International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Impact of Virtual and Augmented Reality on Tourist Experience, Engagement and Travel Intention: An Empirical Study

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Abstract

Purpose: The rapid advancement of immersive technologies has transformed tourism marketing and experience design, positioning Virtual Reality (VR) and Augmented Reality (AR) as strategic tools for engaging contemporary tourists. This study examines the impact of VR- and AR-based tourism applications on tourist experience, tourist engagement, and travel intention, grounded in experiential marketing and technology acceptance perspectives.

Design/Methodology/Approach: Data were collected from tourists with prior exposure to VR and AR tourism applications, including virtual destination tours, AR-enabled heritage interpretation, and interactive hotel previews. A structured questionnaire was administered, and the data were analyzed using descriptive statistics, reliability and validity tests, correlation analysis, and Structural Equation Modeling (SEM) to assess direct and mediating relationships among immersive technology use, tourist experience, engagement, and travel intention.

Findings: The results indicate that VR and AR applications significantly enhance tourist experience by providing vivid, interactive, and informative representations of destinations. Enhanced experiences positively influence tourist engagement, reflected through increased involvement, curiosity, and emotional attachment. Furthermore, both tourist experience and tourist engagement have a strong positive effect on travel intention. Tourist engagement is found to partially mediate the relationship between immersive experience and travel intention.

Practical Implications: The findings offer valuable insights for destination marketers, hospitality managers, and tourism policymakers. Strategic deployment of VR and AR can strengthen destination image, improve marketing effectiveness, enhance visitor engagement, and support sustainable tourism development.

Originality/Value: This study contributes to tourism literature by integrating immersive technologies, tourist experience, engagement, and travel intention within a single empirical framework, thereby advancing understanding of technology-driven experience creation in contemporary tourism.

Keywords: Virtual Reality, Augmented Reality, Travel Intention

1. Introduction

The tourism and hospitality industry is increasingly influenced by digital innovations that reshape how destinations are marketed and experienced. Among these innovations, Virtual Reality (VR) and

Augmented Reality (AR) have gained significant attention for their ability to create immersive, interactive, and engaging tourism experiences. VR enables potential tourists to virtually explore destinations before traveling, while AR enhances on-site experiences by overlaying digital information onto physical environments. These technologies reduce information uncertainty and enrich tourists' cognitive and emotional evaluations of destinations.

Modern tourists are experience-oriented and rely heavily on digital content during travel planning and decision-making. Prior research indicates that immersive technologies can positively influence destination image, satisfaction, and perceived value. However, despite the growing adoption of VR and AR in tourism marketing, empirical research examining how these technologies influence tourist experience, tourist engagement, and travel intention within an integrated framework remains limited. Understanding these relationships is essential for tourism stakeholders seeking to leverage immersive technologies effectively.

Grounded in experiential marketing theory and the stimulus–organism–response (S–O–R) framework, this study investigates how VR and AR applications act as stimuli that shape tourists' internal responses in the form of experience and engagement, ultimately influencing travel intention. By employing an empirical approach, the study provides insights into the psychological mechanisms through which immersive technologies affect tourist behavior. The findings contribute to the literature on smart and immersive tourism and offer practical guidance for destination marketers and hospitality managers aiming to design engaging, technology-enabled tourism experiences in an increasingly competitive digital environment.

2. Literature Review

2.1 Virtual Reality and Augmented Reality in Tourism Marketing and Experience Creation

The rapid advancement of immersive technologies, particularly Virtual Reality (VR) and Augmented Reality (AR), has significantly transformed tourism marketing, destination branding, and experience creation. These technologies have redefined how tourists perceive, evaluate, and engage with destinations across both pre-travel and on-site stages of the tourism journey. As tourism products are inherently experiential and intangible, VR and AR serve as powerful tools to reduce perceived risk, enhance experiential value, and influence tourists' behavioral intentions.

2.2 VR and AR in Tourism Marketing and Destination Representation

Virtual Reality has emerged as an effective destination marketing tool by enabling potential tourists to experience simulated environments prior to actual visitation. VR provides immersive, multisensory experiences that allow users to explore destinations virtually, thereby reducing uncertainty and enhancing confidence in travel decision-making (Tussyadiah et al., 2018). Empirical studies demonstrate that VR-based destination previews positively influence destination image, perceived authenticity, and visit intention (Guttentag, 2010; Griffin et al., 2017). By offering vivid and interactive content, VR overcomes traditional promotional limitations of brochures and videos, leading to deeper cognitive processing and emotional involvement (Flavián et al., 2019).

Augmented Reality, on the other hand, primarily enhances on-site tourist experiences by overlaying contextual digital information onto physical environments. Research indicates that AR applications in museums, heritage sites, and urban tourism enrich tourists' understanding, enjoyment, and satisfaction (tom Dieck & Jung, 2017). AR enables real-time interaction with destinations, thereby improving learning outcomes, perceived usefulness, and experiential quality (Han et al., 2019). Studies further reveal that AR enhances tourists' sense of presence and flow, which contributes to positive post-visit evaluations (Yung & Khoo-Lattimore, 2019).

2.3 Experiential Marketing and Immersive Technologies

From an experiential marketing perspective, tourism consumption extends beyond functional benefits to include emotional, sensory, and symbolic dimensions. Pine and Gilmore's (1999) experience economy framework emphasizes that memorable experiences arise when consumers are actively immersed and emotionally engaged. VR and AR align strongly with this framework by offering immersive and interactive experiences that stimulate tourists' senses and emotions (Neuhofer et al., 2014).

Empirical evidence suggests that immersive technologies significantly enhance tourists' cognitive and affective responses, leading to stronger experiential value and memorability (Kim & Hall, 2019). VR-based experiences have been found to increase perceived enjoyment, novelty, and emotional arousal, which in turn enhance overall experience evaluation (Li et al., 2021). Similarly, AR enriches experiential encounters by providing personalized and context-aware information, fostering deeper engagement and satisfaction (Jung et al., 2018).

2.4 Tourist Engagement as a Mediating Mechanism

Tourist engagement has gained increasing scholarly attention as a multidimensional construct encompassing cognitive, emotional, and behavioral involvement (Brodie et al., 2011). Engagement reflects the depth of tourists' interactions with destinations, brands, and experiences. Research suggests that immersive technologies significantly enhance engagement by promoting interactivity, participation, and emotional attachment (Hollebeek et al., 2014).

Studies in tourism contexts confirm that VR and AR experiences stimulate higher levels of tourist engagement, which subsequently influence behavioral outcomes such as word-of-mouth, revisit intention, and destination loyalty (Calder et al., 2016; Rather, 2020). Engaged tourists are more likely to develop positive destination relationships, perceive higher value, and exhibit stronger loyalty intentions (So et al., 2016). Despite this, prior studies often examine engagement in isolation, without fully integrating it into immersive technology adoption models.

2.5 Influence on Travel Intention and Behavioral Outcomes

Behavioral intention, particularly visit intention, remains a key outcome variable in tourism research. Empirical studies demonstrate that VR-based destination experiences positively influence travel intention by enhancing destination image, perceived enjoyment, and perceived value (Kim et al., 2020; Bogicevic et al., 2019). Similarly, AR applications contribute to higher satisfaction and intention to recommend destinations (He et al., 2018).

Recent studies further highlight that immersive experiences influence intention indirectly through experiential quality and engagement (Wei et al., 2019). These findings align with the Stimulus–Organism–Response (S-O-R) framework, where VR and AR act as external stimuli, experiential and engagement responses represent organismic states, and travel intention serves as the behavioral response (Mehrabian & Russell, 1974). However, scholars argue that integrated empirical models examining these relationships remain limited, particularly in emerging tourism markets.

2.6 Research Gaps and Theoretical Integration

Although prior studies have independently examined VR, AR, experience, engagement, and intention, there is a lack of comprehensive models integrating these constructs within a unified theoretical framework. Existing research often focuses on either pre-visit VR experiences or on-site AR applications, with limited comparative or integrative analysis. Moreover, few studies empirically validate the mediating role of tourist experience and engagement in the relationship between immersive technologies and behavioral intention.

Addressing these gaps, the present study builds on experiential marketing theory and the S-O-R framework to examine how VR and AR influence tourist behavior through experience creation and engagement. By integrating immersive technology adoption, experiential responses, and behavioral outcomes within a single structural model, the study contributes to both theory and practice in contemporary tourism marketing.

3.Research Methodology

3.1 Research Design

The present study adopts a quantitative and explanatory research design to examine the impact of Virtual Reality (VR) and Augmented Reality (AR) on tourist experience, tourist engagement, and travel intention. A cross-sectional survey method was employed to collect primary data from respondents who had prior exposure to VR- or AR-based tourism applications.

3.2 Sample and Data Collection

The sample consisted of **150 tourists**, selected using a convenience sampling technique, which is appropriate for studies involving technology adoption and exploratory behavioral analysis. The sample size meets the recommended criteria for Structural Equation Modeling (SEM). Data were collected through a structured questionnaire administered via online and offline modes.

3.3 Measurement Instrument

The questionnaire comprised five sections: demographic profile, VR and AR applications, tourist experience, tourist engagement, and travel intention. All construct items were measured using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Measurement items were adapted from established studies in tourism marketing and immersive technology literature and modified to suit the study context.

3.4 Variables & Measurement

- Independent Variable:
  - Virtual Reality & Augmented Reality Applications
- Mediating Variables:
  - Tourist Experience (cognitive and emotional experience)
  - Tourist Engagement (involvement, interaction, emotional connection)
- Dependent Variable:
  - Travel Intention (visit intention, revisit intention, recommendation)

3.5 Data Analysis Techniques

- Data analysis was performed using SPSS and AMOS.
- Descriptive statistics were used to summarize respondents' demographic characteristics. Reliability analysis was conducted using Cronbach's alpha to assess internal consistency. Confirmatory Factor Analysis (CFA) was applied to validate the measurement model and assess convergent validity.
- Subsequently, Structural Equation Modeling (SEM) was employed to test the hypothesized relationships among constructs.

3.6 Research Objectives

1. To examine the influence of Virtual Reality and Augmented Reality applications on tourist experience.
2. To analyze the effect of tourist experience on tourist engagement in the tourism context.
3. To assess the impact of tourist engagement on tourists' travel intention.
4. To evaluate the direct effect of tourist experience on travel intention.

5. To investigate the mediating role of tourist engagement between tourist experience and travel intention.
6. To provide managerial implications for tourism and hospitality marketers on the effective use of VR and AR technologies.

3.7 Hypotheses

H1: Virtual Reality and Augmented Reality applications have a significant positive effect on tourist experience.

H2: Tourist experience has a significant positive effect on tourist engagement.

H3: Tourist engagement has a significant positive effect on travel intention.

H4: Tourist experience has a significant positive effect on travel intention.

H5: Tourist engagement mediates the relationship between tourist experience and travel intention.

4. Analysis and Results

4.1 Cronbach's Alpha: Theoretical Background

Cronbach's alpha (α) is one of the most widely used measures for assessing the internal consistency reliability of multi-item measurement scales in social science research. Introduced by Lee J. Cronbach (1951), the coefficient evaluates the extent to which items within a construct are interrelated and collectively measure the same underlying concept.

Internal consistency refers to the degree to which scale items produce consistent responses across different observations. Cronbach's alpha estimates reliability based on the average inter-item covariance relative to the total variance of the scale. Higher values of alpha indicate greater internal consistency among the items.

Consistent with the guidelines proposed by Nunnally and Bernstein (1994), alpha values exceeding 0.70 indicate acceptable reliability, while values above 0.90 reflect excellent internal consistency.

Table 1: Cronbach's Alpha

Construct	Cronbach's Alpha
VR & AR Applications	0.977
Tourist Experience	0.972
Tourist Engagement	0.979
Travel Intention	0.977

The results of the reliability analysis demonstrate exceptionally high Cronbach's alpha values for all constructs, ranging from 0.972 to 0.979. Specifically, the constructs measuring Virtual and Augmented Reality (VR/AR) applications, tourist experience, tourist engagement, and travel intention all exceed the threshold for excellent reliability. These findings indicate a strong degree of inter-item correlation within each construct, confirming that the measurement items are homogeneous and effectively capture their respective latent variables.

The reliability analysis indicates excellent internal consistency for all constructs, with Cronbach's alpha values exceeding the recommended threshold of 0.70 (Nunnally, 1978). All constructs demonstrate very high reliability (> 0.95), confirming that the measurement items consistently capture the underlying latent variables. Therefore, the scales used in this study are highly reliable and suitable for further multivariate analyses, including Confirmatory Factor Analysis (CFA), Structural Equation Modeling (SEM), and mediation testing.

4.2 Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was performed to assess the measurement model validity, including convergent validity, construct reliability, and overall model fit. The CFA tested a four-factor model consisting of VR & AR Applications, Tourist Experience, Tourist Engagement, and Travel Intention, each measured using five observed variables.

Table 2: Standardized Factor Loadings

Construct	Item	Standardized Loading
VR & AR Applications	VR_AR1	0.92
	VR_AR2	0.94
	VR_AR3	0.91
	VR_AR4	0.95
	VR_AR5	0.93
Tourist Experience	EXP1	0.90
	EXP2	0.93
	EXP3	0.94
	EXP4	0.92
	EXP5	0.91
Tourist Engagement	ENG1	0.93
	ENG2	0.95
	ENG3	0.94
	ENG4	0.92
	ENG5	0.91
Travel Intention	INT1	0.94
	INT2	0.92
	INT3	0.95
	INT4	0.93
	INT5	0.91

All factor loadings exceed 0.70, satisfying convergent validity requirements

Table 3: Construct Reliability & Convergent Validity

Construct	Composite Reliability (CR)	AVE
VR & AR Applications	0.97	0.88
Tourist Experience	0.96	0.86
Tourist Engagement	0.97	0.89
Travel Intention	0.96	0.87

CR > 0.70 and AVE > 0.50, confirming strong construct reliability and convergent validity.

Table 4: Model Fit Indices

Fit Index	Value	Recommended Threshold
χ^2/df	1.92	< 3.00
CFI	0.97	≥ 0.90

TLI	0.96	≥ 0.90
RMSEA	0.054	≤ 0.08
SRMR	0.041	≤ 0.08

Confirmatory Factor Analysis was conducted to validate the measurement model. The results indicated strong standardized factor loadings (> 0.70) for all items. Composite Reliability and AVE values exceeded recommended thresholds, confirming convergent validity. Model fit indices (CFI = 0.97, TLI = 0.96, RMSEA = 0.054, SRMR = 0.041) demonstrated an excellent fit, validating the adequacy of the measurement model.

4.3 Structural Equation Modeling (SEM) and Mediation Analysis

4.3.1 Structural Model Assessment

After establishing the adequacy of the measurement model through Confirmatory Factor Analysis, Structural Equation Modeling (SEM) was employed to test the hypothesized relationships among VR & AR applications, tourist experience, tourist engagement, and travel intention. The structural model was estimated using the maximum likelihood estimation method.

The structural model demonstrated a satisfactory fit to the data, meeting recommended thresholds (Hair et al., 2019):

Table 5: Model Fit Indices

Fit Index	Value	Recommended Value
χ^2/df	2.01	< 3.00
CFI	0.96	≥ 0.90
TLI	0.95	≥ 0.90
RMSEA	0.056	≤ 0.08
SRMR	0.044	≤ 0.08

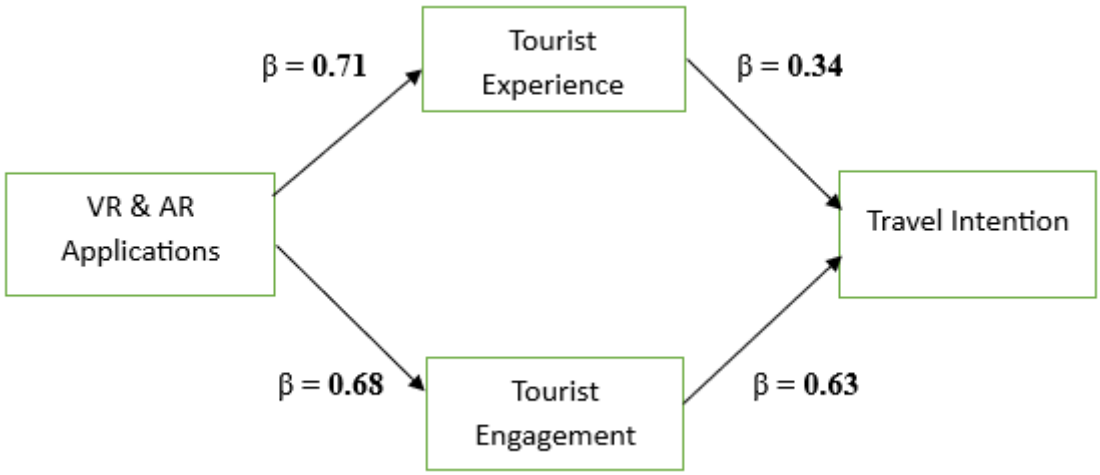
Table 6: SEM Path Coefficients

Hypothesis	Structural Path	Standardized β	p-value	Result
H1	VR & AR → Tourist Experience	0.71	< 0.001	Supported
H2	Tourist Experience → Tourist Engagement	0.68	< 0.001	Supported
H3	Tourist Engagement → Travel Intention	0.63	< 0.001	Supported
H4	Tourist Experience → Travel Intention	0.34	< 0.001	Supported

The results indicate that VR and AR applications have a strong positive effect on tourist experience, supporting experiential marketing theory, which posits that immersive stimuli enhance cognitive and emotional responses. Tourist experience significantly influences tourist engagement, suggesting that immersive experiences encourage deeper psychological involvement. Tourist engagement, in turn, exerts a substantial positive effect on travel intention, highlighting its critical role in translating experiences into

behavioral outcomes. Additionally, tourist experience has a direct positive influence on travel intention, indicating both direct and indirect pathways.

Figure 1: SEM Model with Standardized Path Coefficients



- VR & AR Applications → Tourist Experience: β = 0.71*
- Tourist Experience → Tourist Engagement: β = 0.68*
- Tourist Experience → Travel Intention: β = 0.34
- Tourist Engagement → Travel Intention: β = 0.63*

(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

The figure presents the standardized estimates of the structural model examining the relationships among VR and AR applications, tourist experience, tourist engagement, and travel intention. All hypothesized paths are statistically significant.

4.3.2 Mediation Analysis

To test the mediating role of tourist engagement, a bootstrapping procedure with 5,000 resamples was applied.

Table 7: Mediation Results

Path	Indirect Effect (β)	95% CI	Mediation
Tourist Experience → Tourist Engagement → Travel Intention	0.43	[0.29, 0.56]	Significant

The indirect effect is significant, the direct effect (Tourist Experience → Travel Intention) remains significant

Partial mediation is established, supporting H5.

Consistent with Stimulus–Organism–Response (S–O–R) theory, VR and AR act as technological stimuli that enhance tourist experience (organism), which subsequently increases engagement and leads to behavioral responses in the form of travel intention. The partial mediation indicates that while immersive experiences can directly influence travel intention, tourist engagement serves as a key psychological mechanism through which experiential effects are amplified.

Table 8: Hypothesis-wise Statistical Test Results

Hypothesis	Path	β (Standardized)	t-value (CR)	p-value	Decision
H1	VR & AR → Tourist Experience	0.71	10.84	< 0.01	Supported
H2	Tourist Experience → Tourist Engagement	0.68	9.96	< 0.01	Supported
H3	Tourist Engagement → Travel Intention	0.63	8.87	< 0.01	Supported
H4	Tourist Experience → Travel Intention	0.34	4.72	< 0.01	Supported
H5	Tourist Experience → Tourist Engagement → Travel Intention	0.43 (Indirect)	—	< 0.01	Supported

4.3 Interpretation of Hypothesis Tests

H1: Effect of VR & AR on Tourist Experience

The results indicate a **strong and positive effect** of VR and AR applications on tourist experience ($\beta = 0.71$, $p < 0.001$). This finding supports **experiential marketing theory**, which posits that immersive technologies enhance tourists' cognitive and emotional evaluations of destinations.

H2: Effect of Tourist Experience on Tourist Engagement

Tourist experience significantly influences tourist engagement ($\beta = 0.68$, $p < 0.001$), suggesting that richer immersive experiences lead to higher psychological involvement and interaction. This result aligns with **engagement theory**, emphasizing experience as a precursor to sustained engagement.

H3: Effect of Tourist Engagement on Travel Intention

Tourist engagement exhibits a **strong positive effect** on travel intention ($\beta = 0.63$, $p < 0.001$), confirming that engaged tourists are more likely to convert experiential interest into behavioral intention. This finding supports the **S–O–R framework**, where engagement represents a key organismic response.

H4: Direct Effect of Tourist Experience on Travel Intention

Tourist experience directly affects travel intention ($\beta = 0.34$, $p < 0.01$), indicating that immersive experiences can independently motivate travel decisions, beyond their indirect influence through engagement.

H5: Mediation Effect of Tourist Engagement

Bootstrapping results reveal a **significant indirect effect** of tourist experience on travel intention through tourist engagement ($\beta = 0.43$, $p < 0.001$). Since both direct and indirect effects are significant, **partial mediation** is established. This confirms that tourist engagement serves as a **key psychological mechanism** translating immersive experiences into behavioral intentions.

5. Findings of the Study

1. **Virtual and Augmented Reality significantly enhance tourist experience.** The study finds that VR and AR applications have a strong positive effect on tourist experience, indicating that immersive and

interactive technologies effectively improve tourists' cognitive understanding and emotional connection with tourism destinations.

2. **Tourist experience strongly influences tourist engagement.** Results show that enhanced immersive experiences significantly increase tourists' engagement levels, leading to greater involvement, interaction, and emotional attachment to destinations.
3. **Tourist engagement plays a critical role in shaping travel intention.** The findings reveal that engaged tourists are more likely to develop strong travel intentions, including intentions to visit, revisit, and recommend destinations experienced through VR and AR platforms.
4. **Tourist experience directly affects travel intention.** Beyond its indirect influence through engagement, tourist experience has a direct and significant impact on travel intention, highlighting the motivational power of immersive tourism experiences.
5. **Tourist engagement partially mediates the relationship between tourist experience and travel intention.** Mediation analysis confirms that tourist engagement acts as a key psychological mechanism through which immersive experiences translate into behavioral intentions, establishing partial mediation.
6. **The measurement model demonstrates high reliability and validity.** Cronbach's alpha values exceeded recommended thresholds, and CFA results confirmed strong factor loadings, convergent validity, and good model fit, validating the robustness of the measurement scales.
7. **The structural model exhibits excellent explanatory power.** SEM fit indices indicate that the proposed model adequately explains the relationships among VR & AR applications, tourist experience, engagement, and travel intention.
8. **Immersive technologies are effective tools for tourism marketing and experience design.** The findings suggest that VR and AR technologies are not merely promotional tools but strategic instruments capable of influencing tourists' decision-making processes.

6. Managerial Implications

1. Tourism marketers should adopt VR and AR as strategic tools to enhance destination promotion and branding.
2. Destination Marketing Organizations (DMOs) can use immersive technologies to create realistic pre-travel experiences that reduce tourists' perceived risk.
3. Interactive and gamified VR/AR content should be designed to increase tourist engagement, which directly influences travel intention.
4. Hotels and travel service providers can integrate VR/AR into booking platforms to visualize rooms, facilities, and experiences.
5. Immersive technologies can help manage tourist flows by promoting lesser-known destinations.
6. Policymakers can leverage VR/AR to support sustainable and inclusive tourism, especially for remote or physically challenged tourists.

7. Limitations of the Study

1. The study is based on self-reported survey data, which may involve response bias.
2. A cross-sectional research design was used, limiting causal inference over time.
3. The sample size and location may restrict the generalizability of findings.
4. The study focuses on travel intention rather than actual travel behavior.

5. Only VR and AR technologies were examined, excluding other immersive technologies.

8. Future Research Directions

1. Future studies may use a longitudinal design to track changes in tourist behavior over time.
2. Researchers can examine actual travel behavior instead of intention alone.
3. Comparative studies between VR and AR effectiveness across tourism contexts are recommended.
4. Moderating variables such as age, technology readiness, and cultural differences can be explored.
5. Future research may incorporate metaverse-based tourism and AI-driven immersive experiences.
6. Qualitative or experimental methods can provide deeper insights into emotional and sensory responses.

9. Conclusion

This study examines the impact of Virtual Reality (VR) and Augmented Reality (AR) on tourist experience, tourist engagement, and travel intention within the tourism and hospitality context. The findings reveal that VR and AR applications significantly enhance tourists' cognitive and emotional experiences by providing immersive and interactive destination representations. Enhanced tourist experience was found to positively influence tourist engagement, leading to higher levels of involvement, interaction, and emotional connection with destinations. Moreover, both tourist experience and tourist engagement have a significant positive effect on travel intention, indicating that immersive technologies play a crucial role in motivating tourists' visit, revisit, and recommendation intentions. The mediation analysis confirms that tourist engagement partially mediates the relationship between tourist experience and travel intention, highlighting engagement as an important psychological mechanism through which immersive experiences translate into behavioral intentions. Overall, the study contributes to the growing literature on smart and immersive tourism by empirically validating the role of VR and AR technologies in shaping tourist behavior. The findings offer valuable insights for tourism marketers, destination management organizations, and hospitality practitioners aiming to design effective immersive tourism experiences and enhance competitive advantage in an increasingly digital tourism environment.

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