

## Storytelling in heritage tourism for sustainable development: enriching visitor experiences in Vietnam's heritage destinations

Duc Thang Nguyen<sup>1</sup>, Tri Phuong Nguyen<sup>2\*</sup>

<sup>1</sup>East Asia University of Technology, Hanoi, Vietnam

<sup>2</sup>Hanoi University of Culture, Hanoi, Vietnam

\*Corresponding author E-mail: [phuongnt@huc.edu.vn](mailto:phuongnt@huc.edu.vn)

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### Abstract

The research investigates the potential of storytelling to increase visitor experiences and perceived value in the context of heritage tourism in Vietnam. Based on an integrated theoretical foundation combining experience economy, authenticity, and value co-creation theories, the study examines how seven storytelling dimensions shape heritage experience and subsequently influence overall positive value - defined here as visitors' holistic evaluation of the worth, meaningfulness, and recommend ability of their heritage visit. A quantitative questionnaire survey was conducted with 467 visitors to Vietnamese heritage sites, and the Partial Least Squares Structural Equation Modelling (PLS-SEM) technique was used to analyze the data. Results showed that interactive technologies ( $\beta=0.299$ ) and co-creation ( $\beta=0.225$ ) exerted the strongest positive effects on heritage experience, followed by authenticity ( $\beta=0.195$ ), genuineness ( $\beta=0.193$ ), novelty ( $\beta=0.139$ ), and enjoyment ( $\beta=0.097$ ). Knowledge and learning yielded a marginally significant effect ( $\beta=0.113$ , 95% CI:  $-0.063$  to  $0.179$ ), with the confidence interval crossing zero, indicating limited stability. Heritage experience significantly predicts overall positive value ( $\beta = 0.436$ ). The structural model explains 51.1% of the variance in heritage experience and 19.0% of the variance in overall positive value. The present study advances the heritage tourism literature by testing a multidimensional storytelling framework in the context of an emerging destination. Uniquely, this is among the first studies to empirically integrate authenticity, genuineness, co-creation, interactive technologies, novelty, knowledge, and enjoyment into a single storytelling model tested in the Vietnamese heritage context. From a practical perspective, the findings underscore the need for a concerted focus on participatory storytelling and digital interaction as means of enhancing visitor engagement and generating support for sustainable heritage tourism development.

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## 1. Introduction

Heritage-based tourism is important in maintaining cultural identity and providing socio-economic benefits [1]. In an era of globalization and heightened expectations from visitors, heritage destinations are not judged only on the authenticity of their artefacts but on as well on the quality of their experiences [2]. In line with the experience economy logic [3], value is generated when destinations produce meaningful and memorable experiences rather than delivering services. This is a move which means heritage sites must progress from rigid presentations to dynamic and engaging forms of interpretation.

Storytelling is now considered a strategic instrument to enhance the heritage-based experience. By turning historical information into emotional stories, storytelling helps visitors to think about and feel for heritage [4], [5]. It promotes sense making and learning [6], and enables value co-creation between visitors and destinations [7], [8]. Contemporary research also emphasize the role of interactive technologies (e.g. augmented reality, digital exhibitions) in fostering multisensory and participatory stories telling [9], [10].

However, authenticity, and to some extent, sincerity, continues to be a focus in the production of heritage tourism [11], [12]. Balancing historical accuracy with good storytelling using new media and new formats was a strong trend among visitors [13], [14]. This enables a synergy that not only positively impacts on visitors' satisfaction but at the same time it empowers community development and cultural preservation [15], [16].

Although there is a growing body of international literature on heritage tourism and storytelling, existing studies have largely examined these dimensions in isolation or focused on developed-country contexts. No prior study has simultaneously integrated authenticity, genuineness, novelty, interactive technologies, co-creation, knowledge and learning, and enjoyment within a unified storytelling framework validated in an emerging destination such as Vietnam. As such, in this study, we explore the multifaceted nature of storytelling as a means to enhance visitor experiences, and as a pathway towards sustainable heritage tourism in Vietnam.

## 2. Theoretical framework and research methodology

### 2.1. Theoretical framework

This research is grounded in an integrated theoretical framework that synthesizes heritage tourism theory, the experience economy, storytelling theory, authenticity, and value co-creation. Rather than treating these perspectives independently, the present study builds on their interconnections: authenticity and genuineness are conceptualized as narrative foundations; novelty, enjoyment, and knowledge serve as experiential mediators shaped by storytelling delivery; while interactive technologies and co-creation represent the participatory mechanisms through which visitors jointly construct heritage meaning. Together, these dimensions converge to explain how storytelling shapes the overall perceived value of a heritage visit [2], [3]. Based on this view, the research model proposed herein treats heritage experience as a multidimensional construct with seven antecedent factors, which ultimately determine the overall positive value of the experience.

#### 2.1.1. Authenticity and genuineness in heritage experiences

There is a long-standing consensus that the authenticity of the experience is a central influence on the heritage tourism experience [11], [17]. It is based on tourists' perceptions of the credibility, integrity, and accuracy of the historical narratives and environments of heritage [12]. Authenticity is very much a part of genuineness, which is the perceived sincerity and emotional truthfulness experienced by visitors in heritage experiences [18]. Instead of being an objective quality, authenticity is increasingly recognized as a construct social and experiences - influenced through interpretation and narration [19]. Heritage storytelling has been the focus in communicating authentic and real meanings and has enabled tourists to emotionally connect with the past as they construct narratives when they read heritage [5]. Therefore, it can be expected that authenticity (H1) and genuineness (H2) have a positive effect on the heritage experience.

### **2.1.2. Novelty and experiential engagement**

Novelty concerns with the newness, surprising and uniqueness of the object during a tourism experience [14]. In heritage tourism, novelty is not a breach with historical accuracy but is rather the introduction of new interpretive forms that recast heritage storylines for the contemporary [13]. Through the art of storytelling, heritage destinations have the ability to weave together old and new by sharing familiar heritage assets with reference [20]. When tourists consider heritage experiences to be novel and exciting, they are more emotionally and cognitively involved, which improves their perception of the quality of the heritage experience. Therefore, novelty is predicted to influence heritage experience positively (H3).

### **2.1.3. Interactive technologies in heritage interpretation**

The adoption of interactive tools including digital storytelling, multimedia installations, and augmented reality has reshaped heritage interpretation [21]. Such technologies allow for multisensory engagement and tailored experiences, giving visitors the opportunity to engage actively with heritage rather than being passive receivers of information [9]. Interactive platforms also enhancing co-creative story telling spaces, where visitors can navigate through content, participate in choices and end up contributing in unique experiential pathways [10]. Hence, it is hypothesized interactive technologies would have a positive effect on the heritage experience (H4).

### **2.1.4. Co-creation and participatory experiences**

Based on Service-Dominant Logic, value in heritage tourism is increasingly seen as co-created through interactions of tourists with heritage sites, technologies, and local communities [8]. Co-creation is the process of visitors being involved in the production of meanings, narratives and experiences rather than being 'consumers' of such offerings [22].

Heritage storytelling is a significant tool to enable co-creation by challenging tourists to decode, customize, and even spread heritage tales [4], [7]. This type of participatory interaction increases emotional investment and relevance, and, consequently, richer heritage experience is achieved. Therefore, co-creation is expected to have a positive impact on heritage experience (H5).

### **2.1.5. Knowledge, learning, and meaning-making**

Learning and knowledge are key motivations to visit for heritage tourists [2]. Good storytelling enables historical information to become narratives, which promote thinking and facilitates understanding in cultural heritage [6]. In storytelling, visitors are not only informed, but also participate in reflective processes of meaning formation, through which heritage is related to other cultural and social dimensions [23]. Therefore, H6 is that perceived knowledge and learning outcomes will positively affect the enhancement of the heritage experience.

### **2.1.6. Enjoyment and emotional responses**

Enjoyment is the core element of the affective component of tourism experiences and has a significant influence on the visitors' evaluation of the tourism product [3]. In the context of heritage tourism, enjoyment is said to be achieved through emotional immersion, narrative engagement and fun exchanges with heritage places. By humanizing heritage, eliciting feelings and making memorable experiences storytelling adds to the enjoyment of heritage [24]. It is thus expected that emotional enjoyment has a positive effect on the heritage experience (H7).

### **2.1.7. Heritage experience and overall positive value**

In this study heritage experience is defined as a holistic effect resulting from incremental authenticity and genuineness, along with newness, interactive culture, co-creation, learning and entertainment. This multi-faceted experience is said to represent the way visitors think about, feel and behave in cognitive, emotional and behavioral terms towards heritage landscapes [25]. In line with the experience economy theory, meaningful and engaging heritage experiences create better education return and positive lifelong value [3]. Therefore, the

heritage experiences are likely to will positively contribute to the overall enhancing value of the experience (H8).

## **2.2. Research methodology**

### **2.2.1. Sample and data collection**

The research is quantitative, with the data using structured survey questionnaires. Respondents were individuals who had visited a heritage site in Vietnam, and who could be of any age, occupation or place of living. The data were collected at five major heritage sites in Vietnam: Hoi An Ancient Town, Hue Imperial Citadel, My Son Sanctuary, Thang Long Imperial Citadel (Hanoi), and the Old Quarter of Hanoi all of which are UNESCO World Heritage Sites or nationally designated heritage areas. The sample was distributed across these sites, with face-to-face administration conducted on-site and an additional online version disseminated via social media channels and heritage tourism communities. A convenience sampling technique was used, appropriate for tourism situations involving heterogeneous tourists group. The questionnaire was made available via two main channels: (1) face-to-face administration at the selected heritage sites and (2) through an online version via social media and touristic communities. A total of 520 questionnaires were handed out. After data collection, 489 questionnaires had been returned, and of these, 467 were valid and were used for analysis. Twenty-two questionnaires were discarded because of missing answers, patterned answers or they did not meet the criteria of having visited a heritage site. A sample of 467 is sufficiently large for PLS-SEM modelling, which has a relatively high expected number of observed variables; thus, the results are reliable and generalizable.

### **2.2.2. Measurement design**

The measurement scales were adapted from validated instruments in prior tourism and heritage studies. Specifically, the Authenticity scale drew from Park et al.[12]; Genuineness from Wood [18]; Novelty from Skavronskaya et al. [14]; Interactive Technologies from Fogli et al. [9] and Panhale et al. [10]; Co-creation from Mijnheer and Gamble [22]; Knowledge and Learning from Jackson and Kidd [6]; Enjoyment from Pine and Gilmore [3]; Heritage Experience from Kastenholz and Gronau [25]; and Overall Positive Value from Beever et al. [5]. All items were reviewed and contextually adapted through a two-stage process: a literature review followed by expert consultation with three tourism academics familiar with the Vietnamese heritage context, ensuring content validity and linguistic appropriateness. The scale development and validation confirmed applicability to the cultural and contextual setting of heritage tourism in Vietnam.

All items were rated on a 5-point Likert scale from: 1 = “Strongly disagree” to 5 = “Strongly agree.” The following multi- item scales were used: Authenticity - 5 items; Realness – 4 items; Novelty – 5 items; Interactive Technologies – 3 items; Co-creation – 5 items; Knowledge and Learning – 4 items; Enjoyment – 5 items; Heritage Experience - 5 items; Overall Positive Value of the Experience – 4 items.

### **2.2.3. Data analysis procedure**

The data collected were processed and analyzed as follows:

Step 1 Cleaning & Coding for data: Eliminating incomplete or non-sincere response; coded variables on the bases of measurement.

Step 2 Descriptive Statistics: To describe the respondents on gender, age, education, visitation frequency, trip purpose.

Step 3: Assessing the measurement model: Cronbach’s Alpha for assessing internal consistency, Composite Reliability (CR) and Average Variance Extracted (AVE) for convergent validity; Fornell – Larcker and Heterotrait-Monotrait ratio (HTMT) for discriminant validity; Cross-loadings to check whether each indicator loaded significantly on its respective factor.

Step 4 Structural Model Testing (PLS-SEM) SmartPLS, with 5000 bootstrap samples to test: Path coefficient; Statistical Significance (p-value, t-value); R<sup>2</sup> values of the dependent constructs; Direct and Indirect Effects

(mediation through Heritage Experience). PLS-SEM was selected over CB-SEM for three reasons: (1) the research model is exploratory with seven antecedent constructs, making PLS-SEM preferable for complex models; (2) the data distributions of several constructs deviated from normality, as is common in tourism survey research; and (3) PLS-SEM is well-suited to simultaneously assess reflective measurement models and test predictive relationships, consistent with the aims of this study [26].

Step 5 Conclusion and Discussion: contrast results with storytelling theory; evaluate the relative weight of each factor; suggest implications for management of Vietnamese heritage sites.

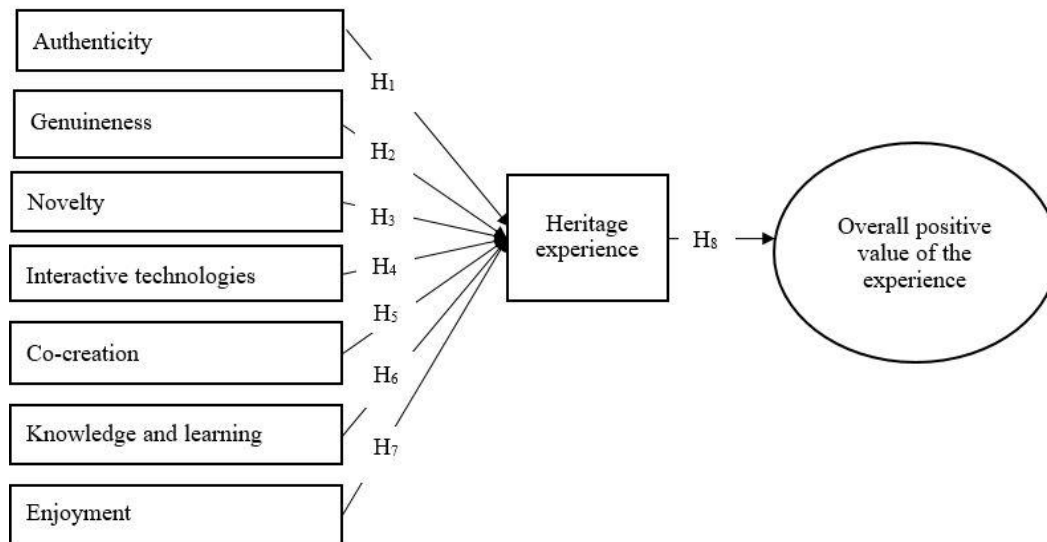


Figure 1. Proposed research model

Figure 1 illustrates the proposed research model, which presents the hypothesized relationships between authenticity, genuineness, novelty, interactive technologies, co-creation, knowledge and learning, enjoyment, heritage experience, and the overall positive value of the experience.

### 3. Results and discussion

#### 3.1. Descriptive statistics

##### 3.1.1. Demographic characteristics

The research was conducted among 467 users who had a past experience of visiting heritage in Vietnam. The sample size was gender-balanced (50.1% male; 49.5% female). The majority of the respondents (63.4%) was between 18 and 35 years old, with the 26–35 age group as the largest group (33.2%).

The education was fairly high, with 52.7% holding a bachelor's degree and 21.6% a postgraduate degree. The majority of visitors (82.2%) stated that they visited heritage sites 1–4 times a year, suggesting a high level of audience involvement. The focus of visits were mainly sightseeing (40.0%) and cultural activities (33.8%), followed by study/research (23.8%). In sum, the sample is representative of a young, highly educated and active group of visitors, which is a suitable target group to test storytelling in heritage tourism. Table 1 presents the descriptive statistics of the respondents' demographic characteristics, including gender, age, education level, visitation frequency, and purpose of visit.

Table 1. Descriptive statistics of respondents' demographic characteristics

Characteristics	Category	Frequency	Percentage (%)
Gender	Male	234	50.1
	Female	231	49.5
	Other	2	0.4
Age	Under 18	43	9.2
	18–25	141	30.2

Characteristics	Category	Frequency	Percentage (%)
Education Level	26–35	155	33.2
	36–45	81	17.3
	Over 45	47	10.1
	High School	50	10.7
	College	70	15
Visitation Frequency	Bachelor's degree	246	52.7
	Postgraduate	101	21.6
	1–2 times/year	186	39.8
	3–4 times/year	198	42.4
Purpose of Visit	More than 4 times/year	83	17.8
	Sightseeing	187	40
	Study/Research	111	23.8
	Cultural Experience	158	33.8
	Other	11	2.4

Source: Survey data analysis results

### 3.1.2. Characteristics of the measurement scales

The observed variables were measured by 5-point Likert scales, with 1 denoting ‘Strongly disagree’ and 5 denoting ‘Strongly agree’. The descriptive statistics show that the minimum and maximum of means for the observed variables are 2.48 and 3.90, respectively, while between 0.660 and 0.845 are the standard deviations. This means that visitors' responses to questions related to storytelling at heritage sites have a slight spread but are within an acceptable range. For the Authenticity group, the mean values were the lowest across the entire model (M ranged from 2.48 to 2.57). More specifically, for A3 (the information is consistent with what we know about the historical period), mean is 2.48 and standard deviation is 0.845. With a standard deviation of 0.776, variable A5 (the experience is authentic and not overly manipulated) obtained a score of 2.49. With regard to the other variables, A2, A4 and A1 obtained scores of 2.52, 2.53 and 2.57, correspondingly. These findings suggest that visitors felt that the level of authenticity in storytelling at Vietnamese heritage sites was quite low, which might have been because of a lack of historical study or poor narrative delivery.

On the contrary, the Co-creation group showed the highest mean scores from 3.79 to 3.90. Item C1 (having the opportunity to participate in storytelling or historical reenactments) received the highest score of 3.90 with a low standard deviation of 0.728, suggesting high level of visitor satisfaction to participatory experiences. Item C5 (interactive elements make storytelling more lively and interesting) has a group lowest standard deviation (0.660) and mean 3.83. Items C3, C2 and C4 had equivalent scores ranging between 3.79 and 3.80. This indicates a positive development that heritage sites are starting to offer specialized sessions for visitors to become involved. The Genuineness group was also higher, with mean values of 3.78 and 3.82. Item G1 (the heritage site's ambiance is authentic and natural) was the highest-rated item with a score of 3.82 and a standard deviation of 0.738. Items G2, G3 and G4 were between 3.78 and 3.79 with standard deviations between 0.755 and 0.798. This implies that when historical authenticity was perceived negatively, visitors still considered the heritage sites to be a genuine and not too commercialized place.

The Interactive Technologies category yielded relatively high scores (M = 3.29 to M = 3.31. IT3 (the technology is convenient, suitable and easy to use) obtained the highest value of 3.31, with a standard deviation of 0.791. IT1 (AR/VR technologies and interactive screens allow to better understand the story) garnered 3.30, with the largest standard deviation in the set (0.843), meaning that there is more diversity among the visitors' opinions. IT2 was rated 3.29 (SD = 0.774). These findings indicate that, although technology has found its way into heritage sites, it has not made a big impression on visitors as yet. The Novelty group rated between 3.11 and 3.21. Item N3 (the experience here is unlike other places you have been) was the highest attributing answer with 3.21 (SD = 0.745). N2 and N4 had identical means of 3.19 the N1 received 3.14. Item N5 (the content is packaged in a novel/conventional way) had the lowest mean of 3.11 (SD = 0.822). This indicates that storytelling in heritage sites is plainly different but it is not exceptional in its creativity. The Knowledge and

Learning factor scored from 3.23 to 3.30, showing a similar pattern of results. Scores for K1, K2, and K3 ranged between 3.29 and 3.30 with the standard deviation (SD) from 0.665 to 0.717. K4 (ease of access to stories told) had the lowest mean of 3.23 and the largest standard deviation (0.797). This demonstrates that storytelling has added considerably to the transfer of cultural and historical information. The Enjoyment group was range from 2.95 to 3.09, inferior to our expectations. E2 (storytelling induces positive emotion) received the highest mean value of 3.09 (SD = 0.750). E3, E5 and E4 were the sub-variables under consideration with scores ranging from 3.02 to 3.04. Importantly, E1 (pleasure in participating in the heritage satisfaction) was only 2.95 with a standard deviation of 0.746, which was the lowest in this group. This means that trailblazing storytelling will not necessarily create intense excitement for visitors.

The Heritage Experience group received scores ranging from 3.01 to 3.15, (the experience fulfilled my expectations) received the highest rating of 3.15 (SD 0.732). HE5 (visitor satisfaction with the heritage experience) scored 3.13 while HE2 and HE3 received scores of 3.10 and 3.11 respectively. HE4 (intense association between a storyline and a heritage site) yielded the lowest mean (3.01, SD = 0.778). These results suggest that, in general, heritage experiences are the moderately rated experiences, not the exceptional ones. On the whole, the Positive Value category obtained scores from 3.36 to 3.44, which were higher than most of the other categories. OP4 (recommending the destination to other people) obtains the maximum score of 3.44 with minimum standard deviation (0.745). OP2 (getting meaningful value from the experience) received a score of 3.41, OP3 received a score of 3.37, and OP1 received a score of 3.36. Despite some areas in which the results are less positive, visitors still gave their overall valuation of the visit a fairly positive score and expressed their intention to suggest the destination to other people. Table 2 presents the descriptive statistics of the observed variables, including minimum, maximum, mean, and standard deviation values for each measurement item.

Table 2. Descriptive statistics of observed variables

Variable Group	Code	Min	Max	Mean	SD
Authenticity	A1	1	5	2.57	0.759
	A2	1	5	2.52	0.811
	A3	1	5	2.48	0.845
	A4	1	4	2.53	0.753
	A5	1	4	2.49	0.776
Genuineness	G1	2	5	3.82	0.738
	G2	2	5	3.78	0.783
	G3	1	5	3.79	0.798
	G4	2	5	3.79	0.755
Novelty	N1	1	5	3.14	0.735
	N2	1	5	3.19	0.765
	N3	1	5	3.21	0.745
	N4	1	5	3.19	0.758
	N5	1	5	3.11	0.822
Interactive Technologies	IT1	1	5	3.3	0.843
	IT2	1	5	3.29	0.774
	IT3	1	5	3.31	0.791
Co-creation	C1	2	5	3.9	0.728
	C2	2	5	3.79	0.774
	C3	2	5	3.8	0.732
	C4	2	5	3.79	0.706
	C5	2	5	3.83	0.66
Knowledge & Learning	K1	1	5	3.29	0.699
	K2	1	5	3.29	0.665
	K3	1	5	3.3	0.717
	K4	1	5	3.23	0.797
Enjoyment	E1	1	5	2.95	0.746
	E2	1	5	3.09	0.75

Variable Group	Code	Min	Max	Mean	SD
Heritage Experience	E3	1	5	3.04	0.775
	E4	1	5	3.02	0.778
	E5	1	5	3.03	0.758
	HE1	1	5	3.15	0.732
	HE2	1	5	3.11	0.767
	HE3	1	5	3.1	0.732
	HE4	1	5	3.01	0.778
	HE5	1	5	3.13	0.788
Overall Positive Value	OP1	1	5	3.36	0.793
	OP2	1	5	3.41	0.776
	OP3	1	5	3.37	0.801
	OP4	1	5	3.44	0.745

## 3.2. Scale assessment

### 3.2.1. Convergent validity

Table 3. Reliability and convergent validity assessment of the measurement scales

Scale	Code	Cronbach's Alpha	Rho_a	Composite Reliability (Rho_c)	AVE
Authenticity	A	0.798	0.801	0.861	0.553
Co-creation	C	0.785	0.786	0.853	0.536
Enjoyment	E	0.86	0.867	0.899	0.64
Genuineness	G	0.727	0.731	0.829	0.549
Heritage Experience	HE	0.833	0.834	0.882	0.6
Interactive Technologies	IT	0.746	0.754	0.855	0.663
Knowledge and Learning	K	0.834	0.734	0.857	0.604
Novelty	N	0.762	0.773	0.839	0.511
Overall Positive Value	OP	0.763	0.763	0.849	0.585

Table 3 presents the results of reliability and convergent validity assessment for the measurement scales, including Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE). All scales in the model demonstrate good convergent validity, as Cronbach's Alpha, Composite Reliability, and AVE values all exceed the required thresholds. This confirms that the observed variables within each construct are highly correlated and effectively measure the corresponding latent concept.

### 3.2.2. Discriminant validity

Table 4. Fornell–Larcker matrix for discriminant validity

	A	C	E	G	HE	IT	K	N	OP
A	<b>0.743</b>								
C	0.408	<b>0.732</b>							
E	0.113	0.056	<b>0.8</b>						
G	0.343	0.366	-0.024	<b>0.741</b>					
HE	0.439	0.495	0.185	0.48	<b>0.775</b>				
IT	0.283	0.279	0.2	0.388	0.524	<b>0.814</b>			
K	-0.077	0.004	0.01	-0.006	0.117	0.036	<b>0.777</b>		
N	-0.015	0.212	-0.029	0.178	0.24	0.059	0.057	<b>0.715</b>	
OP	0.522	0.201	0.122	0.263	0.436	0.282	0.125	0.11	<b>0.765</b>

Note: Bold numbers on the diagonal are the square roots of AVE

Table 5. HTMT Matrix for discriminant validity

	A	C	E	G	HE	IT	K	N	OP
A									
C	0.518								
E	0.138	0.123							
G	0.436	0.476	0.129						
HE	0.534	0.606	0.216	0.609					
IT	0.363	0.362	0.243	0.53	0.662				
K	0.141	0.103	0.055	0.079	0.115	0.093			
N	0.086	0.277	0.076	0.244	0.293	0.099	0.081		
OP	0.665	0.258	0.147	0.35	0.546	0.372	0.157	0.15	

Table 4 and Table 5 present the results of discriminant validity assessment using the Fornell–Larcker criterion and the HTMT ratio, respectively. Both Fornell–Larcker and HTMT analyses confirm that the scales in the model have strong discriminant validity. This means the latent constructs are measured distinctly and are not confused with each other.

### 3.2.3. Cross loadings

Table 6. Cross-loadings matrix of observed variables

Variable	A	C	E	G	HE	IT	K	N	OP
A1	0.723	0.326	0.074	0.239	0.338	0.201	-0.097	-0.016	0.415
A2	0.75	0.282	0.094	0.322	0.341	0.25	-0.037	-0.033	0.37
A3	0.782	0.297	0.144	0.265	0.307	0.223	-0.063	-0.08	0.393
A4	0.71	0.328	0.002	0.207	0.272	0.166	-0.031	-0.001	0.348
A5	0.751	0.29	0.096	0.235	0.358	0.207	-0.056	0.067	0.404
C1	0.251	0.725	0.064	0.304	0.393	0.235	-0.038	0.172	0.121
C2	0.316	0.736	0.081	0.269	0.36	0.178	-0.037	0.149	0.144
C3	0.353	0.716	0.004	0.279	0.357	0.192	-0.008	0.198	0.147
C4	0.292	0.749	0.12	0.239	0.388	0.217	0.038	0.107	0.197
C5	0.285	0.735	-0.093	0.247	0.297	0.193	0.072	0.153	0.123
E1	0.105	0.042	0.826	-0.058	0.159	0.179	-0.014	0.037	0.101
E2	0.072	0.056	0.774	-0.008	0.123	0.135	0.021	-0.054	0.067
E3	0.121	0.046	0.82	0.017	0.164	0.178	-0.006	-0.026	0.118
E4	0.056	-0.01	0.774	-0.062	0.13	0.145	0.004	-0.04	0.072
E5	0.09	0.085	0.806	0.011	0.156	0.157	0.039	-0.045	0.119
G1	0.314	0.297	-0.065	0.739	0.39	0.272	0.013	0.075	0.198
G2	0.318	0.337	-0.091	0.778	0.383	0.311	-0.035	0.144	0.24
G3	0.187	0.24	-0.005	0.732	0.29	0.293	-0.033	0.115	0.177
G4	0.173	0.197	0.107	0.712	0.344	0.276	0.035	0.197	0.156
HE1	0.3	0.388	0.073	0.338	0.765	0.385	0.134	0.262	0.362
HE2	0.375	0.382	0.141	0.337	0.738	0.366	0.048	0.119	0.332
HE3	0.369	0.402	0.16	0.389	0.812	0.418	0.106	0.201	0.349
HE4	0.308	0.381	0.197	0.346	0.785	0.425	0.12	0.126	0.343
HE5	0.347	0.364	0.145	0.447	0.771	0.434	0.045	0.217	0.301
IT1	0.248	0.236	0.223	0.303	0.472	0.849	0.054	0.044	0.252
IT2	0.246	0.219	0.173	0.26	0.405	0.812	0.074	0.028	0.273
IT3	0.196	0.226	0.082	0.391	0.398	0.781	-0.045	0.072	0.16
K1	-0.14	-0.032	-0.048	0.007	-0.012	-0.047	0.622	0.011	-0.061
K2	-0.112	-0.052	0.051	0.014	0.036	-0.005	0.752	0.013	-0.013
K3	-0.059	0.063	0.001	0.006	0.108	0.068	0.868	0.005	0.091
K4	-0.066	-0.045	-0.006	-0.022	0.101	-0.006	0.843	0.102	0.145
N1	-0.01	0.183	-0.03	0.15	0.192	0.056	0.072	0.724	0.112
N2	0.015	0.164	-0.012	0.187	0.136	0.018	0.028	0.694	0.143
N3	-0.006	0.134	0.017	0.145	0.147	0.001	0.023	0.701	0.048
N4	-0.016	0.159	-0.059	0.016	0.16	0.033	0.034	0.673	0.052

Variable	A	C	E	G	HE	IT	K	N	OP
N5	-0.027	0.125	-0.016	0.143	0.205	0.083	0.036	0.777	0.05
OP1	0.387	0.134	0.158	0.154	0.345	0.213	0.111	0.072	0.781
OP2	0.437	0.161	0.124	0.198	0.336	0.23	-0.024	0.078	0.728
OP3	0.361	0.153	0.059	0.26	0.323	0.226	0.114	0.079	0.775
OP4	0.409	0.168	0.027	0.194	0.328	0.193	0.182	0.109	0.773

Note: Bold values indicate the loading of each observed variable on its corresponding latent construct

Table 6 presents the cross-loadings of observed variables on their respective latent constructs, used to assess convergent and discriminant validity of the measurement model. The cross-loading results indicate that all observed variables load highest on their intended latent constructs, with loading values ranging from 0.622 to 0.868. The cross-loadings on other latent constructs are significantly lower, demonstrating strong convergent and discriminant validity of the measurement scales. This confirms that the measurement model meets the requirements for proceeding to structural model analysis.

### 3.3. PLS-sem estimation

#### 3.3.1. Testing direct effects

##### 3.3.1.1. The effects of storytelling elements on heritage experience

The estimated path coefficients indicate that all hypothesized relationships are statistically significant. Among the seven independent variables influencing Heritage Experience, Interactive Technologies (IT) has the strongest impact, with a path coefficient of 0.299. The t-statistic of 5.975 and p-value of 0.000 show a highly significant effect at the 1% level. The bootstrapped mean 0.298 close to the naive estimate shows the result is very stable. The 95% confidence interval is 0.201 to 0.397, and the bias-corrected interval 0.206 to 0.400, with a negligible bias of -0.002. This finding underscores the importance of devices such as AR/VR or touchscreen-based interfaces to amplify visitor experiences at heritage places. When heritage sites introduce interactive forms of technology, visitor involvement increases dramatically, enabling them to more fully comprehend historical stories and enhancing their emotional attachment to heritage. Co-creation (C) is the next potent predictor, with a path coefficient of 0.225. The t-value of 5.593 and p-value of 0.000 represent a very high level of significance. The bootstrapped mean of 0.222, with a SE of 0.040, indicates low variability. The 95% confidence interval is 0.142 to 0.301, and the bias-corrected interval is 0.149 to 0.309 with a bias of -0.003. This finding indicates that allowing visitors to engage in storytelling activities, to participate in historical reenactments, or in any other hands-on aspect of a tour greatly enhances their overall experience. Visitors are not just passive receivers of knowledge but active co-creators of their experience, which personalizes and enriches the visit itself, making it more meaningful.

Authenticity (A) is 0.195 with  $t = 4.454$  and  $p = 0.000$ . The bootstrapped estimate of 0.194 and standard error of 0.044 indicate robustness. The 95% confidence interval is [0.106, 0.278] for the bias-corrected interval is [0.106, 0.279], with a negligible bias of -0.001. Even the descriptive statistics indicate rather low mean values for Authenticity (between 2.48 and 2.57), this dimension continues to exert a meaningful, relatively strong influence on heritage experience. “And that that tells us is that visitors do want historical accuracy in storytelling and they want stories to be set in real historical contexts.” Increasing authenticity was found to have a considerable positive impact on the quality of the heritage experience. Genuineness (G) exhibits a path coefficient of 0.193, close to that of Authenticity, along with  $t = 4.074$  and  $p = 0.000$ . The bootstrapped mean is 0.193, Standard error = 0.047. The 95% confidence interval is (0.096; 0.287) and the bias-corrected confidence interval is (0.093; 0.284) with zero bias (0.000). This finding indicates that a natural, authentic environment – albeit one that isn’t excessively commercialized – does foster positive visitor experiences. Visitors expect to experience the true spirit of heritage sites not a spectacle tourism product. When places retain their authentic character and provide an authentic experience, satisfaction levels soar.

Novelty (N) has a path coefficient of 0.139 with t value of 4.230 ( $p = 0.000$ ). The bootstrapped mean of 0.141 and the standard error of 0.033 are very small, denoting a robust estimation. The 95% confidence interval is

0.075 to 0.203, and the bias corrected interval is 0.072 to 0.200 with a small bias of 0.002. However, even though the strength of this effect is smaller than the previous variables, it is still statistically significant; novelty and creativity in story-telling have a significant, if underpowered effect. Visitors expect new viewpoints or stories from out beyond well-being, or are subjected to different ways of presenting content than they have under taken anywhere else.

Knowledge and learning (K) has a path coefficient of 0.113 with t-value = 2.019, p-value = 0.044. The bootstrapped mean of 0.106 is slightly smaller than the original estimate, and the standard error of 0.056 is the largest among all predictors, suggesting lesser estimation stability. Importantly, the 95% confidence interval spans from -0.063 to 0.179 and the bias-corrected interval from -0.085 to 0.170, both of which include zero. This indicates a contradiction: although the p-value is below 0.05, the confidence interval crossing zero renders the effect statistically unstable. Therefore, H6 (Knowledge and Learning → Heritage Experience) is considered only partially supported, this indicates that learning-related variables exerted the weakest and least stable influence on heritage experience, a finding that may reflect the diverse motivations of visitors to heritage sites, not all of whom priorities educational outcomes.

The path coefficient of Enjoyment (E) is the lowest at 0.097, but it is still statistically significant (t-value = 2.762 and p-value = 0.006). The bootstrapped mean of 0.098 with a standard error of 0.035 suggests a stable estimation. The 95% confidence interval is 0.031 to 0.168 the bias-corrected interval is 0.029 to 0.167 and there's a minimal bias of 0.001. Although Enjoyment is the least influential factor, it still significantly accounts for heritage experience at 1% level. This can be explained by the rather low mean values of the Enjoyment scale (ranging from 2.95 to 3.09), indicating that existing storytelling strategies have not yet elicited high levels of excitement or emotional engagement.

Table 7. Direct effects on heritage experience

Hypo thesis	Relationship	Path Coefficient	Mean Value	Standard Error	t-value	p-value	95% Confidence Interval	Bias	Bias-Corrected 95% CI
H4	IT → HE	0.299	0.298	0.05	5.975	0.000 ***	[0.201; 0.397]	- 0.00 2	[0.206; 0.400]
H5	C → HE	0.225	0.222	0.04	5.593	0.000 ***	[0.142; 0.301]	- 0.00 3	[0.149; 0.309]
H1	A → HE	0.195	0.194	0.044	4.454	0.000 ***	[0.106; 0.278]	- 0.00 1	[0.106; 0.279]
H2	G → HE	0.193	0.193	0.047	4.074	0.000 ***	[0.096; 0.287]	0	[0.093; 0.284]
H3	N → HE	0.139	0.141	0.033	4.23	0.000 ***	[0.075; 0.203]	0.00 2	[0.072; 0.200]
H6	K → HE	0.113	0.106	0.056	2.019	0.044 **	[-0.063; 0.179]	- 0.00 7	[-0.085; 0.170]
H7	E → HE	0.097	0.098	0.035	2.762	0.006 ***	[0.031; 0.168]	0.00 1	[0.029; 0.167]

Notes: \*\*\* p < 0.01; \*\* p < 0.05

Table 7 presents the results of the structural model analysis, showing the direct effects of the seven antecedent variables on Heritage Experience. Results indicate that all seven elements of storytelling positively influence the Heritage Experience. Interactive Technologies and Co-creation have the greatest impact, with the second strongest effect being that of Authenticity and Genuineness. The weakest effects are observed on Knowledge and Learning and on Enjoyment, whereas Novelty has a moderate effect. This implies that in promoting heritage experience, management need to focus their investment in interactive technology, provide visitors the

chance to actively co-create their own experience, and at the same time maintain the storytelling's authenticity and genuineness.

### 3.3.1.2. Impact of heritage experience on overall positive value

The path from HE to OP has the biggest coefficient among the entire model, which reaches 0.436. The t-statistic is 9.071 and the p-value is 0.000 indicating a very strong effect that was significant at the 1% level. The mean value of bootstrapping is 0.438, which is a bit higher than that of original sample, with the standard error as 0.048. The 95% confidence interval (CI) was 0.341 to 0.531, which is wide, and did not contain the value 0, indicating the high stability of this association. The bias-corrected CI was 0.332 to 0.522 with a positive bias of 0.003, suggesting a stable point estimate.

It is evident that visitors who enjoy a superior heritage experience are more likely to positively rate the overall value of their visit. In particular, when heritage experience changes by one standard deviation, overall positive value changes by 0.436 standard deviations. This relationship is central to the model and it confirms the significant mediating role of Heritage Experience in converting the storytelling elements into the ultimate benefits attained by visitors. A superior quality heritage experience makes visitors believe that the trip is worth taking, is meaningful, and that they will pass along the story. Table 8 presents the results of testing the impact of Heritage Experience on Overall Positive Value in the structural model.

Table 8. Results of testing the impact of heritage experience on overall positive value

Hypothesis	Relationship	Path Coefficient	Mean	Standard Error	t-value	p-value	95% CI	Bias	Bias-Corrected 95% CI
H8	HE → OP	0.436	0.438	0.048	9.071	0.000* **	[0.341; 0.531]	0.003	[0.332; 0.522]

Note: \*\*\*  $p < 0.01$

Results indicate that seven of the eight direct-effect hypotheses are supported (H1, H2, H3, H4, H5, H7, H8). H6 (Knowledge and Learning → Heritage Experience) is only partially supported: while  $p = 0.044 < 0.05$ , the 95% confidence interval  $[-0.063; 0.179]$  crosses zero, indicating that this effect is statistically unstable and should be interpreted with caution. This finding confirms that storytelling through authenticity, genuineness, novelty, interactive technology, co-creation, knowledge and learning, and enjoyment generates positive impacts on heritage experience, which in turn strongly influences overall positive value perceived by visitors.

### 3.3.2. Testing indirect effects

In addition to direct effects, the study also examines the indirect effects of storytelling factors on Overall Positive Value through the mediating variable Heritage Experience. The analysis of indirect effects helps clarify the mediating role of Heritage Experience within the research model, demonstrating that storytelling factors influence not only directly but also indirectly the final value perceived by visitors.

Interactive Technologies (IT) exhibit the strongest indirect effect on Overall Positive Value, with a coefficient of 0.130. The t-value is 4.663 and the p-value is 0.000, indicating strong statistical significance at the 1% level. The bootstrapping mean is 0.131 with a standard error of 0.028. This result shows that Interactive Technologies do not only directly affect Heritage Experience ( $\beta = 0.299$ ) but also indirectly influence Overall Positive Value through Heritage Experience. The indirect effect is calculated as the product of the two path coefficients:  $0.299 \times 0.436 = 0.130$ , consistent with the analysis. This indicates that investment in interactive technologies at heritage sites not only enhances the visitor experience but also significantly improves the overall value perceived by visitors. Co-creation (C) has the second strongest indirect effect, with a coefficient of 0.098. The t-value is 5.294 and the p-value is 0.000. The bootstrapping mean is 0.097 with a standard error of 0.019, lower than that of Interactive Technologies, showing high stability. This indirect effect is derived from  $0.225 \times 0.436 = 0.098$ . The result indicates that when visitors participate in co-creating their experiences, not only is heritage experience enhanced, but the overall value they perceive from their visit also increases.

Authenticity (A) has an indirect effect of 0.085 on Overall Positive Value. The t-value is 3.472 and the p-value is 0.001, indicating significance at the 1% level. The bootstrapping mean is 0.086 with a standard error of 0.025. This effect is computed from  $0.195 \times 0.436 = 0.085$ . The result shows that authenticity in storytelling not only improves the experience but also indirectly enhances the overall value perceived by visitors. Genuineness (G) exhibits an indirect effect of 0.084, nearly identical to Authenticity. The t-value is 4.011 and the p-value is 0.000. The bootstrapping mean is 0.084 with a standard error of 0.021. This is computed from  $0.193 \times 0.436 = 0.084$ . This result suggests that the authentic atmosphere at heritage sites plays an important role in improving the overall value of the visit through enhancing heritage experience.

Novelty (N) has an indirect effect of 0.061 on Overall Positive Value. The t-value is 4.080 and the p-value is 0.000. The bootstrapping mean is 0.062 with a standard error of 0.015, showing high stability. This indirect effect is computed from  $0.139 \times 0.436 = 0.061$ . The result indicates that creativity and distinctiveness in storytelling contribute to enhancing overall value by improving the experience.

Knowledge and Learning (K) has an indirect effect of 0.049 on Overall Positive Value via Heritage Experience (t-value = 1.928, p = 0.054). This indirect effect does not reach the 0.05 significance threshold and is therefore not statistically significant. Consistent with the direct effect results, which show that the confidence intervals include zero, both the direct and indirect effects of Knowledge and Learning indicate limited statistical robustness. Accordingly, H6 is considered only partially supported, with Knowledge and Learning exhibiting the weakest and least stable influence on Heritage Experience.

Enjoyment (E) has the smallest indirect effect at 0.042. The t-value is 2.629 and the p-value is 0.009, indicating significance at the 1% level. The bootstrapping mean is 0.043 with a standard error of 0.016. This effect is computed from  $0.097 \times 0.436 = 0.042$ . Although smallest in magnitude, the effect is still statistically significant, suggesting that positive emotions play a role in enhancing overall value through improving heritage experience, although this role is limited. Table 9 presents the results of the indirect effects analysis, illustrating the mediating role of Heritage Experience in the relationship between storytelling factors and Overall Positive Value.

Table 9. Results of testing indirect effects on overall positive value

Relationship	Indirect Effect	Mean	Standard Error	t-value	p-value	Conclusion
IT → HE → OP	0.13	0.131	0.028	4.663	0.000***	Significant
C → HE → OP	0.098	0.097	0.019	5.294	0.000***	Significant
A → HE → OP	0.085	0.086	0.025	3.472	0.001***	Significant
G → HE → OP	0.084	0.084	0.021	4.011	0.000***	Significant
N → HE → OP	0.061	0.062	0.015	4.08	0.000***	Significant
K → HE → OP	0.049	0.047	0.026	1.928	0.054	Not significant
E → HE → OP	0.042	0.043	0.016	2.629	0.009***	Significant

Note: \*\*\* p < 0.01; p < 0.10 (not reaching the 0.05 threshold)

Most storytelling dimensions have statistically significant indirect effects on Overall Positive Value through Heritage Experience. The exception is Knowledge and Learning (indirect effect = 0.049, p = 0.054), which fails to reach significance at the 0.05 level. This reinforces the partial-support conclusion for H6: Knowledge and Learning contributes the weakest and least reliable pathway in the model, both directly and indirectly. Interactive Technologies and Co-creation have the greatest indirect effects, demonstrating their dominant influence on heritage tourism value.

### 3.3.3. Model fit assessment

#### 3.3.3.1. Coefficient of determination R<sup>2</sup>

The coefficient of determination (R<sup>2</sup>) is a measure of the extent to which the independent variables account for the variance in the dependent variables in the model. Chin (1998) suggested that values of R<sup>2</sup> of 0.67 are

classified as strong, 0.33 as moderate and 0.19 as weak. The explanatory power for the two dependent variables differs markedly, as the results show.

The  $R^2$  for the Heritage Experience (HE) variable is 0.511 with an adjusted  $R^2$  of 0.504. This indicates that 51.1% of the variation in heritage experience is accounted for by seven independent variables including Authenticity, Genuineness, Novelty, Interactive Technologies, Co-creation, Knowledge and Learning, and Enjoyment. This is a fairly high degree of explained variance – classified as moderate-to-strong according to Chin (1998) suggesting that the model contains the salient predictors of heritage experience [27]. The small decrease in the adjusted  $R^2$  (a decrease of 0.007) is due to the adjustment for the number of predictors but is still high, indicating that the independent variables help in predicting the dependent variable meaningfully and they are not increasing  $R^2$  artificially. Other factors contributing to the unexplained 48.9% of the variance might include non-storytelling related aspects, such as the quality of the facility, the service attitude of staff, the price of the ticket, the weather, the mood of the visitors, or other sociocultural factors. But as more than half of the variance is accounted for, the model attests to the significance of storytelling in the formation of heritage experience.

Overall Positive Value (OP) has  $R^2 = 0.190$ , adjusted  $R^2 = 0.188$ , indicating that heritage experience alone accounts for only 19% of the variability in overall positive value. This level of explanatory power is classified as weak-to-moderate by Chin (1998) [27]. While this limitation should be acknowledged, it is theoretically expected: overall perceived value in tourism is inherently multi-determined, influenced by factors beyond the heritage experience itself, including perceived price-quality ratio, service staff behavior, ancillary facilities (restaurants, transport, and accommodation), personal income level, prior travel experience, and situational factors such as weather or crowd density. Future studies should incorporate these additional antecedents to improve the explanatory scope of the model. Despite this limitation, the direct effect of Heritage Experience on Overall Positive Value remains highly significant ( $\beta = 0.436$ ,  $p < 0.001$ ), confirming its central role in value formation.

Such factors include perceived price-quality ratio and ancillary supports, including restaurants, souvenir shops, parking personal factors, such as income and level of education, prior travel experiences, initial expectations and contextual factors, including travel season or special events. Also, overall value might be influenced by other travel experiences that are not influenced by heritage, like hotel quality, transports or other leisure activities. Explanatory power aside, the results suggest that Heritage Experience contributes in some meaningful way to determining Overall Positive Value. Further, the direct effect of Heritage Experience on Overall Positive Value is significant ( $\beta = 0.436$ ), indicating that heritage experience is still one of the strongest influential factors in value perception, regardless of the effects of other variables. Table 10 presents the coefficient of determination ( $R^2$ ) and adjusted  $R^2$  values, indicating the explanatory power of the model for the dependent variables.

Table 10. Coefficient of determination  $R^2$  of the model

Dependent Variable	$R^2$	$R^2$ -adjusted	Difference	Explanatory Level
Heritage Experience (HE)	0.511	0.504	0.007	Moderate–strong
Overall Positive Value (OP)	0.19	0.188	0.002	Weak–moderate

### 3.3.3.2. Effect size $f^2$

With the  $f^2$  index, the proportion of the contribution of each independent variable to the dependent variable can be defined by quantifying the change in the value of  $R^2$  when that independent variable is excluded from the equation. Cohen (1988) Suggested that  $f^2 = 0.02$  may be regarded as small effect, 0.15 medium, and 0.35 large effects. The results indicate that the independent variables have varying degrees of influence on the dependent variables.

Heritage Experience (HE) pertaining to Overall Positive Value (OP) obtains  $f^2 = 0.234$  which lies within the medium–large range and this value is approaching towards 0.35 Beck, which is the threshold value for

considering a large effect. This is consistent with the strengthening the highest path coefficient in the model (0.436) in concluding the importance of heritage experience as a key determinant of overall value. If Heritage Experience is taken out of the equation, the  $R^2$  of Overall Positive Value would decrease substantially, demonstrating that this variable is crucial to understanding the value that is perceived by visitors.

Among the factors affecting Heritage Experience, Interactive Technologies (IT) has  $f^2 = 0.142$ , which is a medium size effect and almost equivalent to the threshold of 0.15. This is the one influencing factor on Heritage Experience that has the strongest power, emphasizing the significance of using technology in storytelling in heritage sites. If Remove Interactive Technologies from the model, the explanatory power of the model for the heritage experience would drop drastically.

Co-creation (C) yielded an  $f^2 = 0.076$ , which can be interpreted as a small to medium effect size according to the thresholds of 0.02 and 0.15. Although the path coefficient is relatively high (0.225), the effect size of  $f^2$  is not correspondingly large, which might be caused by the correlations with other constructs in the model that mitigated its unique contribution. Authenticity effects are  $\mu = 0.059$  in the small–medium range. Genuineness (G) has  $f^2 = 0.055$ , again in the small–medium effect size range and very close to that of Authenticity. Neither determinant is particularly pivotal to statement heritage experience, but they are meaningful.

Novelty (N) has  $f^2 = 0.037$ , a small effect. Knowledge and Learning (K)  $f^2 = 0.026$ , also a small effect and the lowest of the N values. Among the variables Effect of Enjoyment (E) has the smallest  $f^2$ -value of 0.018, which is close to the threshold of 0.02. None of the three variables is a strong explanatory variable for Heritage Experience, and the discard process will not dramatically reduce the  $R^2$  variance explained of Heritage Experience if any or all of them are discarded.

Table 11. Effect Size  $f^2$ 

Independent Variable	Dependent Variable	$f^2$	Effect Size	Rank
HE	OP	0.234	Medium–large	1
IT	HE	0.142	Medium	2
C	HE	0.076	Small–medium	3
A	HE	0.059	Small–medium	4
G	HE	0.055	Small–medium	5
N	HE	0.037	Small	6
K	HE	0.026	Small	7
E	HE	0.018	Small	8

Table 11 presents the effect size ( $f^2$ ) of each independent variable, indicating their relative contribution to the explanatory power of the model. The  $f^2$  statistics indicate that there is a considerable heterogeneity in the effects among the model constructs. Experience with Heritage and IT have the strongest effects, followed by the other variables which have low to moderate effects. This implies that in order to aim the resources most effectively, heritage managers need to focus on directing investment in interactive technologies and co-creation activities, and the rest on other factors at modest levels.

### 3.3.4. Model predictive power assessment

#### 3.3.4.1. $Q^2$ index using the blindfolding method

The  $Q^2$  index is used to evaluate the model's predictive capability through the Blindfolding technique, which performs cross-validation by removing part of the data and using the remaining data to predict the omitted portion. According to Hair et al. (2017),  $Q^2 > 0$  indicates predictive relevance,  $Q^2 > 0.25$  medium, and  $Q^2 > 0.50$  good. The results show differing levels of predictive capability for the two dependent variables.

Heritage Experience (HE) has  $Q^2 = 0.299$ , indicating medium–good predictive capability and close to the 0.5 threshold. This shows that the model has acceptable predictive power for heritage experience based on the seven independent variables. The sum of squares of observations (SSO) = 2335.000, while the sum of squared

prediction errors (SSE) = 1636.697, meaning the prediction error accounts for 70.1% of total observations-i.e., the model reduces error by 29.9% compared to using the mean value for prediction. This is consistent with  $R^2 = 0.511$ , confirming that the model has good explanatory and predictive capability for Heritage Experience.

Overall Positive Value (OP) has  $Q^2 = 0.108$ , indicating weak predictive capability but still positive, meaning the model possesses some predictive relevance, though limited.  $SSO = 1868.000$  and  $SSE = 1665.760$  show that prediction error accounts for 89.2% of total observations-i.e., the model reduces error by only 10.8% compared to using the mean. This aligns with  $R^2 = 0.190$ , indicating modest predictive capability for Overall Positive Value due to many unobserved factors. All independent variables (A, C, E, G, IT, K, N) have  $Q^2 = 0.000$  because they are exogenous variables not predicted by any other variable in the model. Their SSO values equal SSE, indicating no reduction in prediction error. Table 12 presents the  $Q^2$  values obtained through the blindfolding procedure, indicating the predictive relevance of the model for each endogenous construct.

Table 12.  $Q^2$  Predictive power assessment using blindfolding

Variable	SSO	SSE	$Q^2$	Error Reduction %	Predictive Capability
A	2335	2335	0	0%	Not applicable
C	2335	2335	0	0%	Not applicable
E	2335	2335	0	0%	Not applicable
G	1868	1868	0	0%	Not applicable
HE	2335	1636.697	0.299	29.90%	Medium–good
IT	1401	1401	0	0%	Not applicable
K	1868	1868	0	0%	Not applicable
N	2335	2335	0	0%	Not applicable
OP	1868	1665.76	0.108	10.80%	Weak

### 3.3.4.2. $Q^2$ predict analysis

The analysis of  $Q^2$ predict is also conducted to test the model when applied to new data is even more relevant for predicting model performance on unknown data than traditional  $Q^2$  because it reflects the generalizability of the model. This method divides the data into several training and test splits, and each split allows to train a model on the training split and validate on the test split. The results indicate that Heritage Experience has a  $Q^2$ predict of 0.483, substantially higher than  $Q^2 = 0.299$ . This means that the model not only fits the current data well but is strongly generalizable and that it accurately predicts heritage experience for new visitors. The Root Mean Square Error (RMSE) is 0.722, which measures the average of squared prediction errors, and the Mean Absolute Error (MAE) is 0.566, less than RMSE, which is the average of absolute prediction errors. The fact that RMSE is greater than MAE suggest that a few values contribute with large errors.

The overall Positive Value has a  $Q^2$ predict = 0.179 which is better than  $Q^2 = 0.108$ . Even if they are still quite low, this already suggests enhanced prediction power relative to solely using mean values.  $RMSE = 0.909$  and  $MAE = 0.740$ , which are both greater than those for Heritage Experience, so they are less accurate. A greater difference between the RMSE and the MAE would indicate more occurrences of a large error. Table 13 presents the results of  $Q^2$ predict analysis, evaluating the out-of-sample predictive performance and generalizability of the PLS-SEM model.

Table 13. Summary of predictive capability in the PLS-SEM model

Variable	$Q^2$	$Q^2$ predict	RMSE	MAE	$Q^2$ Difference
HE	0.299	0.483	0.722	0.566	0.184
OP	0.108	0.179	0.909	0.74	0.071

### 3.3.4.3. Predictive error distribution analysis

The prediction error analysis, comprising, of course, just-review bias gives some properties of the distribution of prediction errors and thereby quality and stability of the model can be inferred from it. The number of

observations in the predictive analysis is 4670 (much bigger than the original sample of 467), as the bootstrapping technique produces many subsamples to assess the stability of the regressions.

Mean prediction error for the Heritage Experience has a mean very close to 0 (-0.001), suggesting that there were no systematic over- or under-prediction. The average error is 0.050, which is slightly greater than the mean. The standard deviation of 0.722 gives an indication of how the errors in a data set are dispersed around the mean. The smallest observed error is -2.303, corresponding to substantial overprediction by the model, and, the largest errors is 2.226, which also leads to an observation of substantial underprediction.

Excess kurtosis is 0.307 which is positive but small which mean that tails of distribution is slightly heavier than in normal distribution and literally it means more extreme values. Skewness equals to -0.205 which is slightly negative but very close to 0 and it implies that the distribution is mildly left-skewed, with a few more overpredictions than underpredictions. The test statistic for the Cramér–von Mises test is 1.584 with p-value = 0.000, showing a statistically significant departure from normality though the level of departure is not high.

Prediction errors for Overall Positive Value have means close to 0 (0.000) and are thus not systematically biased. The median error is -0.102, smaller than the average, which means slighter underprediction than overprediction. The standard deviation of 0.909 is higher than that of Heritage Experience, thus a greater dispersion of errors. The minimum error is -2.749 and the maximum 2.847, which corresponds to a wider band of errors. The excess kurtosis is 0.102 which is less than that of Heritage Experience suggesting a more normal like error distribution. The skewness was -0.022, which is very close to zero, which means the distribution is nearly symmetrical. The Cramér–von Mises statistic is 2.520 with p-value = 0.000 which is greater than that of Heritage Experience, indicating a stronger deviation from normality.

#### **3.3.4.4. Analysis of predicted value distributions**

In addition to error analysis, examining the distribution of predicted values also helps evaluate model quality. For Heritage Experience, the predicted values have a mean of 0.000 due to data standardization in PLS-SEM. The median is -0.021, close to the mean. The standard deviation is 0.713, slightly lower than the standard deviation of the errors (0.722). The minimum predicted value is -2.497 and the maximum is 2.241, indicating a wide range of variation. Excess kurtosis is 0.619, higher than that of the errors, indicating that the distribution of predicted values has heavier tails than a normal distribution. Skewness is 0.127, positive and higher than the error distribution, indicating a slightly right-skewed distribution. The Cramér–von Mises test statistic is 1.822 with a p-value of 0.000. For Overall Positive Value, the predicted values have a mean of 0.000 and a median of -0.009. The standard deviation is 0.311, much lower than the error standard deviation (0.909), showing that predicted values are more concentrated than prediction errors. The minimum predicted value is -1.152 and the maximum is 1.035, reflecting a much narrower range of variation compared to Heritage Experience. Excess kurtosis is 0.605, similar to Heritage Experience. Skewness is 0.123, also positive and similar to Heritage Experience. The Cramér–von Mises test statistic is 1.788, with a p-value of 0.000.

In conclusion, the model fits the data and predicts well, although a clear distinction could be made between the dependent variables. Heritage Experience was well explained and predicted ( $R^2 = 0.511$ ,  $Q^2 = 0.299$ , and  $Q^2_{\text{predict}} = 0.483$ ), implying that the model captured the core storytelling-driven antecedents of heritage experience. However, Overall Positive Value exhibits less explanatory and predictive power with  $R^2 = 0.190$ ,  $Q^2 = 0.108$  and  $Q^2_{\text{predict}} = 0.179$ , indicating a potential benefit in integrating factors other than heritage experience—such as price, service quality, personal characteristics and trip context—to enhance the explanation of general value perceptions in heritage tourism.

### **3.4. Discussion**

#### **3.4.1. Interactive technologies and co-creation: drivers of heritage experience**

In line with previous studies focusing on immersive tools and increasing engagement (Fogli et al., 2017; Panhale et al., 2023), Interactive Technologies was the strongest predictor of Heritage Experience ( $\beta = 0.299$ ,  $t$

= 5.975,  $p < 0.001$ ). Although the scores for technology use were considered moderate (3.29–3.31) on average, this path coefficient indicates that AR/VR and digital interfaces are the most efficient ones in engaging visitors with narratives. This confirms the perspective when interactive storytelling co-creation through choice-making and multi-sense engagement in agreement with the development of technology in cultural narratives.

Furthermore, Co-Creation had the second largest positive direct effect on heritage experience ( $\beta = 0.225$ ,  $t = 5.593$ ,  $p < 0.001$ ). Participants rated co-creative opportunities very positively (mean 3.79–3.90), reflecting strong visitor interest in participatory storytelling formats. In the Vietnamese context, this is particularly significant: heritage sites such as Hoi An already feature community-based participatory activities: lantern-making workshops, traditional music performances, local craft demonstrations which constitute natural platforms for structured co-creative storytelling experiences. Heritage managers should formalize these community assets into visitor-oriented participatory programs designed to deepen narrative engagement. These results contribute to the value co-creation literature in tourism, showing that active visitor participation in narrative construction significantly enhances heritage experience [4], [7].

### 3.4.2. Authenticity and genuineness: critical yet underperforming

Although Authenticity had relatively low means (2.48–2.57), it had a significant effect on Heritage Experience ( $\beta = 0.195$ ,  $t = 4.454$ ,  $p < 0.001$ ). This means that visitors appreciate historically sound tales even when they feel those telling tales are less than authentic in their current practices. The discrepancy between the low mean scores and the relatively strong path coefficient indicates a possible latent demand for more quality historical narratives. This is in line with the importance of authenticity in meaningful heritage experience [11], [12].

Similarly, Genuineness was a significant positive predictor ( $\beta = 0.193$ ,  $t = 4.074$ ,  $p < 0.001$ ) and was confirmed by higher mean values (3.78–3.82). While authenticity emphasizes historical accuracy, genuineness is associated with visitors' sense that heritage environments are more natural than commercialized. The higher rating for Genuineness over Authenticity in this Vietnamese sample suggests that sites such as Hoi An and Hue are currently better at preserving ambient atmosphere than at delivering rigorous historical narrative. This points to a specific actionable gap: heritage managers in Vietnam should invest in deeper historical content development, drawing on local historians, archival sources, and intangible cultural heritage carriers to close the gap between perceived genuineness and historical authenticity. This is consistent with modern theories that experiential authenticity is jointly constructed between visitors, narratives, and environments [18], [19]. The higher rating for genuineness over the Authenticity scale indicates that Vietnamese heritage destinations, at present, are possibly better at preserving atmosphere than rigorous historical narrative.

### 3.4.3. Moderate roles of novelty, knowledge, and enjoyment

Novelty had a significant positive effect ( $\beta = 0.139$ ,  $t = 4.230$ ,  $p < 0.001$ ), suggesting that presenting narratives in creatively can distinguish visitor experiences. Although Novelty mean scores (3.11–3.21) were moderate, the result is in line with the idea that innovativeness in storytelling – if it is well balanced with heritage content – facilitates engagement [13], [14].

Enjoyment had a smaller but statistically significant effect on heritage experience ( $\beta = 0.097$ ,  $p = 0.006$ ). The lowest mean scores in the Enjoyment domain (2.95–3.09) suggest that current storytelling practices at Vietnamese heritage sites have not yet fully leveraged emotional engagement as a visitor motivator. Knowledge and Learning showed the weakest and least stable effect ( $\beta = 0.113$ , 95% CI:  $-0.063$  to  $0.179$ ), with the confidence interval crossing zero. This outcome may reflect the diversity of visitor motivations in Vietnam's heritage sites: many visitors are primarily leisure-oriented rather than educationally driven, consistent with the sample profile (40% sightseeing, 33.8% cultural experience). This diverges from studies in Western heritage contexts where learning is a primary motivation [6], suggesting that Vietnamese heritage destinations may need to integrate knowledge delivery within entertainment-oriented or participatory formats to make it more experientially meaningful. These findings are consistent with Jackson and Kidd [6], who illustrate that contemporary heritage visitors demand greater interactive engagement rather than passive consumption of

information. These findings are similar to those of Jackson and Kidd that illustrate contemporary heritage visitors as demanding greater interactive engagement as opposed to passive consumption of information, moving away from traditional “learning-first” motivations towards experience-centric involvement [6].

#### 3.4.4. Mediating role of heritage experience in value creation

The path from Heritage Experience to Overall Positive Value was strong and highly significant ( $\beta = 0.436$ ,  $t = 9.071$ ,  $p < 0.001$ ), indicating good visitor experiences are at the core of perceived value. This is in line with the experience economy view, which states that lived and meaningful experiences create enduring positive appraisals [3]. On the other hand, Knowledge and Learning (indirect = 0.049,  $p = 0.054$ ) did not reach significance at the 0.05 threshold and is classified as not statistically significant, consistent with its direct effect instability. Enjoyment (0.042,  $p = 0.009$ ) had the smallest but still significant indirect effect, indicating that positive emotions play a role in enhancing overall value through improved heritage experience, albeit a limited one.

These results confirm that storytelling elements contribute to visitor-perceived value primarily by first enhancing the quality of the heritage experience. Heritage experience thus functions as a full mediator between narrative inputs and value outputs, a process model compatible with strategic storytelling in heritage tourism [5], [23]. Notably, the mediation pathway for Knowledge and Learning is statistically weak ( $p = 0.054$ ), reinforcing that this dimension requires more deliberate integration into the experiential storytelling design before its value-enhancing potential can be fully realized. Interactive Technologies and Co-creation retain the greatest indirect effects, demonstrating their dominant role in heritage tourism value creation.

#### 3.4.5. Model explanatory and predictive power

The  $R^2$  of 0.511 for Heritage Experience indicates that approximately 51.1% of its variance is explained by the seven storytelling dimensions, a moderate-to-strong level per Chin (1998) confirming that the model captures the core antecedents of heritage experience. However, the  $R^2$  of 0.190 for Overall Positive Value is relatively low (classified as weak by Chin, 1998), indicating that heritage experience alone does not fully account for visitors’ overall value assessment. This is theoretically plausible: overall value in tourism is a multi-determined construct influenced by service quality, price-to-value ratio, physical comfort, and individual characteristics such as travel experience and prior expectations [3]. The  $Q^2 = 0.108$  for Overall Positive Value further confirms this limited predictive reach. Future studies should incorporate additional value antecedents such as perceived service quality, price fairness, and personal travel motivations to improve explanatory and predictive power. Predictive power analyses demonstrated satisfactory predictive relevance for Heritage Experience ( $Q^2 = 0.299$ ), but limited relevance for Overall Positive Value ( $Q^2 = 0.108$ ), consistent with the  $R^2$  findings.

#### 3.4.6. Implications for sustainable heritage tourism in Vietnam

The results indicate that strategic storytelling, particularly in its technologically mediated and co-created forms, has significant potential to enhance visitor experience and value in Vietnam. These findings have particular resonance in the Vietnamese context, where heritage sites such as Hoi An and Hue serve a predominantly young, highly educated domestic and international visitor base (63.4% aged 18–35 in this sample) with strong preferences for participatory and digital experiences. The relatively low Authenticity scores ( $M = 2.48$ – $2.57$ ) suggest a gap between visitor expectations for historical accuracy and current storytelling delivery at these sites, a challenge that Vietnamese heritage managers should address through investment in expert-guided interpretive programs and rigorous historical consultation in content development. Furthermore, the high Co-creation scores ( $M = 3.79$ – $3.90$ ) indicate that Vietnamese visitors are already highly receptive to participatory formats, representing a key opportunity to further embed community-based storytelling, where local residents co-narrate heritage alongside professional guides, a model aligned with Vietnam’s broader cultural tourism strategy. These strategic priorities align with the sustainable development goals orienting cultural preservation, community empowerment, and visitor satisfaction [16], [28]. In brief, storytelling-when it is conceptualized holistically with the four interrelated elements of authenticity, interactivity, and innovation-displays considerable potential

for enhancing visitor experiences and accomplishing sustainable heritage tourism development in Vietnam [29], [30].

#### **4. Conclusion**

This research substantiates that storytelling is a significant determinant of heritage tourism experience and perceived value at Vietnam's heritage destinations. All seven storytelling dimensions exert positive effects on Heritage Experience; the strongest effects are from Interactive Technologies and Co-creation, followed by Authenticity and Genuineness. Knowledge and Learning demonstrates only partial support ( $p < 0.05$  but 95% CI crosses zero), underscoring the need for further investigation into its role under different storytelling delivery conditions. Heritage Experience itself is a powerful predictor of Overall Positive Value, confirming its central mediating role between narrative elements and visitor value judgements. The study makes a theoretical contribution by bringing together authenticity, co-creation, and experience economy notions under a unified storytelling-dominant model. Specifically, it advances storytelling theory in heritage tourism by demonstrating that a seven-dimension integrated framework is empirically valid in an emerging destination context, where prior research was predominantly conceptual or qualitatively grounded. The study also clarifies the mediating role of Heritage Experience: storytelling dimensions do not directly drive overall perceived value but channel their effects entirely through experiential quality. From a managerial perspective, the results suggest prioritizing interactive technologies and participatory storytelling while maintaining cultural integrity.

Subsequent studies could adopt longitudinal or comparative approaches to establish causal directions and cross-cultural generalizability. Future research could include additional variables such as service quality, price fairness, visitor motivation, and cultural distance to improve the explanatory power for Overall Positive Value (currently  $R^2 = 0.190$ ). The partially supported H6 (Knowledge and Learning) warrants further investigation: specifically, whether learning outcomes exert stronger effects when delivered through immersive or gamified storytelling formats rather than traditional guided narratives. Comparative studies across heritage site typologies (archaeological, built, and intangible) and visitor segments (domestic vs. international tourists) would further extend theoretical and practical insights. Finally, incorporating qualitative methods, such as in-depth interviews or experience sampling would enrich understanding of how individual visitors construct meaning from heritage storytelling encounters.

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The authors declare no competing interests.

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#### **Author contributions**

Nguyen Tri Phuong: Conceptualization, Methodology, Formal analysis, Writing - original draft, Supervision, Data curation, Investigation, Writing -review & editing. Nguyen Duc Thang: Methodology, Software, Validation, Writing -review & editing, Resources, Visualization.

#### **Informed consent**

Informed consent was obtained from all individual participants involved in the study prior to data collection.

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