

Community-Based Tourism and Cultural Experience Strengthen Sustainable Heritage Tourism Beyond Digital Visibility

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Abstract

Sustainable heritage tourism requires more than just increasing destination visibility; it relies on effectively turning digital marketing into community engagement and authentic cultural experiences. Although digital branding, community-based tourism (CBT), and cultural experiences are important, researchers have often studied them separately, limiting insight into their roles in sustainability. This study examines and compares how these three factors impact sustainable heritage tourism in the Mount Penanggungan heritage landscape in East Java, Indonesia. Using a cross-sectional, quantitative approach, we gathered data from 397 visitors through purposive sampling and analyzed it using partial least squares structural equation modeling (PLS-SEM). Results show that digital branding strongly influences CBT ($\beta = 0.774$) and positively affects cultural experiences ($\beta = 0.374$), but has a moderate direct effect on sustainable tourism ($\beta = 0.218$). CBT positively impacts both cultural experiences ($\beta = 0.484$) and sustainable tourism ($\beta = 0.247$), with cultural experience being the most significant direct predictor of sustainable tourism ($\beta = 0.482$). The model explains 76.6% of the variance in sustainable tourism. These findings challenge strategies that focus solely on promotion, illustrating that digital visibility alone does not ensure sustainability. The study recommends an integrated framework where digital branding enables community governance through CBT, with cultural experience serving as the key immediate driver of sustainability. Heritage destinations should, therefore, combine digital efforts with community empowerment and authentic cultural interpretation instead of only increasing visibility.

INTRODUCTION

The global tourism industry has displayed notable resilience following the COVID-19 pandemic, with international travel rapidly approaching pre-COVID levels. This recovery has revitalized employment, regional enterprises, investment, and destination economies, notably in regions heavily reliant on tourism [1], [2], [3]. However, the swift recovery has also raised concerns about environmental degradation, resource overuse, cultural commodification, over-tourism, and the unequal distribution of tourism benefits [4], [5], [6], [7]. These issues show that increased visitor arrivals and tourism revenue do not inherently enhance destination sustainability or community well-being. As a result, current tourism discourse increasingly assesses destinations based on their capacity to maintain environmental integrity, empower local communities, preserve cultural resources, and foster economic resilience, rather than focusing solely on visitor numbers or short-term economic gains [3], [8], [9], [10]. This evolution shows a broader understanding that sustainable tourism necessitates balancing destination competitiveness, community welfare, cultural continuity, responsible tourist behavior, and ecological resilience.

The global tourism industry has demonstrated remarkable resilience following the COVID-19 pandemic, with international travel recovering rapidly and revitalizing employment, local businesses, investment, and destination economies [1], [2], [3]. However, this recovery has also intensified environmental degradation, resource overuse, cultural commodification, over-tourism, and unequal benefit distribution [4], [5], [6], [7]. Consequently, tourism sustainability is increasingly assessed through environmental

integrity, community well-being, cultural preservation, economic resilience, and responsible tourism practices rather than visitor growth alone [3], [8], [9], [10].

Heritage tourism poses distinct challenges for sustainable tourism because heritage resources serve as attractions, expressions of collective identity, sources of community livelihood, and irreplaceable public assets. While cultural heritage destinations can generate employment, promote urban and rural regeneration, reinforce territorial identity, and revitalize traditional economic activities, they are also susceptible to commercialization, physical deterioration, overcrowding, loss of historical authenticity, and weakened community attachment to local heritage [11], [12], [13], [14]. The commodification of heritage may oversimplify historical narratives and prioritize marketable representations over values important to local communities. Therefore, sustainable heritage tourism should be understood as an integrated system in which cultural resources, residents, visitors, institutions, businesses, governance structures, and technological innovation interact to sustain long-term destination resilience [15], [16], [17], [18].

This systemic perspective aligns with the Sustainable Development Goals, particularly Goals 8, 11, and 12, which emphasize productive local economies, inclusive communities, cultural heritage protection, and responsible production and consumption. Community-based tourism can advance these objectives by generating local employment, supporting small enterprises, enhancing social inclusion, and retaining a larger share of tourism benefits within host communities [19]. However, realizing these benefits requires institutional coordination, participatory governance, environmental responsibility, and empowering local stakeholders in destination development. Recent scholarship therefore promotes collaborative governance, community participation, stakeholder integration, knowledge sharing, and technological innovation as interconnected elements of sustainable tourism, rather than as isolated managerial tools [13], [20], [21], [22], [23]. Destinations are thus expected to develop tourism systems that reinforce local resilience and cultural identity while safeguarding heritage authenticity, rather than prioritizing economic growth at the expense of social and environmental outcomes.

These challenges are particularly pertinent to Mount Penanggungan in East Java, Indonesia, recognized as one of the nation's most significant Hindu–Buddhist cultural landscapes. The site contains over 170 archaeological remains from the ninth to the sixteenth century and is designated as a Provincial Cultural Heritage Area. Unlike heritage destinations managed solely by centralized institutions, tourism at Mount Penanggungan is characterized by collaboration among cultural authorities, the state forestry enterprise, village-owned enterprises, tourism groups, and local communities. Community organizations oversee heritage attractions, trekking routes, cultural activities, and tourism services while striving to protect archaeological resources and enhance local livelihoods. These collaborative arrangements reflect broader Indonesian initiatives to integrate cultural heritage preservation, community empowerment, and sustainable village tourism (Gin et al., 2024; Herpamudji et al., 2025; Kusumastuti et al., 2024). Mount Penanggungan thus provides a valuable context for investigating sustainable heritage tourism through the interconnected dimensions of digital branding, community-based tourism, and cultural experience.

Digital branding has emerged as a critical strategy for enhancing destination visibility and competitiveness. Developments in communication technology have transformed how destinations construct identities, convey cultural narratives, engage potential visitors, and shape destination images through websites, social media, online travel platforms, influencer content, online reviews, and user-generated content [8], [26], [27]. Digital media enable destinations to communicate directly with dispersed audiences and continuously influence perceptions before, during, and after travel. Social media engagement can affect destination awareness, perceived value, travel intentions, and value co-creation by facilitating the exchange of experiences and participation in destination narratives (Ok et al., 2025; Yaling et al., 2025; Yusoff & Wan Hasan, 2026). Territorial and destination branding can also distinguish lesser-known regions, reinforce local identity, and align tourism development with broader regional sustainability goals (Bekmurzaya et al., 2025; Seidualin et al., 2025).

Digital technologies are especially significant for heritage destinations, as they facilitate interpretation, education, storytelling, and the communication of conservation values. Tools such as digital platforms, recommendation systems, augmented reality, virtual environments, and smart tourism applications can deliver personalized information, visualize historical narratives, and make complex heritage meanings more accessible [34], [35], [36]. Digital intelligence can enhance the accessibility and interpretation of industrial and archaeological heritage, while interactive interfaces may increase user engagement with cultural resources (Zhou et al., 2025). Furthermore, spatial and immersive technologies enable visitors to interact with heritage representations that might otherwise be inaccessible due to physical fragility, geographic distance, or conservation restrictions [31], [38]. Thus, digital branding exceeds traditional promotion by communicating historical values, enriching cultural interpretation, and fostering responsible engagement with heritage assets.

However, increased digital visibility does not inherently lead to sustainable tourism. Marketing-driven promotion may boost visitor numbers but can also intensify congestion, environmental stress, heritage commercialization, and spatial concentration if not accompanied by effective governance and destination management [5], [6], [7]. Social media content often highlights visually appealing aspects while overlooking community values, conservation needs, or appropriate visitor behavior. Digital platforms may also perpetuate inequalities if local stakeholders lack the skills, infrastructure, or authority to shape destination narratives and economic activities. Therefore, digital branding should be embedded within a comprehensive sustainability framework that integrates technological innovation with community participation, institutional coordination, cultural preservation, and responsible visitor management [26], [39], [40]. Participatory digital branding is particularly important, as it enables communities to create destination narratives rather than serving solely as subjects of external promotional efforts (Wijaya et al., 2026).

In addition to digital branding, community-based tourism has become a key strategy for sustainable heritage tourism by involving residents as active participants in tourism planning, management, cultural representation, and benefit distribution. Unlike conventional models dominated by external investors and growth-oriented institutions, community-based tourism prioritizes local entrepreneurship, participatory

governance, social equity, cultural stewardship, and retaining economic benefits within host communities [19], [41], [42]. Community participation can enhance residents' sense of ownership, increase the legitimacy of tourism policies, mobilize local knowledge, and strengthen commitment to environmental and cultural conservation. In heritage contexts, community members serve not only as tourism service providers but also as custodians of cultural memory, traditional practices, sacred values, and place-based knowledge [43], [44], [45].

Empirical research shows that community-led destinations often exhibit greater social cohesion, local empowerment, adaptive capacity, and stakeholder support for tourism development [10], [46], [47]. Social capital can enhance participation by fostering trust, cooperation, and collective action among community members, while resident empowerment may increase support for sustainable tourism policies and technological innovation [47], [48]. Community co-creation also helps ensure that tourism products reflect local cultural values rather than externally imposed representations [49]. Thus, community participation is increasingly viewed as a foundational requirement for sustainable heritage management rather than a supplementary social benefit.

Despite its acknowledged significance, implementing community-based tourism remains challenging in many heritage destinations. Institutional fragmentation, power imbalances, insufficient funding, limited managerial capacity, and the dominance of governmental or private decision-making often constrain meaningful community involvement. Residents are frequently engaged only during operational or implementation phases, while more influential institutions control strategic planning, policy development, branding, and resource allocation. These dynamics diminish the transformative potential of community-based tourism and may create only the appearance of participation without granting real authority to local stakeholders [2], [21], [50]. Therefore, sustainable tourism relies not merely on including community actors but on their ability to influence tourism priorities, cultural representations, conservation practices, and the distribution of economic benefits.

Cultural experience constitutes another central factor in sustainable tourism. Cultural experience is a key component of sustainable heritage tourism. Modern tourists increasingly seek meaningful, authentic, educational, and participatory experiences rather than passive observation of cultural sites. Such experiences may include cognitive understanding, emotional engagement, sensory interaction, direct contact with residents, participation in traditions, local cuisine, religious activities, cultural performances, storytelling, and traditional crafts [49], [51], [52]. Meaningful engagement with both tangible and intangible heritage can deepen visitors' understanding of local history and enhance their appreciation of a destination's cultural values. Authenticity, local culture, perceived tourism value, and memorable experiences are also strongly linked to revisit intentions and destination loyalty in heritage tourism [53], [54]. It can encourage visitors to respect heritage resources, support local producers, and recognize communities as living cultural actors rather than tourism spectacles. Perceived cultural authenticity can strengthen experience quality and sense of place, which may subsequently encourage sustainable heritage tourism behavior [35]. Heritage interpretation can also promote inclusion and resilience by allowing communities to communicate their histories in their own voices and challenge simplified or

externally constructed narratives [55]. The value of cultural experience therefore extends beyond visitor satisfaction; it can connect heritage conservation with place attachment, community identity, responsible behavior, and long-term destination support.

Technological innovation can enhance cultural experiences by improving interpretation, interactivity, personalization, and accessibility. Tools such as spatial augmented reality, immersive media, live streaming, smart travel technologies, and digital storytelling allow visitors to explore historical narratives and intangible cultural meanings in more engaging ways [56], [57], [58]. Interactive technologies can increase presence, mental simulation, psychological ownership, and word-of-mouth by fostering a closer connection between visitors and cultural objects or heritage settings [38], [56]. However, technology cannot replace authentic interaction with residents, cultural custodians, and everyday community practices. Therefore, sustainable heritage tourism requires a balance in which digital innovation complements, rather than replaces, direct cultural engagement and locally grounded interpretation [35], [49].

Although scholarly interest in digital branding, community-based tourism, and cultural experience has increased, these concepts have largely evolved within separate research domains. Digital tourism studies primarily address destination image, platform adoption, social media engagement, brand equity, user-generated content, and travel intention [8], [26], [27]. Research on community-based tourism mainly explores empowerment, social capital, collaborative governance, local livelihoods, and community participation [19], [42], [47]. Studies of cultural experience typically focus on authenticity, emotional engagement, memorable tourism experiences, place attachment, satisfaction, loyalty, and revisit intention [35], [53], [54]. Few studies have examined these three dimensions together within a unified structural framework to compare their respective impacts on sustainable heritage tourism.

This fragmentation constitutes a significant theoretical and practical gap. Without directly comparing digital branding, community-based tourism, and cultural experience, destination managers risk overemphasizing promotional visibility while neglecting community authority, cultural interpretation, and visitor engagement. Such imbalances may increase visitor numbers without corresponding improvements in cultural preservation, resident welfare, responsible tourist behavior, or destination resilience. These issues are especially critical in heritage landscapes, where commercial exploitation of cultural resources must be balanced with their spiritual, historical, archaeological, and communal significance. Determining which factor most strongly contributes to sustainability is essential for evidence-based policy, strategic investment, and the effective allocation of limited destination resources [11], [15], [16], [17].

Mount Penanggungan offers a pertinent empirical context for addressing this gap, as its tourism system integrates extensive archaeological heritage, village-based destination management, expanding social media promotion, and diverse cultural experiences shaped by interactions among communities, visitors, and institutional stakeholders. These features facilitate the simultaneous examination of market-oriented, community-oriented, and experience-oriented approaches within a unified sustainable heritage

tourism model. The site also allows for assessment of whether digital visibility alone can achieve sustainability outcomes or if community participation and meaningful cultural experiences are more influential determinants of sustainable destination development.

Accordingly, this study introduces an integrated framework to compare the direct effects of digital branding, community-based tourism, and cultural experience on sustainable heritage tourism. In contrast to prior research that has typically examined these constructs separately, this study assesses their relative explanatory power within a single structural model. It identifies which factor most strongly contributes to sustainability in a heritage destination. The research advances sustainable heritage tourism literature by linking technological promotion, community empowerment, and visitor experience within a unified analytical perspective. It also informs ongoing debates about whether destination sustainability is primarily driven by market visibility, locally controlled tourism development, or visitors' meaningful engagement with cultural heritage. Practically, the findings offer guidance for policymakers, destination managers, heritage authorities, village-owned enterprises, and local communities in prioritizing strategies that enhance cultural conservation, community welfare, destination competitiveness, and long-term tourism resilience.

Building on theories such as Destination Branding, Community-Based Tourism, the Experience Economy, and Sustainable Tourism Frameworks, this study develops an integrated model explaining how digital communication, community involvement, and cultural engagement relate to sustainable heritage tourism. Digital branding is anticipated to support community-based tourism by offering more opportunities for local participation and representation, while also enriching visitors' cultural experiences and perceptions of tourism sustainability. Community-based tourism is expected to improve cultural experiences through meaningful interactions with local communities, traditions, and heritage assets, directly contributing to sustainable tourism. Cultural experience is also likely to promote sustainable tourism by fostering heritage appreciation, responsible visitor behavior, and conservation efforts. Accordingly, this study proposes that digital branding is positively associated with community-based tourism (H1), cultural experience (H2), and sustainable tourism (H3); community-based tourism is positively associated with cultural experience (H4) and sustainable tourism (H5); and cultural experience is positively associated with sustainable tourism (H6). The proposed model further enables comparison of the relative contributions of digital branding, community-based tourism, and cultural experience to sustainable tourism within the Mount Penanggungan heritage landscape.

METHOD

A quantitative survey examined how digital branding, community tourism, and cultural experiences influence sustainable tourism. A cross-sectional design was chosen because the study collected data on all variables from respondents at a single point in time. The study targeted individual social media users who had visited tourism sites in the Mount Penanggungan area of East Java, Indonesia. This methodology enabled an empirical investigation of the hypothesized relationships based on visitors' perceptions.

Research sites were selected based on four criteria: the presence of cultural heritage resources, evidence of community-based tourism features, local community involvement in destination management, and adherence to sustainable tourism principles. Accordingly, four locations in the Mount Penanggungan region were selected: Petirtaan Jolotundo and its hiking trail, the Kedungudi Ancient Site trail, Penanggungan Nature School, and Sumber Gempong Nature Park. These sites collectively represent diverse cultural, natural, educational, and community-managed tourism aspects across the Mount Penanggungan landscape.

The target population comprised all visitors to tourism sites in the Mount Penanggungan area. Because an exact population count and a comprehensive sampling frame were unavailable, the study used nonprobability purposive sampling. Eligibility criteria required participants to have visited at least one selected destination, to have been active on social media, and to have completed the entire questionnaire. Social media engagement was essential because digital branding was a primary focus. Respondents were expected to have encountered, accessed, or shared digital information about the destinations. Data were collected via an online questionnaire, with the survey link distributed through TikTok, Instagram, Facebook, and WhatsApp groups related to tourism and the Mount Penanggungan area. Using multiple platforms enabled access to a diverse range of visitors with varying demographics and social media profiles, reducing reliance on a single recruitment source. After screening and removing incomplete or ineligible responses, 397 completed questionnaires were retained for analysis. This sample size was sufficient for Partial Least Squares Structural Equation Modeling (PLS-SEM), given the model's complexity and the number of structural paths to the endogenous constructs.

Data were collected using a structured questionnaire with two sections. The first section collected demographic and visit-related information from respondents. The second section assessed four latent constructs: digital branding (X1), community-based tourism (X2), cultural experience (Y1), and sustainable tourism (Y2). All items were rated on a five-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). Before analyzing the measurement and structural models, the data were screened for completeness, eligibility, response patterns, and other quality concerns.

Data analysis was conducted using SmartPLS 4 and the Partial Least Squares Structural Equation Modeling (PLS-SEM) method. The analysis comprised two primary steps: assessing the measurement model and evaluating the structural model. The measurement model was examined using confirmatory factor analysis to determine whether the observed indicators accurately represented their respective latent constructs. For reflective measurement models, indicator reliability was assessed using outer loadings, and internal consistency was measured using Cronbach's alpha and composite reliability. Convergent validity was evaluated using the average variance extracted (AVE) [59]. Discriminant validity was primarily assessed using the heterotrait–monotrait ratio (HTMT), supplemented by cross-loading analysis as necessary. Indicators with low outer loadings were carefully reviewed, considering their theoretical relevance and the impact of their removal on construct reliability and validity [60].

After confirming that the measurement model met the required reliability and validity standards, the structural model was evaluated. Potential collinearity was assessed using the variance inflation factor (VIF). The model's explanatory and predictive capabilities were examined using the coefficient of determination (R^2), effect size (f^2), and predictive relevance [61]. Hypothesis testing focused on the direct relationships between constructs specified in the research model. We assessed the significance of path coefficients using bootstrapping in SmartPLS 4, examining path coefficients, p-values, and 95% confidence intervals. Because community-based tourism and cultural experience were not treated as mediating variables, results were interpreted based on the direction, magnitude, and statistical significance of the direct effects in the structural model.

RESULTS AND DISCUSSION

Table 1
Characteristics of Respondents (n = 397)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	224	56,5
	Female	158	39,8
	Not Answer	15	3,8
Age of Tourist	15–20	147	37
	21–25	120	30,2
	26–30	41	10,3
	31–35	37	9,3
	36–40	25	6,3
	> 40	27	6,8
Tourist Location*	Jolotundo Temple	152	38,8
	Kedungudi Cultural Heritage	147	37
	Sumber Gempong Park	62	15,6
	Natural School Penanggungan	132	33,2
Purpose	Family Trip	90	22,7
	Outdoor Activities	140	35,3
	Education purpose	71	17,9
	Recreation	96	24,2
Visiting Frequency	1 time	178	44,8
	2–3 time	159	40,1
	> 4 time	60	15,1
Social Media to Get Information	Tiktok	181	45,6
	Instagram	87	21,9
	Facebook	17	4,3
	Google Map	31	7,8
* Tourists can choose more than one			
Data source: Data processing results, 2026			

Characteristic	Category	Frequency (n)	Percentage (%)
	Web News	19	4,8
	WhatsApps	23	5,8
	Others	39	9,8
Education Level	Elementary School	4	1
	Junior High School	24	6
	Senior High School	178	44,8
	Graduates	158	39,8
	Post Graduates	33	8,3
Jobs	Students	226	56,9
	Cooperation	69	17,4
	Enterpreneur	44	11,1
	Civil Servant	41	10,3
	Freelancer	17	4,3
* Tourists can choose more than one			
Data source: Data processing results, 2026			

Table 1 summarizes the demographic and visitation characteristics of the 397 respondents. The sample was predominantly male (56.5%) and relatively young, with respondents aged 15–20 years (37.0%) and 21–25 years (30.2%) accounting for more than two-thirds of the participants. Jolotundo Temple (38.8%) and the Kedungudi Cultural Heritage Site (37.0%) were the most frequently visited destinations; however, these percentages are not mutually exclusive because respondents could select more than one location. Outdoor activities constituted the primary purpose of visiting (35.3%), followed by recreation (24.2%), family trips (22.7%), and educational purposes (17.9%). Regarding visitation frequency, 44.8% were first-time visitors, 40.1% had visited two or three times, and 15.1% had visited more than four times. TikTok was the dominant information source (45.6%), followed by Instagram (21.9%), underscoring the importance of visual social media platforms in shaping destination awareness. The sample also showed relatively high educational attainment, with 44.8% having completed senior high school and 39.8% classified as graduates, while students constituted the largest occupational group (56.9%). Overall, the respondent profile reflects a young, digitally connected visitor segment whose travel decisions and awareness of heritage destinations are closely associated with social media exposure.

Validity and Reliability

Before evaluating the hypothesized relationships among the latent constructs, the measurement model was assessed to establish the instrument's reliability and validity. This stage examined the extent to which the observed indicators adequately represented digital branding, community-based tourism, cultural experience, and sustainable tourism. Indicator quality was evaluated using factor loadings, while convergent validity and internal consistency reliability were assessed using average variance extracted (AVE) and composite reliability (ρ_c), respectively.

The measurement model was estimated in two stages. The initial estimation identified several indicators with weak empirical contributions to their corresponding constructs. The model was subsequently refined by removing selected indicators based on their factor loadings, effects on AVE and composite reliability, and theoretical relevance. Table 2 compares the initial and modified measurement models, including the retained and removed indicators, as well as the final AVE and composite reliability values for each construct.

Table 2
Convergent Validity, Reliability, and Multicollinearity Test Results

Variable	Indicator	Loading Factor 1st Estimated	Loading Factor Modify	AVE	Composite Reliability (rho_c)	Outer VIF
Digital Branding (DB)	Accessibility - DB.1	0,562	Dropped	0,517	0,865	1,571
	Interactivity - DB.2	0,666	0,658			1,906
	Informativeness - DB.3	0,699	0,715			1,959
	Credibility - DB.4	0,746	0,786			1,859
	Content Quality - DB.5	0,689	0,762			1,671
	Brand Awareness - DB.6	0,679	0,701			1,492
	Consistency - DB.7	0,672	0,686			1,571
	E-Wom - DB.8	0,632	Dropped			1,906
Community Based Tourism (CBT)	Local Culture - CBT.1	0,660	Dropped	0,554	0,861	1,467
	Local Accommodation - CBT.2	0,635	Dropped			1,814
	Local Community - CBT.3	0,703	0,695			1,620
	Local Entertainment - CBT.4	0,746	0,787			1,871
	Local Food - CBT.5	0,665	0,738			1,539
	Local Superstructure - CBT.6	0,741	0,795			1,467
	Natural Environment - CBT.7	0,679	0,702			1,814
Cultural Experience (CE)	Cultural Participation - CE.1	0,488	Dropped	0,512	0,862	1,438
Data source: Data processing results, 2026						

Variable	Indicator	Loading Factor 1st Estimated	Loading Factor Modify	AVE	Composite Reliability (rho_c)	Outer VIF
	Cultural Understanding - CE.2	0,515	Dropped			1,771
	Authentic Experience - CE.3	0,641	0,633			1,788
	Emotional Experience - CE.4	0,692	0,721			1,843
	Cultural Appreciation - CE.5	0,703	0,757			1,789
	Cultural Learning - CE.6	0,740	0,778			1,408
	Experience Memory - CE.7	0,723	0,750			1,438
	Sustainable Intent - CE.8	0,629	0,641			1,771
Sustainable Tourism (ST)	Income Stabily - ST.1	0,664	0,635	0,516	0,882	1,457
	Income Stabilizer - ST.2	0,640	Dropped			1,718
	conservation local values - ST.3	0,694	0,664			2,060
	quality of life - ST.4	0,706	0,684			2,069
	Toursim Impact - ST.5	0,684	0,741			1,913
	Environmental Awarnes - ST.6	0,663	0,760			1,849
	Community Support - ST.7	0,703	0,726			1,632
	Community Develop Policies - ST.8	0,762	0,741			1,457
	Sustainability Intention - ST.9	0,643	Dropped			1,718
Data source: Data processing results, 2026						

The initial measurement-model assessment revealed that several indicators contributed insufficiently to their respective constructs. The model was therefore refined iteratively, considering indicators' factor loadings, theoretical relevance, and effects on average variance extracted (AVE) and composite reliability. Eight indicators were removed: Accessibility (DB.1) and electronic word of mouth (DB.8) from digital branding; Local Culture (CBT.1) and Local Accommodation (CBT.2) from community-based tourism; Cultural Participation (CE.1) and Cultural Understanding (CE.2) from cultural experience; and Income Stabilizer (ST.2) and Sustainability Intention (ST.9) from sustainable tourism. This refinement yielded a more parsimonious measurement model while retaining indicators that adequately represented the conceptual domains of the four constructs.

After the modification, factor loadings for digital branding ranged from 0.658 to 0.786, with Credibility (DB.4) emerging as the strongest indicator. Community-based tourism loadings ranged from 0.695 to 0.795, with Local Superstructure (CBT.6) making the largest contribution. The retained cultural-experience indicators generated loadings from 0.633 to 0.778, with Cultural Learning (CE.6) exhibiting the highest loading. Meanwhile, the sustainable-tourism indicators ranged from 0.635 to 0.760, with Environmental Awareness (ST.6) providing the strongest representation of the construct. Although some retained indicators had loadings below the preferred value of 0.708, they remained above 0.60. They were retained because of their theoretical relevance and because their corresponding constructs satisfied the overall requirements for convergent validity and internal consistency reliability.

The refined measurement model demonstrated satisfactory convergent validity and construct reliability. The AVE values were 0.517 for digital branding, 0.554 for community-based tourism, 0.512 for cultural experience, and 0.516 for sustainable tourism, all exceeding the recommended minimum value of 0.50. These findings indicate that each construct explained more than 50% of the variance in its retained indicators. Composite reliability values were also satisfactory, ranging from 0.861 to 0.882, thereby exceeding the minimum threshold of 0.70 while remaining below the upper limit of 0.95. Taken together, the results confirm that the modified measurement model achieved an acceptable balance among indicator reliability, convergent validity, internal consistency, and theoretical coverage, thus providing an adequate basis for assessing discriminant validity and subsequently testing the structural model.

Table 3
Results of the Discriminant Validity Test-HTMT

Comunity Based Tourism	Comunity Based Tourism	Cultural Experience	Digital Branding	Sustainable Tourism
Cultural Experience	0,952			
Digital Branding	0,957	0,919		
Sustainable Tourism	0,957	1,010	0,926	
Data source: Data processing results, 2026				

As reported in Table 3, HTMT values ranged from 0.919 to 1.010, exceeding the recommended threshold of 0.90 for all construct pairs. These results indicate that discriminant validity was not established under the threshold-based assessment. The highest value occurred between cultural experience and sustainable tourism (HTMT = 1.010), raising particular concerns about the empirical distinctiveness of their measures. The remaining values also suggest substantial overlap among the constructs.

These findings require consideration of both empirical evidence and theoretical distinctions. Emphasize that discriminant validity assessment should be informed by theoretical foundations and that failure to establish empirical distinctiveness does not necessarily imply that the underlying concepts are identical [62]. However, this qualification does not demonstrate that the present measures adequately distinguish the constructs. Accordingly, the elevated HTMT values remain an unresolved measurement limitation. Structural relationships involving these constructs should therefore be interpreted cautiously, particularly when attributing distinct explanatory contributions to cultural experience and sustainable tourism. Further examination of item content, construct specifications, and additional validity evidence is needed before drawing firm conclusions about their separate effects.

Hypothesis Testing

After establishing the measurement model's reliability and validity, the structural model was tested through bootstrapping to examine the hypothesized links between digital branding, community-based tourism, cultural experience, and sustainable tourism. Significance was confirmed with t-statistics above 1.96, p-values under 0.05, and 95% confidence intervals excluding zero. As shown in Figure X, all relationships had p-values less than 0.001, confirming their statistical significance. The model explained 59.9% of the variance in community-based tourism, 65.4% in cultural experience, and 76.6% in sustainable tourism, indicating strong explanatory power. Table 4 provides detailed path coefficients, confidence intervals, t-statistics, effect sizes, collinearity statistics, and hypothesis results.

Image 1. Results of PLS SEM evaluation

According to Table 4, all hypothesized relationships were positive and statistically significant. H1 indicated that digital branding significantly positively influenced community-based tourism ($\beta = 0.774$, $t = 33.068$, $p < 0.001$, $f^2 = 1.496$), while H2 and H3 confirmed its positive effects on cultural experience ($\beta = 0.374$, $t = 26.798$, $p < 0.001$, $f^2 = 0.162$) and sustainable tourism ($\beta = 0.218$, $t = 29.588$, $p < 0.001$, $f^2 = 0.070$), respectively. Additionally, community-based tourism positively impacted cultural experience (H4: $\beta = 0.484$, $t = 8.354$, $p < 0.001$, $f^2 = 0.271$) and sustainable tourism (H5: $\beta = 0.247$, $t = 8.784$, $p < 0.001$, $f^2 = 0.082$). Cultural experience also had a significant positive effect on sustainable tourism (H6: $\beta = 0.482$, $t = 9.262$, $p < 0.001$, $f^2 = 0.344$), making it the strongest immediate predictor of sustainable tourism. Therefore, H1–H6 were supported. Lastly, all inner VIF values ranged from 1.000 to 3.173, well below the critical threshold of 5, confirming no multicollinearity issues among the constructs.

Based on Table 4, the bootstrapping results demonstrate that all hypothesized structural relationships were positive and statistically significant, as indicated by p-values below 0.001 and confidence intervals that did not include zero. Digital branding had a strong positive effect on community-based tourism (H1: $\beta = 0.774$, $t = 33.068$, $p < 0.001$), with a very large effect size ($f^2 = 1.496$), indicating that digital branding plays a substantial role in strengthening community-based tourism practices. Digital branding also positively influenced cultural experience (H2: $\beta = 0.374$, $t = 26.798$, $p < 0.001$), with a moderate effect size ($f^2 = 0.162$). Its direct effect on sustainable tourism was comparatively weaker but remained statistically significant (H3: $\beta = 0.218$, $t = 29.588$, $p < 0.001$, $f^2 = 0.070$). These findings suggest that digital branding contributes to sustainable heritage tourism both by directly supporting sustainability outcomes and, more prominently, by reinforcing community-based tourism and enhancing visitors' cultural experiences.

Community-based tourism demonstrated a significant positive effect on cultural experience (H4: $\beta = 0.484$, $t = 8.354$, $p < 0.001$), with a moderate effect size ($f^2 = 0.271$). This result confirms that meaningful community involvement enhances visitor engagement with local culture. Community-based tourism also exerted a direct effect on sustainable tourism (H5: $\beta = 0.247$, $t = 8.784$, $p < 0.001$), although the effect size was relatively small ($f^2 = 0.082$). Cultural experience exhibited the strongest immediate direct effect on sustainable tourism (H6: $\beta = 0.482$, $t = 9.262$, $p < 0.001$), with an effect size of 0.344, approaching the threshold for a large effect. All hypotheses (H1–H6) were supported. Furthermore, all inner VIF values ranged from 1.000 to 3.173, remaining below the recommended threshold of 5, indicating that multicollinearity did not adversely affect the estimation of structural relationships. These findings identify cultural experience as the most influential immediate driver of sustainable tourism, while digital branding serves as a foundational factor that strengthens the broader community- and culture-based tourism system.

Table 4
Hypothesis Testing Results

Hyp.	Structural Relationship	Total effects	CI (2.5% – 97.5%)	t-Statistic	p-value	f ²	Inner VIF	Interpretation
H1	Digital Branding -> Community Based Tourism	0,774	(0,727-0,819)	33,068	0,000	1,496	1,000	Supported
H2	Digital Branding -> Cultural Experience	0,374	(0,251-0,493)	26,798	0,000	0,162	2,496	Supported
H3	Digital Branding -> Sustainable Tourism	0,218	(0,109-0,332)	29,588	0,000	0,070	2,901	Supported
H4	Community Based Tourism -> Cultural Experience	0,484	(0,370-0,599)	8,354	0,000	0,271	2,496	Supported
H5	Community Based Tourism -> Sustainable Tourism	0,247	(0,139-0,348)	8,784	0,000	0,082	3,173	Supported
H6	Cultural Experience -> Sustainable Tourism	0,482	(0,380-0,585)	9,262	0,000	0,344	2,892	Supported
Data source: Data processing results, 2026								

Discussion

The positive influence of digital branding on community-based tourism indicates that digital communication can increase community involvement in heritage destination development. Despite this relationship, digital branding and community-based tourism remain conceptually distinct. Digital branding involves the external presentation of a destination's identity through digital media, while community-based tourism centers on local participation, empowerment, and governance. Recent research supports this distinction, showing that digital tourism platforms promote sustainable tourism only when they facilitate stakeholder interaction, community engagement, and collaboration in destination development, rather than simply increasing visibility [8], [26]. Similarly, community-led tourism is increasingly characterized by participatory governance, local empowerment, and collective

decision-making [20], [46]. The measurement model demonstrated acceptable reliability, convergent validity, and discriminant validity based on HTMT and cross-loading tests. Inner VIF values were below recommended thresholds, indicating that multicollinearity or measurement artifacts are unlikely to have influenced the results. While it is difficult to eliminate common method variance entirely in cross-sectional surveys, anonymous responses and standardized procedures helped minimize this bias.

The findings primarily support the internal consistency of the proposed theoretical framework rather than establishing definitive causality. Partial least squares structural equation modeling (PLS-SEM) evaluates whether empirical data align with specified theoretical relationships but does not determine temporal causality. The proposed sequence from digital branding to community-based tourism, cultural experiences, and sustainable tourism is grounded in Destination Branding Theory, Community-Based Tourism Theory, the Experience Economy perspective, and Sustainable Tourism Frameworks. These frameworks highlight that destination communication, community involvement, and meaningful cultural interactions are essential for tourism sustainability. Recent studies show that digital technologies generate sustainable value by fostering community co-creation, strengthening local identity, and increasing visitor engagement, rather than serving solely as marketing tools [63], [64], [65]. To establish causal relationships, future research should employ longitudinal or cross-lagged study designs.

The positive relationships identified in this study should be interpreted within the specific context of Mount Penanggungan, where heritage tourism is in the early stages of community-based development. In this context, digital branding appears to enhance local participation and enrich visitors' cultural experiences, thereby supporting sustainable tourism. However, this pattern may not be generalizable to all destinations. Recent evidence indicates that tourism competitiveness and destination promotion must be balanced with community resilience, heritage preservation, and responsible governance to avoid unsustainable tourism development [42], [66], [67]. Research on community-led tourism emphasizes that long-term sustainability depends on collaborative governance, equitable benefit-sharing, and local participation, rather than on promotional intensity alone [68], [69]. Therefore, the effectiveness of digital branding depends on robust community governance that aligns tourism promotion with heritage conservation, equitable benefit distribution, and the long-term sustainability of cultural resources.

The strong relationship between digital branding and community-based tourism observed in this study contrasts with recent research suggesting that digital visibility alone rarely results in meaningful community empowerment or sustainable destination governance. The sustainability benefits of digital tourism depend on collaborative governance, stakeholder engagement, and institutional support that enable local communities to participate actively in tourism development, rather than being passively represented in online promotion [68], [69], [70]. This discrepancy may be attributed to the specific context of Mount Penanggungan, where heritage tourism remains community-oriented, and local actors are actively involved in destination promotion, cultural interpretation, and tourism management. In this setting, digital branding appears to reinforce existing community initiatives rather than simply increasing destination visibility. Nevertheless, the relatively weak direct effect of digital branding on sustainable

tourism suggests that digital promotion alone is insufficient to achieve sustainability without effective community governance, collective action, and meaningful cultural experiences [71], [72], [73].

This study advances current theory by integrating Destination Branding Theory, Community-Based Tourism Theory, the Experience Economy, and the Sustainable Tourism Framework into a unified explanatory model. Unlike previous research that examined these constructs separately, the present findings indicate that digital branding primarily functions as an enabling mechanism, community-based tourism serves as the governance mechanism, and cultural experience represents the most immediate pathway to sustainability outcomes. This integrated perspective suggests that digital branding contributes to sustainable heritage tourism indirectly and relies significantly on effective community governance and authentic cultural interpretation. Therefore, digital transformation should be viewed not only as a marketing strategy but as a collaborative process that aligns destination promotion with community empowerment, heritage conservation, and long-term sustainability.

This study contributes theoretically by integrating digital branding, community-based tourism (CBT), cultural experience, and sustainable tourism into a unified framework. The findings demonstrate that digital branding primarily facilitates community participation, while cultural experience is the most immediate driver of sustainable tourism. These results extend existing perspectives in Destination Branding Theory, Community-Based Tourism Theory, the Experience Economy, and the Sustainable Tourism Framework by showing that sustainable heritage tourism emerges from the interaction of digital communication, community governance, and authentic cultural experiences, rather than from destination promotion alone. Practically, the results suggest that destination managers and policymakers should move beyond prioritizing digital promotion and instead integrate digital branding with community empowerment, participatory governance, heritage interpretation, and authentic cultural storytelling to ensure that tourism growth supports long-term conservation and equitable local benefits.

Several limitations should be acknowledged. The cross-sectional design precludes definitive causal inference; self-reported online survey data may introduce common method and social desirability bias; and the findings are based on visitors to the Mount Penanggungan heritage area, which may limit generalizability to destinations with different governance structures, tourism maturity, or visitor pressure. Future research should use longitudinal or cross-lagged designs, compare multiple heritage destinations at different stages of development, and incorporate additional constructs such as destination governance, perceived authenticity, over-tourism, residents' support, and environmental carrying capacity to better understand the mechanisms underlying sustainable heritage tourism.

Conclusion

The findings indicate that sustainable heritage tourism results less from increased digital visibility and more from translating that visibility into community participation and meaningful engagement with cultural heritage. By analyzing digital branding, community-based tourism (CBT), and cultural experience within a unified structural model, the study identifies a hierarchy in their contributions to sustainability.

Digital branding significantly enhances CBT and contributes to cultural experience, but its direct effect on sustainable tourism is limited. In contrast, cultural experience is the strongest immediate predictor of sustainable tourism, while CBT provides a crucial foundation for community engagement and governance, supporting both cultural engagement and sustainability outcomes. These results suggest that the primary value of digital branding lies in its ability to activate community- and culture-centered processes rather than in promotion alone.

This study extends Destination Branding Theory, Community-Based Tourism Theory, the Experience Economy, and sustainable tourism perspectives by integrating them into a comprehensive explanation of heritage destination sustainability. Instead of viewing digitalization, community participation, and visitor experience as parallel determinants, the findings indicate distinct functional roles: digital branding primarily serves as an enabling mechanism, CBT provides participatory and governance infrastructure, and cultural experience is the most immediate mechanism linking heritage value to sustainability. This approach challenges promotion-centered models of destination development and shifts the focus from digital visibility to destinations' ability to transform visibility into locally grounded, culturally meaningful tourism.

This distinction has direct implications for heritage destination management. Investments in social media presence, digital storytelling, and destination branding should not be implemented as isolated marketing initiatives. Instead, digital strategies should amplify local voices, connect visitors with community-managed tourism activities, enhance heritage interpretation, and communicate cultural meanings that go beyond visually appealing representations of the destination. In emerging heritage destinations such as Mount Penanggungan, this approach can help ensure that increased visibility supports local participation, heritage conservation, and equitable benefits, rather than contributing to commodification or excessive visitor pressure.

These conclusions should be interpreted within the study's limitations. The cross-sectional, self-reported design does not establish temporal causality, and purposive recruitment of digitally engaged visitors, along with the focus on a single heritage landscape, limits generalizability. Future research should test the proposed relationships longitudinally and across heritage destinations with varying governance structures and levels of tourism development. Particular attention should be paid to destination governance, perceived authenticity, resident support, over-tourism, and environmental carrying capacity. Investigating these factors would clarify when digital visibility serves as a resource for sustainability and when it may simply drive tourism growth. Ultimately, sustainable heritage tourism relies not on the extent of a destination's visibility, but on how effectively visibility is transformed into community value, meaningful cultural engagement, and long-term heritage stewardship.

Declarations

Ethics Approval

The Research Ethics Committee, Institute for Research and Community Service, Universitas Negeri Surabaya, Indonesia, formally granted an ethical exemption for this study because it involved an anonymous, non-interventional, questionnaire-based survey, did not collect identifiable or sensitive personal information, and posed minimal risk to participants. Ethical Exemption No. 163/UN38.16/KEP/EC/2026.

Ethical Accordance

The study was conducted in accordance with the ethical principles outlined in the 2016 CIOMS International Ethical Guidelines and the seven ethical standards established by the WHO in 2011.

Consent to Participate

The researchers obtained informed consent from all participants before they participated in the study. Participants were informed about the purpose and procedures of the study, the voluntary nature of their participation, the confidentiality and anonymity of their responses, and their right to withdraw from the study at any time without consequences.

Consent to Publish:

Not applicable.

Clinical trial number

Not applicable.

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Author Contribution

N.B.S. conceptualized the study, developed the methodology, coordinated data collection, performed the formal analysis, prepared the tables and figures, and wrote the original manuscript. S.S. contributed to the research design, supervised the study, and critically revised the manuscript. E.M. & A.M.H contributed to the theoretical framework and interpretation of the findings. R.A.C.R. contributed to the discussion and implications for sustainable heritage tourism and critically revised the manuscript. All authors reviewed and approved the final manuscript.

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Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. The data are not publicly available because they contain participant-level survey responses, and their distribution is subject to the confidentiality commitments communicated to the participants.

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Figures

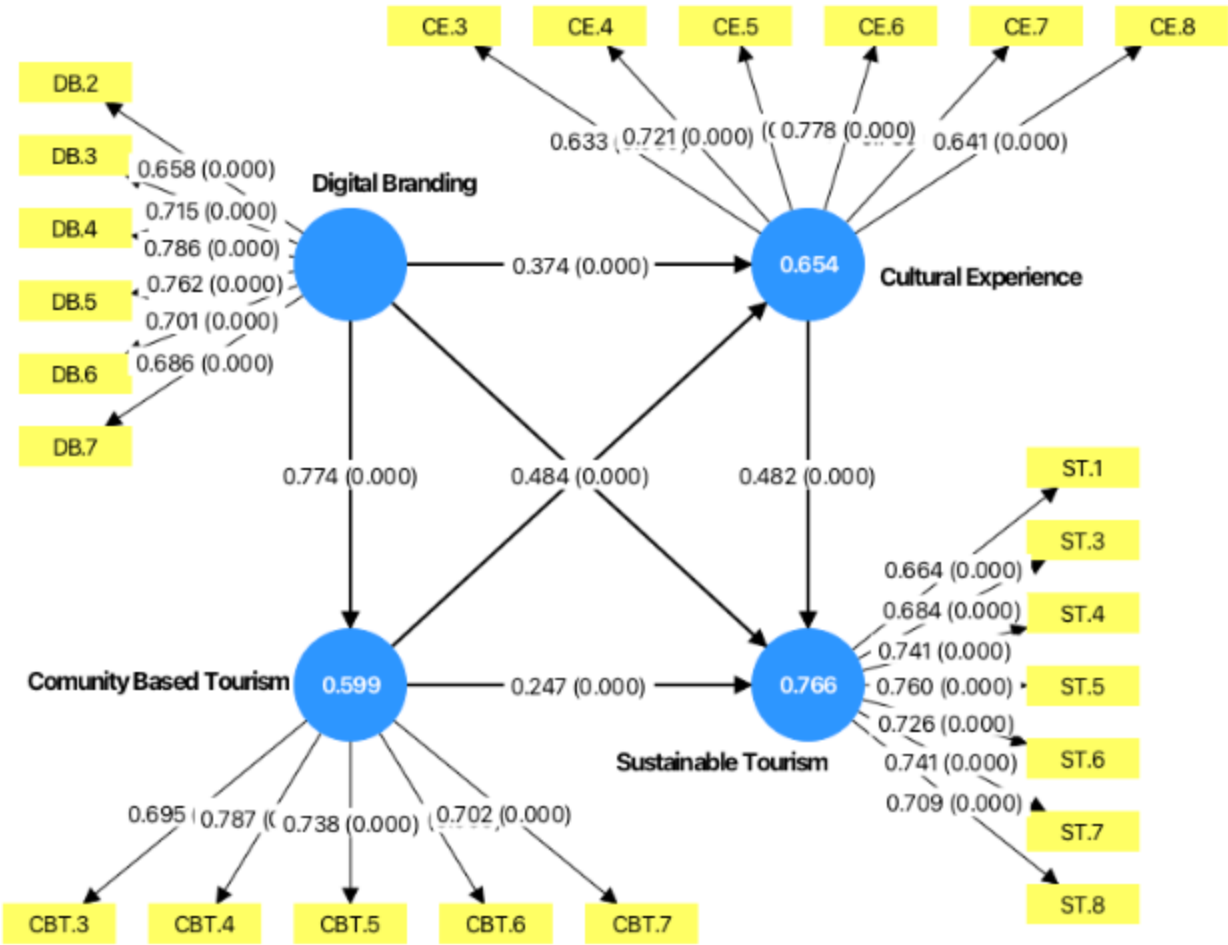


Figure 1

Image 1. Results of PLS SEM evaluation