



Impact of Smart Tourism Technologies and Sustainable Tourism Practices on Tourist Loyalty: A Stimulus–Organism–Response Perspective

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Abstract: The rapid advancement of smart tourism technologies and the growing emphasis on sustainable tourism development have significantly transformed tourists' experiences and behavioural intentions across global destinations. Despite substantial scholarly attention, limited research has examined their integrated influence on tourist loyalty within a unified theoretical framework. Addressing this gap, the present study investigates the combined effects of smart tourism technologies and sustainable tourism practices on tourist loyalty through the mediating roles of tourist trust and tourist satisfaction. The study adopts the Stimulus–Organism–Response (SOR) framework and a quantitative and cross-sectional research design was employed. The primary data were collected from tourists visiting major tourism destinations in Telangana, India. Using purposive and convenience sampling techniques, 440 valid responses were obtained and analysed through Structural Equation Modeling (SEM) using AMOS. The structural model results revealed that smart tourism technologies significantly influence tourist trust and tourist satisfaction. In contrast, sustainable tourism practices indirectly contribute to the development of tourist loyalty through satisfaction and trust. The study also offers important implications for policymakers and tourism practitioners seeking to develop competitive and sustainable smart tourism destinations in emerging tourism economies.

Keywords: Smart Tourism Technologies, Sustainable Tourism Practices, Tourist Trust, Tourist Satisfaction, Tourist Loyalty, SOR Framework, Sustainable Tourism, Smart Destinations, Structural Equation Modeling.

1. Introduction

Tourism has emerged as one of the world's most influential service industries, contributing significantly to economic growth, employment generation, cultural exchange, and regional development. Following the severe disruption caused by the COVID-19 pandemic, the global tourism sector has demonstrated strong recovery momentum. According to UN Tourism, international tourist arrivals reached approximately 1.4 billion in 2024, reflecting a return to pre-pandemic tourism levels. This recovery has intensified competition among tourism destinations, compelling destination management organizations to adopt innovative strategies that enhance tourist experiences while simultaneously ensuring environmental sustainability and long-term destination competitiveness.

In this evolving tourism landscape, smart tourism technolo-

gies (STTs) have gained considerable attention as transformative tools for improving tourist experiences and destination management efficiency. Smart tourism technologies include digital applications, artificial intelligence, Internet of Things (IoT)-enabled services, virtual and augmented reality systems, smart navigation, and real-time information platforms that facilitate seamless tourist interactions and personalized travel experiences (Gretzel *et al.*, 2015). These technologies enable tourists to access destination information, plan travel activities, navigate attractions, and engage with tourism services more effectively and conveniently. Previous studies have shown that smart tourism technologies positively influence tourist experiences, satisfaction, revisit intention, and destination competitiveness (Jeong & Shin, 2020; Pai *et al.*, 2020). However, despite growing scholarly attention, the mechanisms through which smart tourism technologies influence long-term tourist loyalty remain insufficiently explored.

At the same time, sustainable tourism practices have become a central concern for governments, tourism authorities, and destination managers due to increasing environmental challenges, resource depletion, and growing tourist awareness regarding responsible travel behaviour. Sustainable tourism emphasizes environmental conservation, preservation of cultural heritage, community participation, and responsible destination management practices that minimize negative ecological impacts while enhancing visitor experiences (Choi & Sirakaya, 2006). Contemporary tourists increasingly prefer destinations that demonstrate genuine commitments toward sustainability, environmental protection, and socio-cultural preservation. Existing studies suggest that sustainable tourism initiatives significantly improve tourist perceptions, destination image, emotional attachment, and behavioural intentions (Su *et al.*, 2017; Sahabuddin *et al.*, 2024). Nevertheless, research examining the combined influence of smart tourism technologies and sustainable tourism practices on tourist loyalty remains limited.

This research gap becomes particularly relevant in the context of emerging tourism destinations such as Telangana, where tourism development increasingly integrates technology-driven services and sustainability-oriented destination management practices. Telangana is recognized for its historical heritage, spiritual tourism, eco-tourism resources, and modern tourism infrastructure. Tourist attractions such as Charminar, Golconda Fort, Ramoji Film City, Yadadri Temple, Ramappa Temple, and Laknavaram Lake attract a substantial number of domestic and international tourists annually. In recent years, the state has increasingly focused on digital tourism services, smart visitor management systems, online booking platforms, heritage conservation, eco-tourism initiatives, and environmentally responsible tourism development.

To explain the relationship between smart tourism technologies, sustainable tourism practices, and tourist loyalty, the present study adopts the Stimulus–Organism–Response (SOR) framework proposed by Mehrabian and Russell (1974). The SOR theory suggests that external environmental stimuli influence internal psychological states, which subsequently shape behavioural responses. In the present study, Smart Tourism Technologies and Sustainable Tourism Practices are conceptualized as stimuli, Tourist Trust and Tourist Satisfaction are treated as organism-level psychological responses, and Tourist Loyalty represents the behavioural outcome. Prior tourism studies have successfully applied the SOR framework to explain tourist experiences, destination attachment, behavioural intentions, and technology adoption behaviour (Kim *et al.*, 2020; Wu *et al.*, 2021).

Against this background, the present study examines the impact of Smart Tourism Technologies and Sustainable Tourism Practices on Tourist Loyalty through the mediating roles of Tourist Trust and Tourist Satisfaction. The study contributes to tourism literature by integrating smart tourism and sustainable tourism perspectives within a unified theoretical framework. Furthermore, the findings provide valuable managerial insights for tourism authorities and destination managers seeking to enhance tourist loyalty through technologically advanced and environmentally responsible tourism experiences.

2. Literature Review and Hypotheses Development

2.1. Theoretical Foundation: Stimulus–Organism–Response (SOR) Framework

The present study is grounded in the Stimulus–Organism–Response (SOR) framework proposed by Mehrabian and Russell. The SOR theory explains that external environmental stimuli influence individuals' internal cognitive and emotional states, which subsequently determine behavioural responses. Within tourism contexts, the SOR framework has been extensively applied to explain tourists' experiences, behavioural intentions, technology adoption, destination attachment, and loyalty formation. Recent tourism studies have expanded the framework to smart tourism environments, virtual tourism experiences, travel applications, and sustainable tourism behaviour (Kim *et al.*, 2020; Wu *et al.*, 2021).

In the present study, Smart Tourism Technologies (STTs) and Sustainable Tourism Practices (STPs) are conceptualized as external stimuli that influence tourists' internal psychological evaluations represented through Tourist Trust (TT) and Tourist Satisfaction (TS). These organism-level responses subsequently influence Tourist Loyalty (TL), which represents the behavioural response. The integration of smart tourism and sustainable tourism within a unified SOR framework addresses an important gap in tourism literature, as previous studies have predominantly examined these domains independently rather than simultaneously.

2.2. Direct Relationship Between Smart Tourism Technologies and Tourist Loyalty

Tourist loyalty has become one of the most important behavioural outcomes in tourism research because loyal tourists contribute to destination competitiveness through revisit intentions, positive word-of-mouth communication, and long-term destination advocacy. In recent years, smart tourism technologies have increasingly been recognized as strategic tools capable of improving tourist experiences and strengthening destination relationships. Smart tourism technologies facilitate seamless communication, personalized services, efficient travel planning, and real-time information accessibility, thereby enhancing tourists' overall destination experiences.

Existing studies suggest that technologically advanced destinations are often perceived as more innovative, convenient, and tourist-friendly. Smart technologies reduce travel-related uncertainty, improve service efficiency, and create interactive experiences that positively influence tourists' emotional evaluations of destinations. Jeong and Shin (2020) found that positive experiences with smart tourism technologies significantly influence tourists' behavioural intentions and revisit tendencies. Similarly, Pai *et al.* (2020) argued that technology-enabled tourism experiences improve tourists' happiness and emotional attachment, which subsequently strengthen loyalty outcomes.

However, the relationship between smart tourism technologies and tourist loyalty remains theoretically inconclusive. Some studies suggest that technological convenience alone may not directly create destination loyalty unless tourists experience emotional fulfilment, trust, or satisfaction. In many tourism contexts, tourists may appreciate smart technologies functionally but may not necessarily develop long-term behavioural commitment toward destinations. This indicates that loyalty formation may depend on additional psychological mechanisms beyond technological utility alone.

Despite increasing scholarly attention toward smart tourism ecosystems, limited studies have empirically examined the direct influence of smart tourism technologies on tourist loyalty within integrated smart and sustainable tourism contexts. Therefore, the present study examines whether smart tourism technologies directly contribute to tourist loyalty within the proposed SOR framework.

H1: Smart Tourism Technologies positively influence Tourist Loyalty.

2.3. Smart Tourism Technologies and Tourist Trust

The rapid advancement of digital technologies has fundamentally transformed tourism experiences and destination management practices. Smart tourism technologies encompass artificial intelligence, Internet of Things (IoT), mobile applications, cloud computing, augmented reality, virtual reality, smart navigation systems, and real-time information services integrated into tourism ecosystems. These technologies facilitate seamless communication, information accessibility, personalized travel experiences, and efficient service delivery, thereby improving tourists' interaction with destinations (Gretzel et al., 2015).

Existing tourism research largely emphasizes the operational benefits of smart tourism technologies, particularly their ability to improve convenience, accessibility, and personalization. However, tourism experiences are inherently uncertain because tourists consume services before fully evaluating their quality and reliability. In such situations, trust becomes a critical psychological mechanism influencing tourists' behavioural responses. Smart tourism technologies reduce uncertainty by providing accurate information, transparent communication, secure digital transactions, and responsive support systems. Consequently, tourists are more likely to perceive technologically advanced destinations as reliable.

Jeong and Shin (2020) observed that positive experiences with smart tourism technologies significantly strengthen tourists' confidence toward destinations and improve behavioural intentions. Similarly, Ng et al. (2023) argued that tourists develop stronger trust and positive attitudes when smart tourism systems are perceived as secure, interactive, and technologically reliable. Nevertheless, most existing studies focus primarily on technology adoption or usage intention while comparatively neglecting tourist trust as a central psychological outcome within smart tourism ecosystems.

Furthermore, prior studies often examine individual technological dimensions rather than evaluating tourists' holistic perceptions of smart tourism experiences within destination contexts. This creates a theoretical limitation because tourists

increasingly evaluate destinations based on integrated digital experiences rather than isolated technological functions. Therefore, the present study extends the smart tourism literature by positioning tourist trust as an organism-level response within the SOR framework.

H2: Smart Tourism Technologies positively influence Tourist Trust.

2.4. Smart Tourism Technologies and Tourist Satisfaction

Tourist satisfaction represents tourists' overall cognitive and emotional evaluation of their travel experiences. Within smart tourism destinations, satisfaction increasingly depends on the ability of tourism technologies to deliver seamless, personalized, interactive, and convenient experiences throughout the tourist journey. Smart tourism technologies improve tourists' ability to access travel information, manage itineraries, navigate destinations, and engage with tourism services more efficiently. As a result, technological integration has become an important determinant of experiential quality and satisfaction.

Prior tourism studies consistently indicate that tourists derive greater satisfaction when destinations effectively integrate smart technologies into tourism operations. Huang et al. (2017) argued that smart tourism systems enhance tourists' exploratory and exploitative travel behaviours by improving information accessibility and reducing travel-related uncertainty. Similarly, Pai et al. (2020) found that smart tourism technology experiences positively influence tourist happiness, satisfaction, and revisit intentions through enhanced personalization and convenience.

Interactive technologies such as augmented reality applications, AI-enabled recommendation systems, smart kiosks, and digital assistance platforms further contribute to memorable tourism experiences and emotional engagement. Torabi et al. (2022) emphasized that technological interactivity significantly enhances tourists' experiential evaluations and satisfaction outcomes. These findings suggest that smart tourism technologies influence satisfaction not merely through functional utility but also through emotional and experiential enrichment.

Despite these contributions, existing literature remains fragmented in two important ways. First, many studies emphasize technology adoption behaviour rather than post-consumption evaluations such as tourist satisfaction and loyalty. Second, smart tourism studies rarely integrate sustainability dimensions within behavioural frameworks, despite the increasing emergence of smart sustainable tourism destinations. Therefore, the present study develops a more integrated perspective by examining smart tourism technologies within a broader loyalty development framework.

H3: Smart Tourism Technologies positively influence Tourist Satisfaction.

2.5. Direct Relationship Between Sustainable Tourism Practices and Tourist Loyalty

Sustainable tourism practices have emerged as important determinants of destination competitiveness and tourist behavioural outcomes. Environmentally responsible tourism operations, heritage conservation, eco-friendly infrastructure, community participation, and ethical destination governance increasingly shape tourists' destination evaluations and travel preferences. Modern tourists are becoming more environmentally conscious and increasingly prefer destinations that demonstrate genuine commitments toward sustainability and responsible tourism development.

Prior tourism literature suggests that sustainable tourism practices positively influence destination image, emotional attachment, and revisit intentions. Destinations implementing visible sustainability initiatives are often perceived as trustworthy, responsible, and socially conscious, thereby encouraging positive tourist behaviour. Sustainable tourism experiences also generate emotional fulfilment because tourists perceive their travel activities as ethically meaningful and environmentally responsible.

Research further indicates that tourists are more likely to revisit destinations that successfully balance tourism development with environmental preservation and cultural authenticity. Sustainable practices improve tourists' perceptions of destination quality, safety, and authenticity, which contribute to stronger behavioural intentions and loyalty formation. However, some scholars argue that sustainability initiatives alone may not directly generate loyalty unless tourists personally experience satisfaction, trust, and emotional attachment toward destinations.

Although sustainable tourism literature has expanded significantly, most studies primarily focus on environmental attitudes, destination image, or responsible tourist behaviour while comparatively neglecting the direct relationship between sustainable tourism practices and tourist loyalty. Furthermore, limited research simultaneously examines sustainability and technological tourism experiences within a unified behavioural framework. Therefore, the present study investigates whether sustainable tourism practices directly influence tourist loyalty in smart and sustainable tourism destinations.

H4: Sustainable Tourism Practices positively influence Tourist Loyalty.

2.6. Sustainable Tourism Practices and Tourist Trust

Sustainable tourism practices have become increasingly important due to rising environmental concerns, climate change awareness, overtourism challenges, and growing demand for responsible tourism experiences. Sustainable tourism practices include environmental conservation, waste management, renewable energy usage, heritage preservation, eco-friendly transportation, biodiversity protection, and community participation initiatives. Contemporary tourists increasingly evaluate destinations based on their environmental responsibility and

ethical tourism orientation.

Trust plays a critical role within sustainable tourism environments because tourists tend to develop stronger confidence toward destinations that demonstrate transparency, responsibility, and environmental commitment. Sustainable tourism practices signal destination credibility and ethical governance, thereby reducing tourists' perceived risks and strengthening emotional confidence toward destinations. *Su et al. (2017)* argued that socially responsible destination practices positively influence tourists' behavioural responses through trust and emotional attachment mechanisms.

Similarly, *Sahabuddin et al. (2024)* found that environmentally responsible tourism initiatives improve tourist confidence, destination credibility, and satisfaction outcomes. However, despite substantial sustainability literature, prior studies primarily focus on environmental attitudes, destination image, or pro-environmental behaviour while comparatively overlooking tourist trust as a mediating psychological mechanism.

Moreover, existing studies generally investigate sustainability independently from technological tourism developments, despite the growing integration of digital innovation and sustainability within contemporary tourism destinations. This separation limits theoretical understanding of how tourists simultaneously evaluate technological advancement and environmental responsibility during destination experiences. Therefore, the present study addresses this gap by examining tourist trust within integrated smart and sustainable tourism environments.

H5: Sustainable Tourism Practices positively influence Tourist Trust.

2.7. Sustainable Tourism Practices and Tourist Satisfaction

Tourist satisfaction within sustainable tourism contexts increasingly depends on tourists' perceptions of ethical responsibility, environmental quality, and authentic destination experiences. Sustainable tourism practices contribute to tourists' psychological fulfilment because environmentally and socially responsible tourism experiences align with tourists' personal values and moral expectations. Consequently, tourists often develop stronger emotional attachment and favourable evaluations toward destinations that actively engage in sustainable tourism initiatives.

Previous studies suggest that sustainable tourism practices significantly improve destination attractiveness, emotional engagement, and experiential authenticity. Eco-tourism initiatives, heritage conservation programs, and community-based tourism activities create meaningful experiences that positively influence tourist satisfaction. Sustainable tourism destinations are also perceived as cleaner, safer, and more socially responsible, thereby enhancing tourists' overall travel evaluations.

However, much of the existing tourism literature examines sustainability outcomes separately from smart tourism experiences. In reality, contemporary tourism destinations increasingly integrate digital technologies with sustainability-oriented management systems. Smart mobility platforms, digital crowd management systems, environmental monitoring technologies, and AI-enabled tourism services now support sustainable des-

tionation operations while simultaneously improving tourist convenience and satisfaction.

This growing convergence between technological innovation and sustainability requires integrated behavioural models capable of explaining how tourists evaluate these dual destination attributes simultaneously. Therefore, the present study extends prior tourism literature by integrating sustainable tourism practices within a smart tourism behavioural framework.

H6: Sustainable Tourism Practices positively influence Tourist Satisfaction.

2.8. Tourist Trust and Tourist Loyalty

Tourist loyalty represents tourists' intentions to revisit destinations, recommend destinations to others, and maintain long-term emotional attachment toward destinations. Loyalty is considered a critical determinant of destination competitiveness because loyal tourists contribute to positive word-of-mouth communication, repeat visitation, and long-term tourism sustainability.

Tourist trust significantly influences loyalty formation because tourism consumption involves uncertainty, perceived risks, and service intangibility. When tourists perceive destinations as trustworthy, reliable, and capable of delivering promised experiences, they are more likely to develop favourable behavioural intentions and long-term destination commitment. Trust reduces tourists perceived risks and strengthens emotional attachment, thereby encouraging revisit intentions and advocacy behaviour.

Artigas et al. (2017) emphasized that trust toward destinations significantly influences tourist behavioural intentions and loyalty outcomes. Similarly, *Chen and Phou (2013)* found that destination trust positively affects tourists' emotional relationships and revisit intentions. Despite these findings, limited studies have simultaneously examined trust within integrated smart and sustainable tourism frameworks.

H7: Tourist Trust positively influences Tourist Loyalty.

2.9. Tourist Satisfaction and Tourist Loyalty

Tourist satisfaction remains one of the strongest predictors of tourist loyalty within tourism research. Satisfied tourists are more likely to revisit destinations, recommend destinations to others, and develop positive emotional attachment toward tourism experiences. Satisfaction reflects tourists' post-consumption evaluations regarding whether destination experiences meet or exceed their expectations.

Yoon and Uysal (2005) argued that tourist satisfaction significantly influences destination loyalty through positive emotional evaluations and revisit intentions. Similarly, *Prayag et al. (2017)* demonstrated that emotionally satisfying tourism experiences strengthen tourists' recommendation intentions and loyalty outcomes. Within smart and sustainable tourism environments, satisfaction becomes particularly important because tourists increasingly expect technologically efficient and environmentally responsible experiences simultaneously.

Although prior studies acknowledge the importance of sat-

isfaction independently, limited tourism studies examine its mediating role between smart tourism technologies, sustainable tourism practices, and tourist loyalty simultaneously. Therefore, the present study positions tourist satisfaction as a critical organism-level response within the SOR framework.

H8: Tourist Satisfaction positively influences Tourist Loyalty.

2.10. Mediating Role of Tourist Trust and Tourist Satisfaction

The SOR framework suggests that environmental stimuli influence behavioural responses indirectly through internal psychological evaluations. In tourism contexts, tourists do not become loyal merely because destinations adopt advanced technologies or sustainability initiatives. Rather, tourists develop loyalty when these destination attributes enhance trust, satisfaction, emotional attachment, and experiential fulfilment.

Smart tourism technologies improve convenience, reliability, accessibility, and interactivity, which subsequently strengthen tourist trust and satisfaction. Similarly, sustainable tourism practices improve tourists' ethical confidence, emotional fulfilment, and destination credibility, thereby influencing loyalty indirectly through positive psychological evaluations.

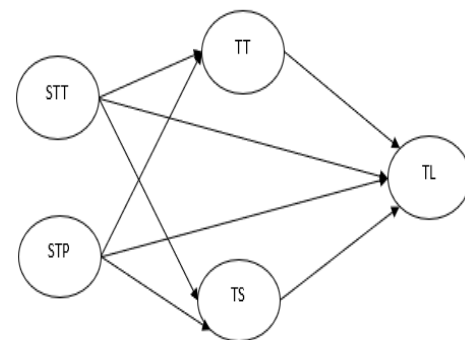


Figure 1: Conceptual Model

Despite substantial tourism literature on technology adoption and sustainability, limited studies have simultaneously examined the mediating roles of tourist trust and tourist satisfaction within integrated smart sustainable tourism environments. This gap becomes increasingly important because contemporary tourists simultaneously evaluate destinations based on technological sophistication and environmental responsibility.

Therefore, the present study proposes that tourist trust and tourist satisfaction mediate the relationships between Smart Tourism Technologies, Sustainable Tourism Practices, and Tourist Loyalty.

- **H9:** Tourist Trust mediates the relationship between Smart Tourism Technologies and Tourist Loyalty.
- **H10:** Tourist Satisfaction mediates the relationship between Smart Tourism Technologies and Tourist Loyalty.
- **H11:** Tourist Trust mediates the relationship between Sustainable Tourism Practices and Tourist Loyalty.
- **H12:** Tourist Satisfaction mediates the relationship between Sustainable Tourism Practices and Tourist Loyalty.

3. Methods and Materials

- Methods:** The conceptual framework of the study was anchored in the Stimulus–Organism–Response Model (SOR), which explains how external environmental stimuli influence individuals' internal evaluations and subsequent behavioural responses. Within the context of the present study, smart tourism technologies and sustainable tourism practices were conceptualized as stimulus variables, tourist trust and tourist satisfaction as organism variables, and tourist loyalty as the response variable. The study aimed to assess the impact of smart tourism technologies and sustainable tourism practices on destination loyalty among tourists through trust and satisfaction in the state of Telangana. The research adopted a quantitative and cross-sectional research design. A purposive and Convenience sampling technique has been adopted for the study.
- Participants:** The target population consisted of tourists who had experienced digital tourism services, smart tourism facilities, or sustainable tourism practices during their visits to Telangana. Data were collected from tourists visiting major tourism destinations including Hyderabad, Charminar, Golconda Fort, Ramoji Film City, Yadadri Temple, Ramappa Temple, and Laknavaram Lake using using a structured questionnaire. A total of 440 responses were found usable to perform the analysis out of the 500 distributed questionnaires. The respondents were asked to rate a given item on a 5-point Likert scale ranging from strongly disagree to strongly agree.
- Instruments:** The items for this study were adopted from established scales to measure Smart Tourism Technologies (STT) quality and Tourist satisfaction.
 - Smart Tourism Technologies (STT) Scale:** A 7-item scale developed by *Pai C, Chen H, Lai IKW, Li T (2025)* was adapted for the study to measure the Smart Tourism Technologies (STT) practices among tourist respondents.
 - Tourist Trust Scale:** A five-item scale established by *Liu, J., Wang, C., Fang, S., & Zhang, T. (2019)* was adapted and slightly adjusted to suit the present study requirement.
 - Tourist Satisfaction Scale:** A five-item short scale developed by *Oliver (1980)* and *Prayag et al. (2017)* was adopted to assess tourist satisfaction.
 - Tourist loyalty scale:** A five-item scale developed and adapted from *Zeithaml et al. (1996)* and *Yoon and Uysal (2005)*.

4. Structural Equation Modeling

STRUCTURAL EQUATION MODELING A two-stage approach of the SEM (measurement model and structural model) was selected to analyze the empirical data (*Byrne & van de Vijver, 2010*). By running AMOS, a measurement model was developed, and then the model fitness and constructs' reliability and validity were assessed in the first stage by means of confirma-

tory factor analyses (*Byrne & van de Vijver, 2010*). This was followed by a structural model assessment which related to the validation of the conceptual model and testing of the research hypotheses (*Byrne & van de Vijver, 2010; Hair Jr. et al., 2014*).

4.1. Analysis of Measurement Model

The measurement model examines the relationship between indicators and constructs. The study integrated constructs like Smart Tourism Technologies (STT), Trust, Sustainable Tourism, Tourist satisfaction, and Tourist loyalty into a single measurement model. The development of the measurement model was carried out by foot stepping into the guidelines provided by Hair et al (2006). The measurement model was estimated using the maximum likelihood method with the help of AMOS 25. Model fit results, Construct Reliability, Convergent Validity and Discriminant Validity were tested to estimate the measurement model.

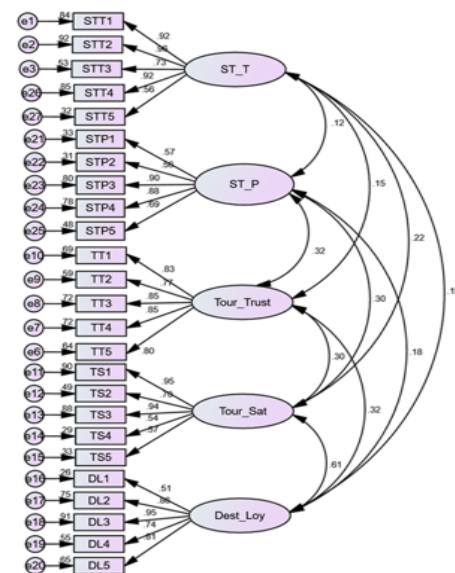


Figure 2: Measurement model

Model fit: Various fit indices were considered for the assessment of the model fit of the measurement model (*Hair et al., 2008*).

Goodness of Fit Index (GFI) and *Root Mean Square Error Approximation (RMSEA)* values are within the standard, which indicates the model theory fits the sample data. *Comparative Fit Index (CFI)* values were above 0.90, showing that the model fits relative to an alternative baseline model. The Parsimony fit indices, like the chi-square/df value 4.875, were between 1 and 8, showing that the measurement model is acceptable (*Hair Jr. et al., 2014; Hu L.-T. & Bentler P. M., 1999*).

Construct reliability, sometimes called composite reliability, is a measure of the internal consistency of a particular scale (*Netemeyer et al., 2003*). The construct reliability values for all the constructs, like *Smart Tourism Technologies (STT)*, *Sustainable Tourism Practices (STP)*, *Tourist Trust*, *Tourist satisfaction*, and *Tourist loyalty*, are above the standard requirement of >0.70. It denotes that the measurement model possesses reliability.

Convergent Validity was assessed through standardized factor loadings and *Average Variance Extracted (AVE)*.

Table 1: Model fit measures

Fit Indices	χ^2	Df	χ^2/df	GFI	AGFI	TLI	CFI	RMSEA
Obtained Value	2072.501	425	4.875	0.913	0.901	0.953	0.962	0.067
Recommended Value				>.90	>.90	>.90	>.95	<.08

Table 2: Convergent validity

Construct	Items	Standardized Loading	CR	AVE	Cronbach Alpha
Smart Tourism Technology (ST_T)	STT1	0.917	0.923	0.711	0.918
	STT2	0.960			
	STT3	0.726			
	STT4	0.921			
	STT5	0.563			
Tourist Trust (Tour_Trust)	TT1	0.849	0.900	0.643	0.897
	TT2	0.849			
	TT3	0.768			
	TT4	0.829			
	TT5	0.797			
Tourist Satisfaction (Tour_Sat)	TS1	0.950	0.875	0.605	0.869
	TS2	0.701			
	TS3	0.936			
	TS4	0.541			
	TS5	0.575			
Destination Loyalty (Dest_Loy)	DL1	0.510	0.865	0.576	0.857
	DL2	0.865			
	DL3	0.953			
	DL4	0.744			
	DL5	0.805			
Sustainable Tourism Practices (ST_P)	STP1	0.573	0.832	0.514	0.821
	STP2	0.561			
	STP3	0.895			
	STP4	0.882			
	STP5	0.694			

CR: composite reliability.

Table 3: Discriminant validity

Variables	AVE	MSV	ST_T	T_T	T_S	D_Loy	ST_P
ST_T	0.711	0.374	0.843				
T_T	0.643	0.414	0.612	0.802			
T_S	0.605	0.472	0.548	0.644	0.778		
D_Loy	0.576	0.472	0.571	0.633	0.687	0.759	
ST_P	0.514	0.271	0.496	0.521	0.472	0.503	0.717

AVE: average variance extracted; Diagonal values represent the square root of the AVE.

The resulting standard estimates of all the items of the measurement model and AVE values of the constructs range between 0.51 and 0.96 and 0.51 and 0.71, respectively, also meeting the minimum requirement of 0.50. It indicates that measured variables of the concern construct share a high proportion of variance in common (Byrne & van de Vijver, 2010; Hair Jr. et al., 2014).

Discriminant validity was judged through comparison of Maximum Shared variance (MSV) with AVE or Square root of AVE with inter-construct correlations.

The AVE values for all the constructs were found to be greater than the MSV values of the concerned constructs, and the square root of AVE values of all the constructs were greater

than inter-construct correlations. This indicates that the constructs were dissimilar in the model (Byrne & van de Vijver, 2010; Hair Jr. et al., 2014).

5. Analysis of Structural Model

The structural model explains the relationship among constructs. The model explains the correlational links among observed variables like Smart Tourism Technologies (STT) and latent variables like Trust and Tourist satisfaction. Smart Tourism Technologies (STT) Platform is treated as an exogenous variable, Tourist loyalty as an endogenous variable, and satisfaction and Trust are treated as mediating variables.

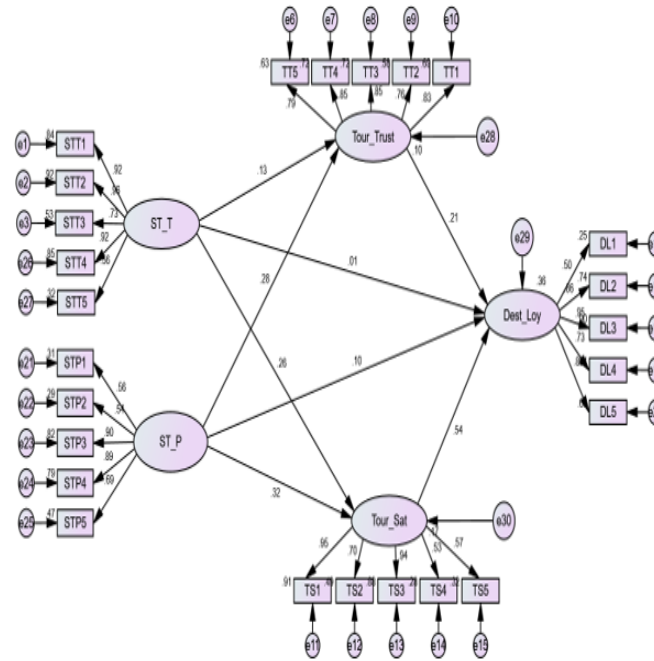


Figure 3: Validated Model

Table 4: Direct effects

Variables	AVE	MSV	ST_T	T_T	T_S	D_Loy	ST_P
ST_T	0.711	0.374	0.843				
T_T	0.643	0.414	0.612	0.802			
T_S	0.605	0.472	0.548	0.644	0.778		
D_Loy	0.576	0.472	0.571	0.633	0.687	0.759	
ST_P	0.514	0.271	0.496	0.521	0.472	0.503	0.717

AVE: average variance extracted; Diagonal values represent the square root of the AVE.

Table 5: Indirect Effects

Hypo	Indirect Path	Unstandardized Estimate	Lower	Upper	P-Value	Standardized Estimate	Result
H9	ST_T → TT → TL	0.112	0.004	0.026	0.003	0.127	Supported
H10	ST_T → TS → TL	0.162	0.038	0.097	***	0.238	Supported
H11	ST_P → TT → TL	0.145	0.079	0.021	***	0.160	Supported
H12	ST_P → TS → TL	0.229	0.081	0.191	***	0.272	Supported

Effects: The direct effects are pathways from the exogenous variable to the outcome variable without any intermediaries. The direct effects and hypothesis results connected to the structural model are presented in Table 5.

The standardized coefficient value for the path from Smart Tourism Technologies (STT) to Tourist Loyalty ($STT \rightarrow TL$) 0.010) was found not significant (P value 0.830), which denotes that Smart Tourism Technologies (STT) does not possess a direct effect on Tourist Loyalty and hence, hypothesis H1 is not supported. Similarly, the standardized coefficient value from the path from Sustainable Tourism Practices (STP) to Tourist Loyalty (TL) was 0.095 also found not significant (p-value 0.085), indicating that there was no direct effect of sustainable tourism practices on tourist loyalty. So, hypothesis H4 is not supported.

Among the remaining all direct effects, the paths from smart tourism technologies to tourist trust (Estimate value 0.128; p

value 0.014), smart tourism technologies to tourist satisfaction (Estimate value 0.255; p value 0.000), tourist trust to tourist loyalty (Estimate value 0.212; p value 0.000), tourist satisfaction to tourist loyalty (Estimate value 0.541; p value 0.000), sustainable tourism practices to tourist trust (Estimate value 0.285; p value 0.000) and sustainable tourism practices to tourist satisfaction (Estimate value 0.317; p value 0.000) are found significant and hence, hypotheses, H2, H3, H5, H6, H7 and H8 are supported.

Mediation effect is the intermediary effect in the causal relationship between exogenous and endogenous variables. Trust and Satisfaction are assumed as mediators in the link between Smart Tourism Technologies (STT), Sustainable Tourism Practices, and Tourist loyalty.

The unstandardized coefficient value for the indirect path from Smart Tourism Technologies (STT) to Tourist loyalty through Trust (0.127) is significant (p-value 0.000) and hence,

hypothesis H6 was supported. The mediation path from Smart Tourism Technologies (STT) to tourist loyalty through tourist satisfaction (0.238) is also found significant (p-value 0.000). Hence, both mediators are found statistically significant in the path from Smart Tourism Technologies (STT) to tourist loyalty. When it comes to the link between sustainable tourism practices and tourist loyalty, tourist trust (0.160) is significant (p-value 0.000), and the mediation path from sustainable tourism practices to tourist loyalty through satisfaction (0.272) is also found significant (p-value 0.000). Hence, hypotheses H9, H10, H11 and H12 are supported. Among the mediation effects, tourist satisfaction was found to be stronger than others.

6. Implications

The findings of the study provide important theoretical and practical implications for tourism researchers and destination managers. The results revealed that Smart Tourism Technologies (STT) and Sustainable Tourism Practices (STP) do not directly influence Tourist Loyalty (TL). Instead, their influence becomes significant through Tourist Trust (TT) and Tourist Satisfaction (TS). This indicates that tourists do not become loyal merely because destinations adopt advanced technologies or sustainability initiatives; rather, loyalty develops when tourists feel satisfied and trust the destination.

From a theoretical perspective, the study extends the existing tourism and relationship marketing literature by confirming the mediating role of trust and satisfaction in the relationship between smart tourism initiatives, sustainable practices, and loyalty. The findings support earlier studies that emphasized that technology and sustainability improve tourist experiences, confidence, and emotional attachment toward destinations (Gretzel et al., 2015; Neuhofer et al., 2015). The stronger mediation effect of Tourist Satisfaction also supports expectation-confirmation and experiential consumption theories, where satisfaction acts as a key predictor of revisit intention and loyalty (Yoon & Uysal, 2005).

Practically, the findings suggest that tourism destinations should not focus only on implementing smart technologies and sustainable initiatives, but also on ensuring that tourists experience convenience, trust, safety, and satisfaction through these practices. Destination managers should design user-friendly digital services, transparent information systems, eco-friendly tourism operations, and personalized experiences to strengthen tourist trust and satisfaction. Since Tourist Satisfaction emerged as the strongest mediator, tourism organizations should prioritize experiential quality enhancement strategies to improve long-term tourist loyalty and destination competitiveness.

7. Limitations and Directions for Future Scope

The study has certain limitations that offer scope for future research. First, the study was limited to selected tourist respondents, which may restrict the generalizability of the findings to other regions and tourism contexts. Future studies may include

larger and more diverse samples across different destinations or countries. Second, the study used a cross-sectional design with data collected at one point in time. Future researchers may adopt longitudinal studies to examine changes in tourist perceptions and loyalty over time. Third, the study considered only Smart Tourism Technologies, Sustainable Tourism Practices, Tourist Trust, Tourist Satisfaction, and Tourist Loyalty. Future studies may include additional variables such as destination image, perceived value, tourist engagement, and experiential quality for a more comprehensive understanding. Finally, future research may examine moderating factors such as age, travel motivation, digital literacy, and cultural differences to better understand tourist behaviour in smart and sustainable tourism environments.

8. Conclusion

The study examined the influence of Smart Tourism Technologies and Sustainable Tourism Practices on Tourist Loyalty through the mediating roles of Tourist Trust and Tourist Satisfaction. The findings revealed that both Smart Tourism Technologies and Sustainable Tourism Practices do not directly influence Tourist Loyalty; however, they significantly enhance Tourist Trust and Tourist Satisfaction, which in turn lead to stronger tourist loyalty. Among the mediating variables, Tourist Satisfaction emerged as the strongest predictor of loyalty. The study highlights that modern tourists value destinations that provide technologically advanced, convenient, reliable, and environmentally responsible experiences. The findings emphasize that tourism destinations should focus not only on adopting smart technologies and sustainable practices, but also on ensuring that these initiatives create meaningful, trustworthy, and satisfying experiences for tourists. Overall, the study contributes to the growing literature on smart and sustainable tourism and provides useful insights for tourism managers and policymakers to strengthen long-term tourist relationships and destination competitiveness.

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