact and remains memorable. They noted that MTEs are important for the development of destination loyalty. As people aim to have one-of-a-kind experiences, STTs make it possible (Dredge, 2022).

Religious Heritage Tourism in Pakistan

The country's sacred places help attract religious tourists and contribute to preserving its cultural heritage. Distinctive tourism activities at religious heritage places centre around history, faith and architecture. Due to the Kartarpur Corridor, Sikh pilgrims can visit Gurdwara Darbar Sahib without visas, which promotes good relations between people of different faiths (Akhtar et al., 2019). Shrines found in Multan include those of Bahauddin Zakariya, Shah Rukn-e-Alam and Shah Shams Sabzwari, earning it the name "City of Saints". Many people attend these shrines as pilgrims or tourists because of their attractive look and Sufi influence (Del Bo & Bignami, 2014; Gillani, 2024). Uch Sharif has a significant history of spiritual importance, adding to Pakistan's reputation as a popular place for religious tourists (Ali, 2025).

MATERIALS AND METHODS

Theoretical Framework

The study relies on the Technology Acceptance Model (Davis et al., 1992) and the Stimulus-Organism-Response (S-O-R) Framework. According to TAM, people use or accept technology when they consider it useful and user-friendly. We can also add enjoyment and personalisation as ways they feel about using the technology. Under this model, STT is the stimulus, the interaction with technology is positioned as the organism, and the response is the sustainable behaviour. The framework provides a way to explore the impact of different attributes of STTs on people's thoughts and feelings and their resulting behaviours relating to sustainability.

Research Methodology

The research was done using a cross-sectional survey as the primary data collection method. Participants in the study were given a prepared questionnaire to answer if they had ever used smart technology during travel. Researchers measured the constructs using scales designed in previous studies and adapted them for tourism. SmartPLS PLS-SEM was preferred to analyse our data, as it efficiently handles mediation and moderation effects in exploratory research (Nallaluthan et al., 2024). The number of cases involved in the study was larger than the minimum necessary for PLS-SEM, as it gave the test good statistical power. The measurement model was found to be valid and reliable, so the structural model analysis was performed next; its results are described below.

FINDINGS

Descriptive analysis was conducted using SPSS software to understand the demographic and travel-related characteristics of the respondents. Out of 499 participants, the majority were male (76.6%), with females comprising 23.4%. Most respondents were aged between 36–45 years (48.7%), followed by 26–35 years (22.2%) and 18–25 years (21.0%). Regarding occupation, government employees made up the largest group (30.7%), while students (25.7%) and private sector employees (17.0%) were also significantly represented. In terms of travel companions, most tourists travelled with family (54.9%), while others travelled solo (23.6%) or in tour groups (10.0%). Air travel was the most common mode of transport (48.9%), and a large majority were domestic tourists (69.1%). Additionally, 66.5% were first-time visitors, with 33.5% being repeat visitors. These demographic patterns provide valuable context for interpreting the impact of smart tourism technologies on sustainability and visitor loyalty in Pakistan's religious tourism sector.

Inferential analysis

For inferential analysis, the Smart PLS 4.0 software with the partial least squares technique was adopted to draw the conclusion of the study. The two main tests that were run on SmartPLS 4 were the measurement model and structural model analysis. The measurement model consists of reliability and validity analysis, and structural model analysis, with path coefficients analysis.

Measurement model

The measurement model was assessed using key indicators such as Cronbach's Alpha, rho_A, Composite Reliability (CR), and Average Variance Extracted (AVE) to confirm internal consistency and convergent validity.

Table 1: Trial Data

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)

A	0.660	0.694	0.821	0.613
Inf	0.876	0.878	0.924	0.802
Int	0.752	0.750	0.859	0.671
MTE	0.882	0.886	0.914	0.680
MTE*ST	0.954	1.000	0.959	0.611
P	0.813	0.851	0.889	0.729
PE	0.828	0.831	0.897	0.745
S	0.742	0.765	0.851	0.656
ST	0.731	0.872	0.843	0.596
STT	0.829	0.919	0.870	0.387
TA	0.907	0.912	0.927	0.647
TBP	0.885	0.900	0.909	0.560
TBP*ST	0.976	1.000	0.978	0.464

Most constructs showed strong internal consistency, with Cronbach's Alpha and Composite Reliability values exceeding the recommended threshold of 0.7. The AVE values also mostly surpassed the acceptable threshold of 0.5, indicating sufficient convergent validity. Although STT and TBP*ST had AVE values slightly below the ideal (0.387 and 0.464, respectively), they still exhibited strong reliability and can be considered for further structural analysis with caution.

Figure 18: Measurement Model

Discriminant Validity (HTMT Criterion)

Discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) ratio of correlations. An HTMT value below 0.90 indicates adequate discriminant validity among constructs.

Table 2: Discriminant (HTMT criterion) Validity Results

	A	Inf	Int	MTE	MTE *ST	P	PE	S	ST	STT	TA	TBP	TBP *ST
A													
Inf	0.801												
Int	1.029	0.390											
MTE	0.595	0.516	0.610										

MTE*ST	0.482	0.451	0.367	0.516								
P	0.638	0.337	0.893	0.484	0.227							
PE	0.475	0.398	0.587	0.826	0.348	0.509						
S	0.600	0.670	0.383	0.640	0.193	0.400	0.612					
ST	0.557	0.439	0.636	0.734	0.314	0.527	0.804	0.746				
STT	1.021	0.793	0.927	0.892	0.485	0.802	0.743	0.832	0.771			
TA	0.575	0.386	0.642	0.781	0.343	0.542	0.884	0.629	0.809	0.761		
TBP	0.526	0.570	0.506	0.878	0.370	0.447	0.798	0.782	0.733	0.808	0.724	
TBP*ST	0.582	0.347	0.521	0.438	0.652	0.345	0.261	0.285	0.329	0.521	0.364	0.466

HTMT values between constructs such as Inf and MTE (0.516), Int and MTE (0.610), and P and PE (0.509) indicate that the constructs are distinct from one another. However, a few HTMT values, such as A and Int (1.029) and STT and Int (0.927), exceeded the 0.90 threshold, suggesting potential multicollinearity or overlapping constructs. This could be an indication of theoretical or measurement overlap and may require refinement or merging of constructs in future studies.

The Structural Model

Structural Model Analysis

In the second stage of the inferential analysis using SmartPLS 4.0, the structural model was evaluated to test the hypothesised relationships between constructs. This evaluation included direct, mediation, and moderation effect analyses. The significance of the relationships was assessed through path coefficients, t-statistics, and p-values. Below is a detailed explanation of the results from the structural model.

Table 3: Direct relationship results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values

H1c: Accessibility of STTs has a significant impact on the smart technology supported experience in visitor attractions.	0.132	0.131	0.029	4.592	0.000
H1b: Informative of STTs has a significant impact on the smart technology supported experience in visitor attractions.	0.253	0.253	0.031	8.165	0.000
H1d: Interactivity of STTs has a significant impact on the smart technology supported experience in visitor attractions.	0.354	0.356	0.030	11.674	0.000
H1e: Personalisation of STTs has a significant impact on the smart technology supported experience in visitor attractions.	0.208	0.206	0.031	6.730	0.000
H1a: Security of STTs has a significant impact on the smart technology supported experience in visitor attractions.	-0.316	-0.316	0.029	10.842	0.000
H2: Smart tourism technology significantly influences sustainable tourism.	0.295	0.291	0.054	5.438	0.000

All direct hypotheses (H1a to H1e and H2) are statistically significant at 0.05, with p-values below 0.001. Notably, interactivity (H1d) has the strongest positive effect (β = 0.354), suggesting that interactive features of smart tourism technologies (STTs) most strongly influence smart technology-supported experiences. In contrast, security (H1a) negatively affects STT experiences, implying that increased security concerns may hinder the perceived benefits of STTs.

Table 4: Mediation results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
H3: Perceived enjoyment and implementation significantly mediate the relationship between smart tourism technology and sustainable tourism.	0.143	0.141	0.041	3.502	0.001
H4: Technology adoption and implementation significantly mediate the relationship between smart tourism technology and sustainable tourism.	0.238	0.237	0.039	6.060	0.000

Both mediation hypotheses (H3 and H4) are statistically significant. This indicates that Perceived Enjoyment (PE) and Technology Adoption (TA) partially mediate the relationship between smart tourism technology and sustainable tourism. Notably, TA shows a stronger mediating effect than PE, highlighting its crucial role in linking STT to sustainable tourism outcomes.

Table 5: Moderation results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
H5: Memorable travel experience significantly moderates the relationship between perceived enjoyment.	0.026	0.024	0.039	0.674	0.501
H6: Tourist behaviour and preferences significantly moderate the relationship between technology adoption and implementation and sustainable tourism.	-0.007	-0.007	0.039	0.174	0.862

Neither of the moderation hypotheses (H5 and H6) is supported as their p-values exceed 0.05. This indicates that Memorable Travel Experience (MTE) and Tourist Behaviour & Preferences (TBP) do not significantly moderate the relationship between perceived enjoyment/technology adoption and sustainable tourism. These results suggest that while these factors are conceptually important, they do not statistically influence the strength or direction of these specific relationships within the model.

DISCUSSION AND CONCLUSION

The effect of Smart Tourism Technologies (STTs) on sustainable tourism was analysed using five main features: security, informativeness, accessibility, interactivity and personalisation. The findings of interactivity, providing information and personalisation play a key role in making smart technologies more useful at visitor attractions. Surprisingly, strong security measures made the app's usage harder for users. Although accessibility greatly affected the ranking, it came second to the other factors. It was also proven that technological services improve the sustainability of tourism. Enjoyable experiences and familiarity with technology strengthened the idea that new and engaging technologies can make tourists' behaviours and attitudes more sustainable. However, there was no clear difference in the moderating effects of various travel experiences and how people travel. As a result, STTs encourage sustainability in all communities, overcoming individual differences. It validates a new framework that examines how the use of smart technology in tourism can be linked to achieving sustainable results. It suggests that stakeholders improve tourism technology by making it personal and educational for users and visitors, ensuring security is also efficient and user-friendly.

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