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DIGITAL EXPERIENCE QUALITY, VISITOR ENGAGEMENT, AND CULTURAL HERITAGE PRESERVATION INTENTIONS: A MODERATED MEDIATION MODEL AMONG GENERATION Z AT WORLD HERITAGE SITES

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Abstract: Although mobile heritage tourism research has extensively examined technology adoption and visitor satisfaction as discrete phenomena, the integrated behavioral pathway through which mobile app adoption motivations sequentially translate into cultural heritage preservation intentions among Generation Z tourists remains theoretically and empirically underdeveloped. This study examines how digital engagement with mobile heritage applications shapes cultural heritage preservation intentions among Generation Z visitors, positioning conservation behavioral commitment — rather than touristic experience per se — as the primary outcome of interest. A model was developed with perceived usefulness (PU), social influence (SI), and hedonic motivation (HM) as antecedents; user engagement (UE) and experiential satisfaction (TS) as sequential mediators; and mobile application quality (MAQ) as a boundary condition. Hypotheses were tested using Partial Least Squares Structural Equation Modelling on survey data from 412 Generation Z visitors to cultural heritage sites in Vietnam. All nine hypotheses were supported. Hedonic motivation emerged as the strongest predictor of visitor engagement, followed by PU, and SI. UE strongly predicted TS, which in turn exerted the most proximal effect on preservation intentions. Satisfaction fully mediated the engagement–preservation pathway, and MAQ significantly amplified this conservation behavioral chain, with the satisfaction–preservation relationship nearly doubling in strength at high versus low app quality. High-quality, experientially rich mobile heritage applications constitute effective instruments for cultivating conservation behavioral commitment in Generation Z visitors, operating through a sequential engagement–satisfaction–preservation mechanism. These findings position digital application quality as a direct policy lever for heritage site managers and conservation authorities seeking to activate stewardship intentions among younger generations at cultural heritage sites.

Keywords: cultural heritage preservation, digital visitor engagement, Generation Z, mobile heritage applications, PLS-SEM

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INTRODUCTION

Cultural heritage tourism has emerged as one of the most significant and fastest-growing segments of the global tourism industry, encompassing visits to historic sites, museums, archaeological monuments, traditional performances, and intangible cultural expressions that reflect the collective memory and identity of communities (Deng et al., 2025). Beyond its economic contributions, cultural heritage tourism plays an instrumental role in fostering intercultural dialogue, promoting community resilience, and sustaining the tangible and intangible resources that define human civilization (Khoa et al., 2025). However, the long-term sustainability of this tourism sector depends critically on the extent to which tourists, particularly younger generations, develop genuine commitments to preserving and protecting the cultural assets they encounter during their travels. Without the active participation of contemporary tourists as cultural stewards, heritage sites face irreversible degradation from overcrowding, inadequate funding, climate change, and social indifference.

Simultaneously, the pervasive adoption of mobile technology has created unprecedented opportunities for immersive, personalized, and interactive cultural heritage experiences (Marasco et al., 2022). Mobile applications designed for heritage tourism can deliver augmented reality overlays on historical structures, multilingual audio guides, gamified learning modules, community storytelling platforms, and real-time notifications about cultural events—all within the tourist's immediate reach. These technological affordances have made cultural heritage sites more accessible, engaging, and meaningful to contemporary visitors, particularly to the digital-native Generation Z cohort (born approximately 1997–2012), who represent a growing and increasingly influential market segment in global tourism (Tran & Khoa, 2025a).

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In Vietnam alone, Gen Z tourists account for nearly one-third of all domestic cultural heritage visits, and the country's rapidly expanding cultural mobile app ecosystem, encompassing applications for all eight UNESCO World Heritage Sites, makes it a particularly relevant and timely context for study (Bui et al., 2018).

Generation Z tourists exhibit distinctive behavioral characteristics that set them apart from Millennial and older tourist cohorts. They demonstrate a strong preference for digital-first travel planning, immersive experiential engagement, social media-mediated discovery, and value-aligned consumption patterns (Ivasciuc et al., 2025). Research has consistently found that Gen Z travellers are more likely to express cultural sensitivity and preservation-oriented behaviors when their values are authentically engaged, suggesting that well-designed mobile experiences could serve as powerful conduits for cultivating cultural preservation intentions (Lin et al., 2025). Yet despite growing scholarly interest in mobile tourism and Gen Z travel behavior, there remains a notable gap in understanding how specific dimensions of mobile app adoption; namely perceived usefulness, social influence, and hedonic motivation, translate, through cognitive and affective intermediaries, into behavioral intentions to support cultural heritage conservation. Existing mobile tourism literature has examined technology adoption drivers (Chen et al., 2024), experiential satisfaction (Primadona et al., 2025), and heritage site management (de Oliveira et al., 2022) largely as separate streams of inquiry. The integration of these streams into a unified model that explains the full behavioral pathway from mobile app adoption motivations to conservation outcomes remains underdeveloped. Moreover, the moderating role of mobile app quality—a construct that captures the app's technical and experiential sophistication—has received insufficient theoretical and empirical attention as a boundary condition that shapes the strength of technology-mediated conservation behavioral pathways.

This study addresses these gaps by developing an integrated theoretical model grounded in the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) (Venkatesh et al., 2012), the Technology Acceptance Model (TAM) (Davis, 1989), and the Stimulus-Organism-Response framework (S-O-R) (Mehrabian & Russell, 1974).

The model incorporates three independent variables (perceived usefulness, social influence, hedonic motivation), two mediating variables (user engagement, experiential satisfaction), one mobile-specific moderating variable (mobile app quality), and one dependent variable (cultural heritage preservation intentions). The integration of UTAUT2, TAM, and S-O-R in this study is theoretically generative beyond the sum of its parts. UTAUT2 provides the motivational antecedents (perceived usefulness, social influence, hedonic motivation) that explain why users adopt and engage with mobile heritage apps; TAM supplies the cognitive processing mechanisms that translate perceived utility into behavioral engagement; and S-O-R frames the environment-organism-behavior chain that links app stimuli through affective states to downstream conservation outcomes. No single framework could account for this full behavioral arc: UTAUT2 and TAM lack an explicit affective pathway to prosocial outcomes, while S-O-R lacks the adoption-motivation structure necessary to explain differential engagement. Their integration thus produces a theoretically complete model of technology-mediated conservation behavior that is both parsimonious and explanatorily comprehensive.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

Generation Z and Digital Cultural Tourism

Gen Z represents the first generation of tourists who have grown up entirely in a mobile-first digital ecosystem, and this technological embeddedness fundamentally shapes how they discover, experience, and relate to cultural heritage destinations (Priporas et al., 2024). Unlike prior generations who viewed mobile technology as a supplement to physical tourism experiences, Gen Z tourists tend to integrate digital and physical dimensions seamlessly, co-creating their cultural experiences through mobile app interactions, social media sharing, and peer-mediated discovery (Buhalis et al., 2022). Recent empirical studies have highlighted that Gen Z tourists assign higher importance to digital interactivity, authenticity, and personalization in cultural tourism contexts than older cohorts, while also expressing stronger concern for the long-term sustainability of cultural sites they visit (Liu & Sun, 2023; Yoo, 2023).

The intersection of Gen Z's digital nativity and cultural heritage tourism creates fertile ground for examining how the adoption of mobile technology shapes preservation-oriented behavioral outcomes. Prior research has explored how mobile apps influence experiential satisfaction and revisit intention (Kang et al., 2018; Torabi et al., 2022), but far fewer studies have examined how mobile-mediated cultural experiences translate into active preservation commitment among younger tourists. Several psychological mechanisms help explain why these relationships may be particularly pronounced for Gen Z. First, Gen Z's identity formation is deeply intertwined with digital experiences: mobile app interactions at heritage sites can activate cultural identity schemas and digital self-narratives that strengthen psychological ownership of heritage assets. Second, Gen Z exhibits markedly values-driven consumption behavior, whereby experiential authenticity and social impact align with preservation-oriented prosocial intentions. Third, social media-mediated peer influence operates as a potent norm-transmission channel for Gen Z, amplifying the role of social influence in shaping engagement and conservation commitments through observable peer behavior. This gap is particularly consequential given that Gen Z will constitute the primary custodians of cultural heritage in the coming decades, and the behavioral dispositions they develop during early tourism encounters may have lasting implications for heritage sustainability.

Mobile Applications in Cultural Heritage Tourism

The integration of mobile applications into cultural heritage tourism has been the subject of growing scholarly inquiry over the past five years. Mobile heritage apps encompass a wide range of functional modalities, including digital audio-visual guides, augmented reality (AR) and virtual reality (VR) overlays, geolocation-based content delivery, storytelling platforms, gamification features, and interactive maps (Marasco et al., 2022). Several studies have demonstrated that these

features can substantially enhance the depth, quality, and memorability of heritage tourism experiences (Dieck et al., 2021; Tran & Khoa, 2025b). From a behavioral perspective, mobile heritage apps function as powerful experiential stimuli that activate both cognitive (informational, educational) and affective (emotional, hedonic) processing in tourists.

Anand et al. (2022) found that tourists who engaged with AR-enabled heritage apps reported significantly higher levels of emotional connection to heritage sites compared to non-app users. Similarly, Gretzel et al. (2020) emphasized that mobile technology transforms passive heritage visitors into active co-creators of cultural meaning, which has important implications for preservation consciousness and behavioral intention. Critically, the quality of the mobile app itself, in terms of interface design, content richness, technical stability, and experiential responsiveness, plays a crucial role in determining the depth of engagement and satisfaction achieved (Guo et al., 2025). This quality dimension introduces important heterogeneity into the relationship between mobile app use and behavioral outcomes, suggesting that quality should be explicitly modeled as a boundary condition.

RESEARCH FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Conceptual Research Model

This study proposes an integrated conceptual model in which perceived usefulness, social influence, and hedonic motivation serve as independent variables predicting user engagement, which in turn directly influences both experiential satisfaction and cultural heritage preservation intentions. Experiential satisfaction further predicts cultural heritage preservation intentions, and mobile app quality moderates the relationship between experiential satisfaction and preservation intentions. The model (Figure 1) captures a sequential, technology-mediated behavioral chain through which mobile app adoption motivations ultimately shape conservation-oriented behavioral intentions among Gen Z tourists, integrating UTAUT2, TAM, and S-O-R theoretical logics within a unified structural architecture.

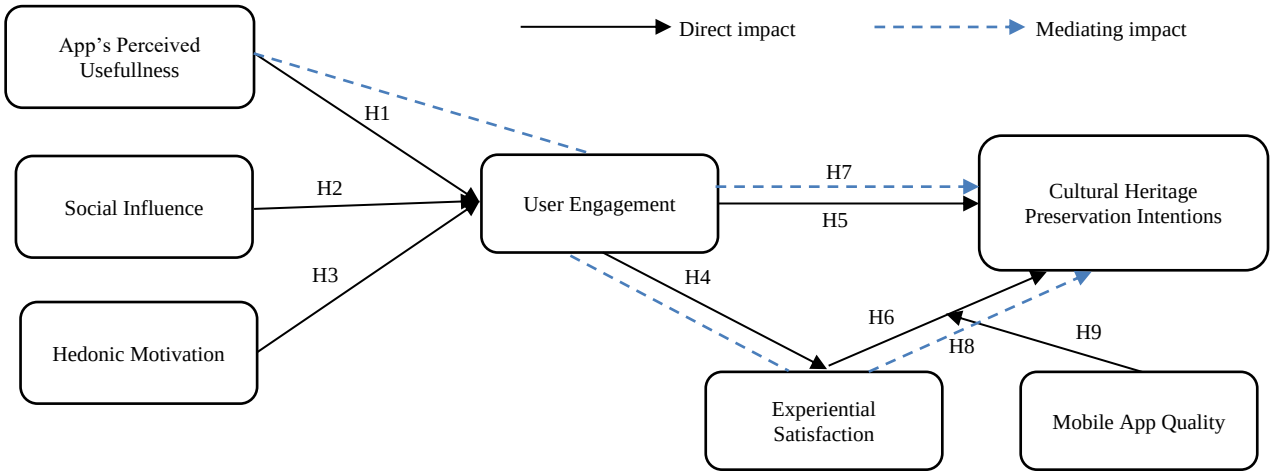


Figure 1. Conceptual model

Hypothesis Development

When Gen Z tourists perceive a heritage mobile application as genuinely useful—that is, when it meaningfully enhances their ability to understand, navigate, and appreciate cultural heritage content—they are more likely to engage deeply and persistently with its features (Tan et al., 2017). Perceived usefulness creates a utilitarian motivation for sustained interaction, encouraging users to explore cultural information more thoroughly, seek contextual explanations, and actively use all available app features (Lee & Kim, 2021; Rasoolimanesh et al., 2021). Consistent with TAM and UTAUT2 logic, multiple empirical studies confirm that perceived usefulness positively predicts user engagement in mobile tourism applications (Bhattacherjee, 2001; Tam et al., 2018). Therefore,

H1: Perceived usefulness has a significant positive effect on user engagement with mobile heritage applications among Generation Z tourists.

Social influence shapes Gen Z tourists' motivation to engage with mobile heritage apps through its role in signaling social desirability, community belonging, and peer validation. When Gen Z tourists perceive that their social peers, influencers, or reference groups actively engage with and endorse mobile heritage apps, they are more likely to adopt similar engagement behaviors to conform to social norms and affirm social identity (Pricope Vancia et al., 2023; Venkatesh et al., 2012). Social influence can also activate cultural identity and community pride, further deepening motivational commitment to app engagement. Empirical support for the social influence-user engagement relationship in mobile app contexts has been documented in recent studies specifically focused on younger tourist cohorts (Priporas et al., 2024; Souiden et al., 2020). Therefore,

H2: Social influence has a significant positive effect on user engagement with mobile heritage applications among Generation Z tourists.

Hedonic motivation reflects the intrinsic enjoyment and pleasure associated with mobile app interaction, and represents a particularly powerful driver of user engagement for Gen Z tourists who prioritize experiential richness and emotional

stimulation in their cultural encounters (Shen et al., 2022). When mobile heritage apps deliver gamified challenges, AR experiences, immersive storytelling, and playful interactive features, they trigger hedonic motivation states that sustain user attention, deepen exploratory behavior, and prolong interaction time with cultural content (Buhalis & Karatay, 2022; Yun, 2023). The positive effect of hedonic motivation on user engagement has been robustly supported across mobile app domains and is especially pronounced among digitally native, entertainment-oriented user cohorts such as Gen Z (Skinner et al., 2018; Tam et al., 2018). Therefore,

H3: Hedonic motivation has a significant positive effect on user engagement with mobile heritage applications among Generation Z tourists.

User engagement with mobile heritage apps creates the conditions for deeper, more meaningful cultural encounters that culminate in elevated experiential satisfaction (Maddah et al., 2025). When tourists actively interact with rich cultural content, participate in immersive digital experiences, and sustain their attention and behavioral involvement throughout their heritage visit, they develop more comprehensive and emotionally resonant cultural experiences that exceed the value of passive observation alone (Fan et al., 2022; Trunfio et al., 2021). This heightened experiential quality translates directly into greater experiential satisfaction, as the app-mediated visit fulfills and potentially surpasses tourists' expectations for cultural enrichment and depth. Recent empirical evidence from multiple cultural tourism contexts confirms that user engagement with digital heritage platforms is a strong positive predictor of experiential satisfaction (Rasoolimanesh et al., 2021; tom Dieck & Jung, 2015). Beyond its indirect pathway through experiential satisfaction, user engagement with mobile heritage apps may exert a direct effect on cultural preservation intentions through the cultivation of cultural awareness, emotional attachment, and personal stewardship responsibility (Zhang et al., 2026). Deep engagement with app content that highlights the fragility, historical significance, and irreplaceable value of cultural heritage can trigger moral obligation cognitions and conservation-oriented behavioral intentions that emerge independently of overall satisfaction evaluations (Sujood et al., 2023; Wu et al., 2023). Research in environmental psychology and heritage studies consistently supports the idea that immersive, engagement-rich experiences directly predict pro-conservation behavioral intentions (Su & Swanson, 2019). Therefore,

H4: User engagement with mobile heritage applications has a significant positive effect on experiential satisfaction among Generation Z tourists.

H5: User engagement with mobile heritage applications has a significant positive direct effect on cultural heritage preservation intentions among Generation Z tourists.

Experiential satisfaction represents a powerful predictor of post-visit behavioral intentions in the heritage tourism context, including preservation-oriented behaviors (Ahmad et al., 2025). When tourists are highly satisfied with their cultural heritage visit—particularly when that satisfaction derives from a mobile app-enhanced experience of genuine cultural richness—they are more likely to develop emotional bonds with the site, feel gratitude toward the cultural community, and translate these positive affective states into behavioral commitments to protect and sustain the heritage site for future generations (Papadopoulou et al., 2022; Wu et al., 2023). This satisfaction-to-preservation behavioral pathway aligns with the norm activation model and value-belief-norm theory, which posit that positive experiential evaluations strengthen personal norms of stewardship and prosocial obligation (Su & Swanson, 2019). Therefore,

H6: Experiential satisfaction has a significant positive effect on Generation Z tourists' intentions to preserve cultural heritage.

Perceived usefulness motivates sustained app engagement, which in turn cultivates preservation consciousness through exposure to culturally significant content and immersive narrative experiences (Zhang et al., 2026). This mediated behavioral chain has been theoretically grounded in UTAUT2 and empirically supported in adjacent domains of mobile learning and cultural engagement (Rasoolimanesh et al., 2021; Tam et al., 2018), making it a natural extension to the heritage conservation behavioral context. Therefore,

H7: User engagement mediates the relationship between perceived usefulness and cultural heritage preservation intentions among Generation Z tourists.

User engagement creates experientially rich cultural encounters that produce experiential satisfaction, which in turn activates prosocial behavioral intentions, including conservation commitment (Yang et al., 2025). This sequential mediation pathway aligns precisely with the S-O-R framework, in which the mobile app stimulus induces an engagement organism state that generates a satisfaction response, which ultimately drives the preservation behavioral output (Malik et al., 2024). Empirical support for satisfaction-mediated technology-behavior relationships in tourism has been documented consistently in recent research (Bhattacherjee, 2001; Rasoolimanesh et al., 2021). Therefore,

H8: Experiential satisfaction mediates the relationship between user engagement and cultural heritage preservation intentions among Generation Z tourists.

This underscores the necessity of examining factors that drive sustained engagement with these digital platforms, as prolonged use may further reinforce the positive feedback loop among app quality, experiential satisfaction, and preservation behaviors (Coves-Martínez et al., 2023). This sustained engagement, therefore, becomes a critical mediator in translating initial positive encounters into long-term commitment towards heritage preservation (Lu et al., 2025). In this context, analyzing how perceived enjoyment and the usefulness of mobile heritage apps influence users' decisions to continue using these platforms is paramount (Orden-Mejia et al., 2025).

Higher levels of immersion facilitated by such applications cultivate stronger emotional responses and deeper cognitive engagement, ultimately shaping attitudes, perceptions, and behaviors conducive to heritage preservation (Jiang et al., 2025). This deeper engagement, when coupled with high system quality and authentic content, not only boosts experiential

satisfaction but also strengthens their intention to continue using such applications. The interplay between perceived authenticity and visitor satisfaction, particularly in digitally enhanced heritage experiences, further elucidates how immersive technologies can cultivate a deeper appreciation for cultural assets, influencing both immediate experiences and future preservation intentions (Uslu & Tosun, 2023; Zhang et al., 2025). Therefore,

H9: Mobile app quality positively moderates the relationship between experiential satisfaction and cultural heritage preservation intention.

MATERIALS AND METHODS

Research Design

This study adopts a quantitative, cross-sectional survey research design, consistent with established practice in mobile tourism behavior research (Venkatesh et al., 2012). The survey instrument was developed following established scale adaptation procedures, including item generation from validated existing scales, expert content validity assessment by five academic specialists in tourism management and information systems, and a pilot study with 45 Gen Z respondents to assess item clarity, comprehension, and internal consistency. Minor wording revisions to the items were made following the pilot to improve construct clarity. All research protocols were approved by the Institutional Review Board, and all participants provided written informed consent prior to participation.

Survey Instrument and Measurement

All constructs were operationalized using multi-item reflective scales anchored at 1 (strongly disagree) to 7 (strongly agree). Perceived usefulness (PU) was measured with five items adapted from Donelli (2013); Miao et al. (2021), capturing respondents' beliefs about the value of mobile heritage apps in enhancing their cultural tourism experience.

Social influence (SI) was measured with four items adapted from Souiden et al. (2020); Venkatesh et al. (2012), reflecting the extent to which peers, social media, and reference groups encouraged mobile app use during cultural visits. Hedonic motivation (HM) was measured with four items adapted from Marasco et al. (2022); Venkatesh et al. (2012), capturing the enjoyment and experiential pleasure derived from mobile app interaction during cultural visits.

User engagement (UE) was measured with six items adapted from O'Brien & Cairns (2016); tom Dieck & Jung (2015), assessing cognitive, affective, and behavioral engagement dimensions. Experiential satisfaction (TS) was measured with four items adapted from Ahmad et al. (2025); Primadona et al. (2025), capturing overall satisfaction with the mobile app-enhanced heritage experience. Mobile app quality (MAQ) was measured using five items adapted from Albayrak et al. (2021); Xie et al. (2024), covering the system, information, and interface quality dimensions.

Cultural heritage preservation intentions (CHPI) were measured with five items adapted from Zhang et al. (2026); Zhao et al. (2025), encompassing passive and active preservation behavioral intentions. Table 1 presents one to two representative survey items for each of the seven latent constructs used in this study.

Table 1. Sample Measurement Items by Construct

Construct	Code	Sample Items (adapted)
Perceived Usefulness	PU	Using this mobile heritage app improves my understanding of the cultural site I am visiting. This mobile heritage app enables me to access cultural information that enhances my visit experience.
Social Influence	SI	People who are important to me think I should use this mobile heritage app during my visit. My friends and peers who use this app encouraged me to use it at cultural heritage sites.
Hedonic Motivation	HM	Using this mobile heritage app is fun and enjoyable. I find using this mobile heritage app entertaining during my cultural heritage visit.
User Engagement	UE	I was fully absorbed in using this mobile heritage app during my visit. I felt emotionally connected to the cultural content presented through this app.
Experiential Satisfaction	TS	Overall, I am satisfied with the experience that this mobile heritage app provided during my visit. Using this mobile heritage app made my cultural heritage visit more meaningful and fulfilling.
Mobile App Quality	MAQ	The information provided by this mobile heritage app is accurate and up to date. The interface of this mobile heritage app is visually appealing and easy to navigate.
Cultural Heritage Preservation Intentions	CHPI	I intend to actively promote awareness of and support for the preservation of this cultural heritage site. I am willing to contribute financially or through volunteering to support the conservation of this cultural heritage site.

Sample and Data Collection

The target population consisted of Gen Z individuals (born 1997–2006, aged 18–27 at the time of the survey) who had used at least one mobile application during a visit to a cultural heritage site within the twelve months preceding the survey. Data were collected via a purposive online survey distributed through university networks, the heritage site's official social media channels, and cultural tourism communities across Vietnam. The survey link was distributed to an estimated 780 eligible individuals; of those who accessed the survey, 478 submitted completed responses, yielding an effective response rate of approximately 61.3%. Data collection took place over 16 weeks, from March 1 to June 30, 2024, ensuring adequate temporal coverage throughout Vietnam's spring heritage tourism season. Among the final sample, approximately 61.2% of respondents indicated that their most recent heritage app-mediated visit was to one of Vietnam's eight UNESCO World Heritage Sites (e.g., Hoi An Ancient Town, My Son Sanctuary, Ha Long Bay), while the remaining 38.8% had visited nationally designated cultural heritage sites of non-UNESCO status. This distribution reflects the breadth of heritage

experiences captured and supports cautious generalizability of findings across both tiers of heritage site classification. Vietnam was selected as the study context due to its exceptionally rich cultural heritage landscape—encompassing eight UNESCO World Heritage Sites and hundreds of nationally protected cultural assets—alongside its high smartphone penetration rate among Gen Z (approximately 97% as of 2023) and the recent proliferation of dedicated cultural heritage mobile applications across the country. After removing 66 responses for incomplete data, inattentive responding patterns identified through embedded attention check items, or failure to meet the eligibility criterion, a final valid sample of 412 responses was retained for analysis. As summarized in Table 2, the sample comprised 54.4% female (n = 224), 44.2% male (n = 182), and 1.4% other gender identities (n = 6). The most represented age group was 20–23 years (61.7%), followed by 18–19 years (19.4%) and 24–27 years (18.9%). Most respondents (72.3%) reported using cultural heritage mobile apps at least monthly, and 58.7% indicated that mobile apps had significantly influenced their decision to visit cultural heritage sites.

Table 2. Sample Characteristics and Mobile App Usage

	Category / Item	n	%		Category / Item	n	%
Gender	Female	224	54.4	**Age Group**	18–19 years	80	19.4
	Male	182	44.2		20–23 years	254	61.7
	Other gender identities	6	1.4		24–27 years	78	18.9
Mobile App Usage Behavior	Used cultural heritage apps at least monthly					298	72.3
	Apps significantly influenced decision to visit heritage sites					242	58.7

Data Analysis Approach

Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0 was employed to test the hypotheses. PLS-SEM was selected over covariance-based SEM (CB-SEM) for three primary reasons: the research model contains a complex hierarchical structure with multiple mediating and moderating relationships; the study's predictive orientation aligns with PLS-SEM's emphasis on variance explanation and out-of-sample prediction; and PLS-SEM imposes fewer distributional assumptions, making it appropriate for behavioral social science research with ordinal scale data (Hair et al., 2022). Analysis proceeded in two sequential stages. The measurement model was first assessed for reliability using Cronbach's alpha and composite reliability, for convergent validity using average variance extracted (AVE), and for discriminant validity using HTMT ratios and the Fornell-Larcker criterion. Common method bias was assessed using Harman's single-factor test and full collinearity VIF assessment. The structural model was then evaluated for path coefficients and significance using 5,000-iteration bootstrapping, and for explanatory power using R^2 and effect size (f^2).

Mediation was tested using indirect effects with 95% bias-corrected bootstrap confidence intervals, and moderation was assessed by including the product-indicator interaction term MAQ × TS in the structural model. Harman's single-factor test yielded 28.4% of the variance for the first unrotated factor (well below the 50% threshold), and full collinearity VIF values for all constructs ranged from 1.23 to 2.87 (all below 3.3), collectively indicating that common method bias is unlikely to constitute a significant threat to the validity of the structural estimates.

RESULTS

Measurement Model Assessment

The measurement model results are summarized in Table 3. All indicator factor loadings exceeded the recommended 0.70 threshold, ranging from 0.713 (UE item 5) to 0.912 (PU item 1), confirming adequate indicator reliability. Composite reliability (CR) values ranged from 0.872 (HM) to 0.941 (UE), all exceeding the recommended 0.80 threshold. Cronbach's alpha values ranged from 0.836 (HM) to 0.922 (UE), all exceeding 0.80, confirming strong internal consistency. Average variance extracted (AVE) values ranged from 0.571 (MAQ) to 0.731 (TS), all exceeding the required 0.50 threshold, confirming convergent validity for all constructs in the model.

Table 3. Measurement Model Assessment Results

Construct	Mean	Loading Range	Cronbach's α	CR	AVE
Perceived Usefulness (PU)	5.421	0.791–0.912	0.901	0.924	0.711
Social Influence (SI)	4.872	0.762–0.887	0.876	0.908	0.669
Hedonic Motivation (HM)	5.611	0.743–0.878	0.836	0.872	0.631
User Engagement (UE)	5.185	0.713–0.889	0.922	0.941	0.688
Experiential satisfaction (TS)	5.393	0.824–0.903	0.897	0.920	0.731
Mobile App Quality (MAQ)	5.241	0.761–0.891	0.889	0.914	0.571
Cultural Heritage Preservation Intentions (CHPI)	4.933	0.783–0.896	0.908	0.929	0.681

Discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) criterion. In Table 4, all HTMT values fell below the conservative 0.85 threshold, with the highest observed HTMT ratio being 0.782 (between UE and TS), confirming adequate discriminant validity across all construct pairs. The Fornell-Larcker criterion was also satisfied in full, as the square root of each construct's AVE exceeded its correlations with all other constructs in the model.

The structural model explained 61.3% of the variance in user engagement ($R^2 = 0.613$), 54.7% of the variance in experiential satisfaction ($R^2 = 0.547$), and 68.2% of the variance in cultural heritage preservation intentions ($R^2 = 0.682$), indicating strong explanatory power. The model's predictive accuracy was confirmed by positive Q^2 values from the Stone-

Geisser blindfolding procedure for all endogenous constructs: Q^2(UE) = 0.389, Q^2(TS) = 0.367, Q^2(CHPI) = 0.441, all substantially above zero, confirming predictive relevance. The structural path analysis results are presented in Table 5.

Table 4. Heterotrait-Monotrait Ratio (HTMT) Results

Construct	1	2	3	4	5	6	7
1. Perceived Usefulness (PU)	—						
2. Social Influence (SI)	0.624	—					
3. Hedonic Motivation (HM)	0.712	0.635	—				
4. User Engagement (UE)	0.698	0.671	0.724	—			
5. Experiential satisfaction (TS)	0.587	0.598	0.689	0.756	—		
6. Mobile App Quality (MAQ)	0.743	0.612	0.658	0.701	0.678	—	
7. Cultural Heritage Preservation Intentions (CHPI)	0.561	0.543	0.612	0.734	0.812	0.698	—

Table 5. Structural Model Results — Direct Effects, Mediation, and Moderation

Hypothesis	Path Relationship	β	SE	t-value	95% CI	Decision
H1	PU → UE	0.287	0.048	5.979	[0.193, 0.381]	Supported
H2	SI → UE	0.241	0.051	4.725	[0.141, 0.341]	Supported
H3	HM → UE	0.334	0.046	7.261	[0.244, 0.424]	Supported
H4	UE → TS	0.619	0.039	15.872	[0.543, 0.695]	Supported
H5	UE → CHPI	0.223	0.054	4.130	[0.117, 0.329]	Supported
H6	TS → CHPI	0.418	0.047	8.894	[0.326, 0.510]	Supported
H7	PU → UE → CHPI	0.064	0.018	3.556	[0.029, 0.102]	Supported
H8	UE → TS → CHPI	0.259	0.037	7.000	[0.187, 0.334]	Supported
H9	MAQ × TS → CHPI	0.147	0.041	3.585	[0.067, 0.228]	Supported

All nine hypotheses were supported at $p < 0.001$. Among the three independent variables predicting user engagement (H1–H3), hedonic motivation demonstrated the strongest direct effect (β = 0.334), followed by perceived usefulness (β = 0.287) and social influence (β = 0.241). The path from user engagement to experiential satisfaction (H4: β = 0.619) represented the largest direct path coefficient in the entire structural model, underscoring the pivotal role of engagement quality in determining experiential satisfaction outcomes. Experiential satisfaction had a stronger direct effect on preservation intentions (H6: β = 0.418) than the direct effect of user engagement (H5: β = 0.223), suggesting that satisfaction is the more proximal behavioral determinant of conservation commitment.

For mediation testing, H7 confirmed that user engagement mediates the relationship between perceived usefulness and cultural heritage preservation intentions (indirect effect β = 0.064, 95% CI [0.029, 0.102], $p < 0.001$). H8 confirmed that experiential satisfaction mediates the relationship between user engagement and preservation intentions (indirect effect β = 0.259, 95% CI [0.187, 0.334], $p < 0.001$), with a medium-to-large effect size ($f^2 = 0.211$).

For the moderation test (H9), the interaction term MAQ × TS was statistically significant (β = 0.147, t = 3.585, $p < 0.001$), confirming that mobile app quality positively moderates the relationship between experiential satisfaction and cultural heritage preservation intentions. Simple slope analysis (Figure 2) revealed that the positive effect of experiential satisfaction on preservation intentions was significantly stronger at high levels of mobile app quality (one SD above mean: β = 0.565) than at low levels of mobile app quality (one SD below mean: β = 0.271), consistent with the theoretical prediction in H9.

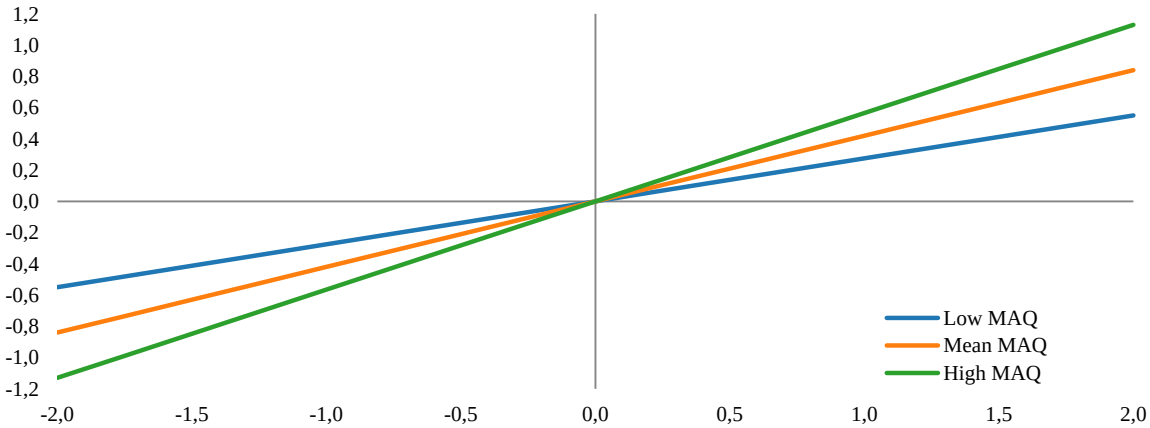


Figure 2. The Moderating Role of Mobile App Quality in the Relationship
Between Experiential Satisfaction and Cultural Heritage Preservation Intentions

DISCUSSION

The finding that hedonic motivation emerges as the strongest predictor (β = 0.334) is consistent with prior research highlighting the primacy of experiential and affective motivations in Gen Z's technology adoption behavior (Miao et al.,

2021; Souiden et al., 2020). This suggests that cultural heritage mobile app developers and heritage site managers should prioritize entertaining, emotionally evocative, and experientially rich features—including interactive storytelling, gamified cultural discovery challenges, and immersive AR reconstructions—as the primary drivers of engagement among younger visitor audiences. The significant effect of perceived usefulness ($\beta = 0.287$) importantly nuances this hedonic emphasis by confirming that Gen Z tourists also demand functional value from their mobile heritage app experiences.

This dual motivational architecture—hedonic enrichment combined with utilitarian effectiveness—implies that the most impactful mobile heritage apps will seamlessly integrate entertainment and education, delivering compelling experiences that are simultaneously informative and enjoyable. This finding aligns with recent scholarship advocating for "edu-tainment" design frameworks in digital heritage platform development (Marasco et al., 2022; tom Dieck & Jung, 2015), suggesting that the dichotomy between educational and entertainment orientations in heritage app design is largely false and potentially counterproductive. Social influence's significant predictive role ($\beta = 0.241$) highlights the enduring importance of peer validation and community endorsement in shaping Gen Z's cultural tourism technology behavior, even in heritage contexts where intrinsic cultural motivation might be expected to dominate (Phu et al., 2026).

Heritage institutions and cultural site managers should consequently leverage social media partnerships, influencer collaborations, community storytelling initiatives, and user-generated content strategies to amplify social signals encouraging mobile app engagement among younger visitors (Yamagishi et al., 2023). The social dimension of mobile heritage engagement is not merely an adoption driver; it connects individual cultural experiences to broader community identity processes, potentially enhancing the social meaning attributed to preservation behavior. The confirmation of H4 ($UE \rightarrow TS$, $\beta = 0.619$) is one of the most robust findings of this study, establishing user engagement as an exceptionally powerful determinant of experiential satisfaction in the context of mobile heritage tourism (Fan et al., 2022; Trunfio et al., 2021). The magnitude of this path coefficient—the largest in the entire structural model—suggests that the depth and quality of mobile app engagement play a more decisive role in shaping heritage experiential satisfaction than many traditional determinants such as physical site amenities or guide quality (Rasoolimanesh et al., 2021; tom Dieck & Jung, 2015). This finding has significant implications for heritage site management strategy, indicating that investment in the quality of digital engagement may yield greater satisfaction returns than equivalent investments in conventional visitor infrastructure.

The confirmation of H7—that user engagement fully mediates the relationship between perceived usefulness and cultural preservation intentions—reveals a critical behavioral mechanism: perceived usefulness does not independently generate preservation cognitions but rather catalyzes them indirectly through the deeper cultural immersion that high-engagement app interactions produce (Zhang et al., 2026). For app developers and heritage managers, this finding suggests that perceived usefulness should be evaluated not only as an adoption driver but also as a sustained engagement motivator that drives long-term conservation behavior. Apps that maintain high perceived usefulness throughout a heritage visit—rather than merely facilitating initial entry—are more likely to generate the sustained engagement depth necessary for the formation of conservation intentions (Rasoolimanesh et al., 2021; Tam et al., 2018).

The confirmation of H5 and H6—that both user engagement and experiential satisfaction positively and independently predict cultural preservation intentions—establishes a comprehensive model of the pathways through which mobile heritage tourism shapes conservation behavior (Sujood et al., 2023; Wu et al., 2023). Experiential satisfaction's stronger direct effect on preservation intentions ($\beta = 0.418$ vs. $\beta = 0.223$ for direct engagement effect) identifies it as the more proximal behavioral gateway to conservation commitment (Ahmad et al., 2025). The confirmation of H8—that experiential satisfaction mediates the UE-CHPI relationship—further clarifies the causal architecture: mobile apps create deeply engaging cultural encounters that produce highly satisfied tourists, who in turn develop authentic emotional bonds with cultural heritage, thereby activating stewardship behavioral intentions (Malik et al., 2024). This sequential mechanism supports the theoretical integration of S-O-R and value-belief-norm frameworks applied to digital heritage tourism contexts, extending prior theoretical work by Chen & Rahman (2018) into the specific domain of mobile technology-mediated conservation behavior. The substantial indirect effect size of the satisfaction mediation pathway ($f^2 = 0.211$) implies that strategies aimed at maximizing experiential satisfaction through mobile app engagement are not only commercially valuable but also carry genuine conservation behavioral consequences of meaningful magnitude.

From a resource allocation perspective, this finding presents heritage institutions and cultural tourism authorities with a clear strategic choice: basic, cost-minimized mobile apps that yield marginal engagement and weak conservation behavioral pathways, or high-quality, richly featured apps that yield substantially stronger and more durable conservation behavioral outcomes. Given the long-term conservation stakes associated with Gen Z's emerging role as the primary custodians of cultural heritage in the coming decades, the strategic case for investment in high app quality is compelling and evidence-based.

CONCLUSIONS

This study makes several original theoretical contributions to the intersection of mobile tourism, cultural heritage conservation, and Gen Z behavioral research. First, it extends the UTAUT2 framework to the cultural heritage mobile tourism domain, confirming the relevance of its core adoption constructs in a conservation behavioral outcome context that has not been previously examined in the literature. Second, it develops and validates a dual-mediation mechanism—user engagement followed by experiential satisfaction as sequential mediators—that provides a theoretically coherent and empirically supported account of the multi-stage psychological process linking mobile app adoption to conservation behavioral commitment. Third, it establishes mobile app quality as an empirically validated moderating variable in the conservation behavioral pathway, introducing a novel boundary condition construct that enriches understanding of the contingency conditions under which mobile technology most effectively promotes cultural stewardship. Fourth, it

integrates UTAUT2, TAM, and S-O-R theoretical frameworks into a unified structural model, demonstrating the complementary explanatory contributions of these frameworks within a single research context.

For cultural heritage site managers and tourism authorities, this study emphasizes the strategic importance of investing in high-quality mobile applications as instruments of cultural conservation policy, not merely visitor service tools. Mobile heritage apps that deliver deep user engagement—through compelling storytelling, interactive AR, gamification, and personalized content—generate not only satisfied visitors but active cultural stewards committed to preserving the sites they have experienced. The study specifically recommends prioritizing hedonic experiential features as the strongest drivers of engagement among Gen Z visitors, while maintaining robust utilitarian functionality to satisfy perceived usefulness throughout the visit. For mobile app developers and digital experience designers in the heritage sector, the moderation findings provide a compelling quantitative case for quality-focused investment in development.

High app quality does not merely improve user experience ratings in the commercial sense; it substantially amplifies the behavioral impact of conservation in tourism experiences—making quality investment directly germane to heritage institutions' core conservation mission and therefore eligible for conservation-directed public funding. Interface design elegance, cultural content depth and accuracy, technical reliability, and personalization sophistication should be treated as conservation-strategic investments rather than secondary commercial features. For policymakers and cultural conservation authorities in Vietnam and comparable heritage-rich developing economies, this study highlights the scalability of mobile technology as a cost-effective mechanism for cultivating conservation awareness and behavioral commitment among the rapidly growing Gen Z tourist demographic. Policy frameworks that support the development of high-quality mobile heritage applications, through direct funding, content quality standards, institutional content partnerships, and digital literacy initiatives targeting Gen Z audiences, may yield substantial long-term dividends for the sustainability of cultural heritage assets.

Limitations and Future Research Directions

Despite its contributions, this study has several limitations warranting acknowledgment. The cross-sectional design precludes causal inference, and longitudinal research tracking the evolution of Gen Z tourists' preservation behavioral intentions and actual preservation behaviors over time would substantially strengthen causal interpretations. The single-country study context limits generalizability, and comparative cross-cultural replications—particularly those that contrast Southeast Asian, Western European, and Latin American heritage tourism contexts—would enrich the theoretical scope. The reliance on self-reported behavioral intentions rather than directly observed conservation behaviors is an additional limitation, as the intention-behavior gap is well documented in the conservation psychology literature. Future research should incorporate behavioral tracking data, social media conservation advocacy analysis, or documented records of donations and volunteering to validate the conservation impact chain from the mobile tourism experience to actual heritage preservation action. Furthermore, future studies could examine the specific contributions of individual app features—AR quality, gamification design parameters, social sharing functionalities, and narrative depth—as more granular antecedents of engagement and preservation outcomes, providing finer-grained design guidance.

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