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The influence of a metaverse presented heritage area on tourist sharing intention based on cognitive appraisal theory

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The metaverse is increasingly being promoted as a tool for heritage management and marketing. Based on the theory of cognitive appraisal theory, this study examines how visual effect, authenticity, immersion affect destination image, and then tourists' sharing intention in metaverse-presented heritage tourism. To achieve this research purpose, this study uses Partial Least Squares structural equation modeling to analyze 227 valid questionnaire data drawn from a survey of participants who experienced Zhangjiajie Heritage Tourism in China in a metaverse environment. This study found that all research hypotheses were valid except for immersion, which had no influence on affective image. For example, authenticity, visual effect and immersion can all significantly enhance cognitive image, while cognitive image and affective image significantly enhance tourists' sharing intention. This study expands the application of cognitive appraisal theory in metaverse presented heritage tourism and assisted metaverse presented heritage marketing and management.

The virtual world is having a significant impact on business and society. In 2022, investment in the metaverse exceeded 120 billion US dollars, and it is expected to generate five trillion US dollars of investment by 2030¹. Gartner reports that in 2026, approximately 25% of people will spend at least one hour a day working, shopping, educating, socializing, entertaining, and travelling in the virtual world¹. These data illustrate that the metaverse has significant economic and research value in marketing terms, especially for the tourism industry and the rise of virtual travel. However, the availability of technology and the emergence of the metaverse are leading to substantial change in many areas of tourism and visitor management, including the experiential nature of heritage tourism².

The convergence of the metaverse and tourism provides for yet another experiential dimension in terms of destination marketing and the consumer experience³. Research suggests that virtual reality (VR) (which emphasizes a completely virtual experience where tourists can experience the world outside of their own home) and augmented reality (AR) (in contrast to VR, AR retains the authenticity of the attractions and is more than a virtual travel experience) are central technologies to the realization of the metaverse⁴. In other words, metaverse tourism requires the use of VR, AR and other

technology tools to realize the metaverse tourism experience⁵. The current study defines metaverse heritage tourism as a tourism experience that incorporates virtual technologies like VR and AR with actual heritage locations.

Although research has previously noted the value of the metaverse in education and business^{4,6}, the role of the metaverse in facilitating the promotion of heritage sites has been rarely discussed given its relative novelty⁷, although heritage destinations are regarded as an important topic of tourism research⁸. For example, in previous research on metaverse presented heritage tourism, Baker et al.⁹ noted that VR authenticity is part of the metaverse experience, but did not examine the impact of authenticity on tourist behavior. Similarly, from the perspective of mixed reality, Buhalis and Karatay¹⁰ examined how the metaverse influences Gen Z's attitude towards heritage tourism. However, these studies only studied the potential value of the metaverse from a qualitative research perspective. As the notion of the metaverse enters common usage, heritage destinations presented through metaverse technology are becoming a new area of exploration for effective marketing strategies¹¹. Therefore, for heritage destination management, more empirical quantitative research is needed to explore how the heritage

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tourism experience presented by the metaverse specifically affects tourist behavior.

Visual effect is the most direct form of sensory stimulation that virtual technology offers to tourists. By improving the design of the visual effects, virtual tours can effectively generate the immersion of the tourists' users¹². The virtual experience of tourists is also influenced by their perception of authenticity which can be experienced through the combination of virtual technology and real attractions, which is representative of VR tourism and AR tourism¹³. As metaverse tourism is also realized through AR and VR tourism, so understanding the perception of authenticity in the metaverse has a significant role in predicting tourist behavior. However, to the best of the authors' knowledge, these two important antecedents, authenticity and visual effect, have not been empirically studied enough in metaverse-related tourism research.

Immersion refers to the constant mental state of the individual¹⁴, in which the user is fully integrated into his or her virtual experience¹⁵. In virtual experiences, immersion is regarded as an important cognitive variable because it is a prerequisite for evaluating its impact on tourists' psychology and behavior¹³. Destination image is a concept that emphasizes how tourists form their perceptions of a destination based on stimulus factors and characteristics of the consumers toward the destination¹⁶. Previous research has proposed the potential role of destination image in virtual destination marketing from both empirical and theoretical perspectives¹². However, whether immersion will affect the destination image of tourists in the metaverse still lacks empirical exploration. Sharing intention in digital studies is defined as sharing useful information intention online¹⁷. Therefore, exploring tourists' sharing behaviors can help metaverse tourism managers understand the metaverse heritage tourism experience information. While research has noted the values of destination image, immersion and sharing intention in understanding the digital tourism experience, limited studies have linked immersion, destination image and sharing intention based on the metaverse tourism experience.

To address the above research gaps, this work draws upon cognitive appraisal theory to examine the impact of visual effect and authenticity on tourist immersion, destination image, and sharing intention in metaverse-presented heritage tourism experience. Further specific objectives were proposed: (1) to investigate the impact of visual effect and authenticity on immersion, cognitive and affective image; (2) to explore the influence of immersion on cognitive image and affective image; and (3) to explore the influence of cognitive image and affective image on sharing intention.

Methods

Metaverse tourism

Metaverse tourism involves offering products or experiences in collaborative spatial environments that are enhanced by multi-sensory information processing in the convergence of physical and virtual environments¹⁸. The metaverse is a shared virtual world based on digital technologies that allows and improves co-creation of experiences, communication, and interaction with more users in the digital world¹⁹ through the psychological and physical immersion of interacting with other agents and objects at the same time²⁰. Thus, metaverse tourism is defined as tourism that provides products or experiences through a collective spatial environment enhanced by multi-sensory information processing in the integration of physical and virtual environments²¹.

Digital technology can build a connection between actual worlds and virtual worlds, and improve the degree of immersion in tourism events²², while the metaverse can provide more flexible content compared with other digital technologies²³. The metaverse may be a cost-effective approach to encourage the conservation and protection of cultural heritage while providing tourists with experiences in a virtual environment and encouraging their interest. It is argued that the metaverse has benefits for developing and supporting tourism, including creating sales and marketing, enhancing employment, and virtual experiences²⁴. Furthermore, the metaverse may help manage long-standing demand and management problems in the tourism industry, including heritage attractions, such as long queues, risk

and security issues, and marketing channels²⁵. Nevertheless, metaverse tourism studies are in their early stages and primarily focus on concepts and the significance of the metaverse rather than empirical research²¹.

Visual effect

Visual effect in system design refers to the level of attraction constituted by visual elements like images and the system's presentation format²⁶. In virtual reality, the visual effect is considered to be the important stimulus²⁷. Visual effects in the metaverse make virtual communication with other users more effective. As for service providers, virtual shops and communication can provide a low-cost and effective approach based on consumer-friendly designs²⁸. Therefore, good design and visual effects are crucial experience in virtual experience²⁹, while other senses rarely impact the metaverse experience³⁰. Thus, the quality of metaverse experience is related to the visual effects. In the relevant study³¹, visual effects increase users' virtual human social/co-presence and physicality and induce social behaviors in augmented reality (AR), while visual effects have been verified to negatively impact the users' perceived depth in AR and VR³². Therefore, it is worthwhile to investigate how visual effects affect the metaverse and cognitive processes.

Authenticity

An authentic experience is one in which individuals feel connected to both the real world and their true selves³³. Authentic experience is a vital element helping to create circumstances and increasing competitiveness and has been defined as an individual perception of places, activities, or other objects generated in traditional culture or customs³⁴. Authentic experiences can be received through virtual reality technology if users feel the experience as very real, which is also related to individuals' behavioral intentions³⁵. Authenticity can be generated in a metaverse environment³⁶. However, there is a lack of studies related to the effects of authentic experience in the metaverse on behavioral intention.

Immersion

Immersion refers to a psychological state in which tourists are completely absorbed and engrossed in their activities and the environment³⁷. Psychological state of immersion is a person has while participating in an interactive virtual environment³⁸. Immersion is characterized by a complex structure that is subjectively experienced, which means that individuals are having a real or virtual experience in a virtual environment that involves both mental immersion and body engagement³⁹. Immersed users can experience (1) forgetting the perception of time, (2) forgetting the perception of the real world, and (3) engaging and gaining a feeling of being present in the task environment⁴⁰. AR and VR provide immersion through technological embodiments such as helmets, increasing the possibility of participating in psychological immersion. There are five factors that influence tourist immersion in digital experience: inclusiveness (the degree to which that physical reality is ignored), surroundings (the degree to which that display allows for panoramic views), vividness (aspects such as resolution and fidelity), extensiveness, and proprioceptive matching⁴¹. Nevertheless, the antecedent and consequential impacts of immersion have received little attention in the technological travel experiences presented by the metaverse.

Destination image

Destination image is considered to be a hybrid concept related to personal beliefs, thoughts, impressions⁴², and as a mental representation that an individual has the features of a particular destination⁴³. A destination image can be generated within a simulated or computer-generated environment⁴⁴. Scholars have also decomposed the destination image into cognitive and affective images⁴⁵. Knowledge about a destination is mainly centered around tangible physical attributes, which make up the cognitive image component⁴⁵. Feelings about a destination are represented by the affective image component⁴⁵.

Studies have argued that cognitive and affective images are interrelated and a destination's image is created as part of the overall impression of the

destination⁴⁶. Affective image exerts a more significant influence on intention to visit compared to cognitive image⁴⁷, and findings have revealed that the effects of affective image are larger than the effects of cognitive image on behavioural intention⁴⁶. However, some studies have found that affective images have less impact than cognitive images on intention towards country's products⁴⁸. Thus, there is disagreement on the relative importance of the influence of affective and cognitive images on tourists' behavioral intentions, especially in new research areas such as metaverse tourism where there are limited studies on cognitive and affective images²¹. The metaverse also provides more user-communicative or affective experience compared to VR. Therefore, it is inferred that the metaverse experience may influence the formation of cognitive and affective images, and this may potentially lead to different insights into their relative significance.

Sharing intention

Sharing intention is the desire of online users to discover information that is useful to others, attract others' attention on the Internet, and share the information with them¹⁷. Sharing content on social media platforms can enhance the experience of tourists both during and after travel and is beneficial for destination marketing, operations, and management⁴⁹.

Conceptual model

Visual experiences are formed by sensory stimulation. In virtual experiences, visual effects are one of the important components of sensory experiences⁵⁰. When tourists obtain visual effect in the tourism experience presented by virtual technology, it may further influence their immersion. Although there are few empirical studies directly exploring the relationship between visual effect and immersion, from the perspective of sensory marketing theory, the sensory experience can profoundly affect consumer psychology⁵¹, including feelings of immersion. Authenticity also influences tourists' immersion as when tourists feel that the experience is sufficiently authentic, then this perception also further affects immersion⁵². Therefore, the current research proposes the following two research hypotheses:

H1: Visual effect positively affects immersion in metaverse presented heritage tourism.

H2: Authenticity positively affects immersion in metaverse presented heritage tourism.

Cognitive appraisal theory explains how external stimuli impact individuals' emotional and behavioral responses through cognitive evaluation of objects⁵³. Cognition and appraisal play important roles in the process of making decisions in variable contexts⁵⁴. The cognitive process of evaluating external stimuli is known as appraisal⁵⁵, and cognitive responses can induce emotional responses⁵⁶. Affective evaluation (i.e., affective image) is a consequence of cognitive evaluation⁵⁷. Therefore, cognitive appraisal is used in this study to interpret the impact of metaverse-presented tourism on sharing behaviors and how the visual effects of the metaverse, as an external stimulus, influence their cognitive evolution (authentic experience, visual effect, immersion and cognitive image), affective evaluation (affective image), and behavioral response (sharing behavior). Visual effects are considered as vital elements impacting impressions, and individuals experience visual fatigue if visual images are flat and static⁵⁸. The importance of visual effects has also been highlighted in virtual reality research²⁷. It is argued that visual stimuli in tourism can boost conscious psychological responses and unconscious psychological responses, which lead into behavioral intentions⁵⁹. In other words, good visual effects impact the evaluation of perception and images. Thus, in metaverse technology, visual effects may impact authentic experience, cognitive image, and affective image.

H3: Visual effect positively affects cognitive image in metaverse presented heritage tourism.

H4: Visual effect positively affects affective image in metaverse presented heritage tourism.

Immersion is an important perception in technological experience⁶⁰. Although there is limited literature to support that immersion can affect cognitive image and affective image in virtual experience, from the

perspective of the characteristics of virtual experiences, previous studies have observed that when tourists obtain the presence of virtual experiences, the sense of immersion will further affect the cognitive and affective images of tourists^{44,61}. Similar to presence perception, studies suggest that immersion and presence complement and interact with each other⁶². Research has verified that when tourists acquire immersive experience in virtual reality, both affective and cognitive images result from the immersive experience⁶³, and immersion positively impacts cognitive destination image⁶⁴. Therefore, based on the literature, this study proposes the following two hypotheses.

H5: Immersion positively affects cognitive image in metaverse presented heritage tourism.

H6: Immersion positively affects affective image in metaverse presented heritage tourism.

Based on cognitive appraisal theory, individual emotions can be generated by stimulus events and emotions that can impact individuals' making decisions and behaviors⁶⁵. The theory also describes how the cognitive process influences the generation of emotions⁵⁵. The theory has therefore been used to explain stimulus events shaping individuals' cognitions and perceptions which, in turn, affect their behavioral responses⁵⁶. Thus, in this study, authentic experiences generated from visual effects might impact affective image and cognitive image under cognitive process included in the generation of emotions and impact sharing intention. In terms of the relationship between cognitive image and affective image, the cognitive-affective model has been widely acknowledged and applied in previous studies^{66–68}. In empirical research, individuals' authentic experience has been verified to impact restaurant image, which in turn influence purchase intention⁵⁶. Authenticity has also been found to impact both cognitive image and affective image, while cognitive image has a positive relationship with affective image⁶⁶. Hence, we developed the following hypotheses:

H7: Authentic experience positively affects cognitive image in metaverse presented heritage tourism.

H8: Authentic experience positively affects affective image in metaverse presented heritage tourism.

H9: Cognitive image positively affects affective image in metaverse presented heritage tourism.

H10: Cognitive image positively affects sharing intention in metaverse presented heritage tourism.

H11: Affective image positively affects sharing intention in metaverse presented heritage tourism.

Therefore, based on the above hypothesis development, we propose the research model in Fig. 1.

Sample size

The sample size should be ten times the number of items measured⁶⁹. Considering that the current scale has 20 items and the valid sample is 227, the sample size is sufficient⁶⁹. Partial Least Squares Structural Equation Modelling (PLS-SEM) is applicable to small sample research and there is no demand for a normal distribution of the data in the PLS-SEM analysis. Therefore, Smart PLS version 3 was applied to analyze the data.

Respondent background

In total, 227 participants from Mainland China took part in the study (Table 1). Most participants were between the ages of 19 and 30 (73.6%). This age distribution is in line with previous research which found that Chinese tourists participating in digital tourism are primarily 19–30 years old⁷⁰, accounting for more than 70% of the total. Of these, 61.2% were females and 38.8% were males. More than 30% of the participants had a monthly income of CNY 4000 or below per month (30.8%) and had a bachelor's degree (52.0%).

Results

Reliability, convergent, and discriminant validity

In conducting PLS-SEM model analysis, collinearity may be present in PLS-SEM model analysis^{71,72}, therefore, based on their suggestion, VIF metrics

Fig. 1 | Research model (source: drawn by the author).

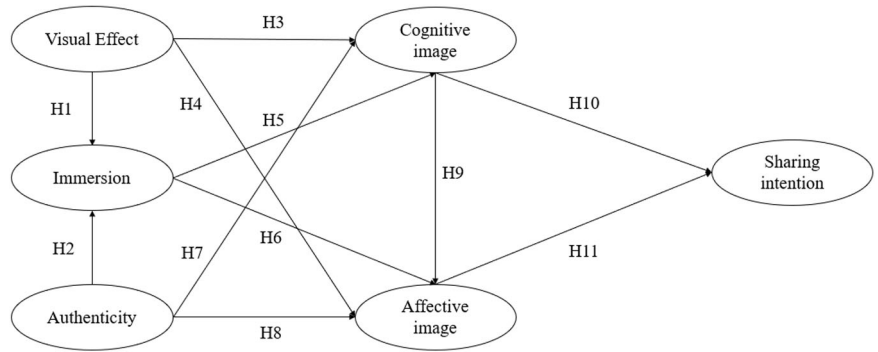


Table 1 | Background of respondents

		Frequency	Percent
Gender	Males	88	38.8%
	Females	139	61.2%
Salary monthly	CNY4000 or below	70	30.8%
	CNY4001 – 6000	55	24.2%
	CNY6001 – 8000	46	20.3%
	CNY8001 – 10000	33	14.5%
	Over CNY 10000	23	10.1%
Education	Primary school	1	0.4%
	High school	12	5.3%
	College	68	30.0%
	Undergraduate	118	52.0%
	Postgraduate	28	12.3%
Age	19–30	167	73.6%
	31–40	47	20.7%
	41–50	12	5.3%
	Over 50	1	0.4%

1USD = 7.2CNY.

were used to assess collinearity. The analysis showed that all VIF values were below 5. Therefore, collinearity does not affect the reliability and validity of the measures. Bootstrapping with 5000 samples was used to examine the PLS-SEM model⁷¹. The PLS factor loadings for the several measurement elements are displayed in Table 2. The model’s validity was good because all PLS factor loadings were higher than 0.70, Cronbach’s alpha and composite reliability (CR) values were higher than 0.7, and AVE values were higher than 0.50⁶⁹ (Table 2). Finally, data analysis indicated that the values of the square root of each AVE were greater than its construct correlations, demonstrating that the model has sufficient discriminant validity⁷¹ (Table 3).

Hypothesis testing

The PLS-SEM results are shown in Table 4, Fig. 2 and Fig. 3 Through bootstrapping calculations, this study has found that except for the influence of immersion on affective image, all other research hypotheses are supported. Visual effect and authenticity positively influence immersion, cognitive image, affective image. Immersion positively influences cognitive image. Cognitive image and affective image positively influence sharing intention. Furthermore, immersion, cognitive image, affective image, and sharing intention recorded *R square* values were greater than 0.26. The structural model was successful in making an adequate prediction⁷¹.

Discussion

Several potential theoretical contributions have been proposed. Firstly, the paper expands the application of cognitive appraisal theory from the perspectives of authenticity, immersion, and visual effect. Cognitive appraisal theory holds that the first level of perception stems from the emotional cognition of the experienter. The metaverse experience presents a new kind of tourism experience because of its richly creative communication and interactive experiences, which can enable tourists to gain psychological and physical immersive perception²⁰. Therefore, this research expands the concept of immersion and its influence on cognitive and affective image from the perspective of cognitive appraisal theory. Although previous studies suggested that immersion is a core aspect of virtual experiences³⁹, these studies lack exploration of immersion experiences in metaverse tourism experiences.

Secondly, this study also expands the concepts of authenticity and visual effect. Although authenticity has long been regarded as influencing the heritage tourism experience³⁵, studies have mostly explored authenticity from a qualitative perspective. This study examined the influence of visual effect on immersion from a quantified empirical perspective. Previous research has suggested that visual effects are an important stimulus, especially in virtual experiences²⁷. In AR research, scholars reported that visual effects can enhance tourists’ virtual human social/co-presence and physicality, and further influence tourists’ behavior³¹. However, these studies lack sufficient exploration of how visual effects affect visitors’ immersion and behavior in the metaverse environment. The current research makes up for this limitation.

Thirdly, this study expands the relationship between immersion and destination image and sharing intention. Previous research has considered the influence of cognitive image and affective image on tourists’ behavior. Some studies have found that cognitive image is stronger, while some studies have found that affective image has a stronger influence^{46,47}. Therefore, in the metaverse tourism experience, the experiences of cognitive image and affective image on tourist behavior are worthy of exploration. Moreover, this study expands understanding of consumer behavior from the perspective of sharing intention. In the era of social media, exploring consumers’ sharing intentions is of great value and provides important academic inspiration for future research and exploration of the development of the metaverse.

This study also offers several notable practical contributions. Firstly, heritage destination managers should consider enhancing the sensory experience, for example, by collaborating with professional media and video production companies. Enhancing consumers’ auditory and visual perception through professional equipment may thereby increasing tourists’ perception of immersion. In addition, the perception of authenticity is also a concern for tourists. Therefore, relevant stakeholders need to monitor tourist perceptions to ensure that the product experience meets expectations. For example, by ensuring that the visitor experience is realistic so as to gain a sense of perceived authenticity. In addition, heritage organizations should also conduct research to understand the perspectives of different visitor segments as to how authenticity and visual effects can be enhanced, thereby ensuring the relevance of the Metaverse experience.

Table 2 | Reliability and validity of the model

Measurable items	Factor Loading	CR	AVE
Visual effect (VE)		0.91	0.772
VE-1: I think metaverse-presented tourism is visually comfortable	0.882		
VE-2: I think metaverse-presented tourism is attractive in visual effect	0.880		
VE-3: I think metaverse-presented tourism shows products vividly	0.874		
Immersion (IM)		0.91	0.771
IM-1: While I was previewing the metaverse-presented tourism experience, I could interact with the view as if I was in the real world.	0.885		
IM-2: While I was previewing the metaverse-presented tourism experience, I felt completely immersed.	0.881		
IM-3: While I was previewing the metaverse-presented tourism experience, I forgot about my everyday concerns.	0.867		
Authenticity (AE)		0.891	0.733
AE-1: Using the metaverse-presented tourism experience provides me with genuine experiences.	0.852		
AE-2: Using the metaverse-presented tourism experience provides me with exceptional experiences.	0.881		
AE-3: Using the metaverse-presented tourism experience provides me with unique experiences	0.834		
Cognitive image (CI)		0.887	0.663
CI-1: Metaverse-presented tourism site presents the authenticity of scenic spots.	0.825		
CI-2: Metaverse-presented tourism site is a peaceful place	0.792		
CI-3: Metaverse-presented tourism site is a place to rest and relax.	0.848		
CI-4: Metaverse-presented tourism site is a place in contact and proximity with nature.	0.789		
Affective image (AI)		0.899	0.689
AI-1: Unpleasant/pleasant	0.842		
AI-2: Sleepy/arousing	0.823		
AI-3: Distressing/relaxing	0.845		
AI-4: Uninteresting/interesting	0.81		
Sharing Intention (SI)		0.894	0.738
SI-1: I'd like to share the metaverse-presented tourism to Weibo or WeChat moments	0.814		
SI-2: I'd like to recommend my family to experience the metaverse-presented tourism	0.882		
SI-3: I'd like to share the scenic spots or products in the metaverse-presented tourism with my relatives and friends	0.879		

AVE Average Variance Extracted, CR Composite Reliability.

Table 3 | Discriminate validity

Constructs	Fornell Larcker					
	AI	AU	CI	IM	SI	VE
AI	0.830					
AU	0.758	0.856				
CI	0.746	0.741	0.814			
IM	0.708	0.797	0.746	0.878		
SI	0.682	0.716	0.671	0.666	0.859	
VE	0.798	0.754	0.750	0.704	0.688	0.879

Italic = square root value of each AVE.

Secondly, this study has found that the role of visual effect is greater than that of authenticity with respect to destination image. Therefore, to enhance the experience and promotion of heritage tourism, it is necessary to strengthen the presentation of visual effects in the metaverse. From the perspective of material heritage, the visual effect can usually be enhanced through professional video production and promotion. In terms of more intangible cultural heritage, managers may need to better present stories related to the heritage. The stories associated with heritage destinations can help draw users into the heritage tourism experience, thereby enhancing the visual effect and sense of reality.

Finally, destination image is a hybrid concept that involves an individual's beliefs, thoughts and feelings towards a destination, and reflects an individual's psychological image of the characteristics of a specific

Table 4 | Results of hypothesis testing

Research hypothesis	Path coefficient	p-value	Support?
H1: Visual Effect → Immersion	0.233	0.001*	Yes
H2: Authenticity → Immersion	0.625	0.000***	Yes
H3: Visual Effect → Cognitive image	0.371	0.000***	Yes
H4: Visual Effect → Affective image	0.416	0.000***	Yes
H5: Immersion → Cognitive image	0.321	0.000***	Yes
H6: Immersion → Affective image	0.078	0.334	No
H7: Authenticity → Cognitive image	0.205	0.020	Yes
H8: Authenticity → Affective image	0.228	0.001*	Yes
H9: Cognitive image → Affective image	0.206	0.002*	Yes
H10: Cognitive image → Sharing intention	0.366	0.000***	Yes
H11: Affective image → Sharing intention	0.409	0.000***	Yes

*p-value < 0.05. ***p-value < 0.001.

destination. Therefore, heritage management needs to consider designing heritage stories and experiences for the virtual world that connect the online and offline environments, enabling visitors to establish a psychological connection with the history and culture of heritage destinations and attractions, and encourage sharing intention. For instance, through metaverse technology, one can travel through history and present the changes in landscapes over time as a way of expanding the heritage experience.

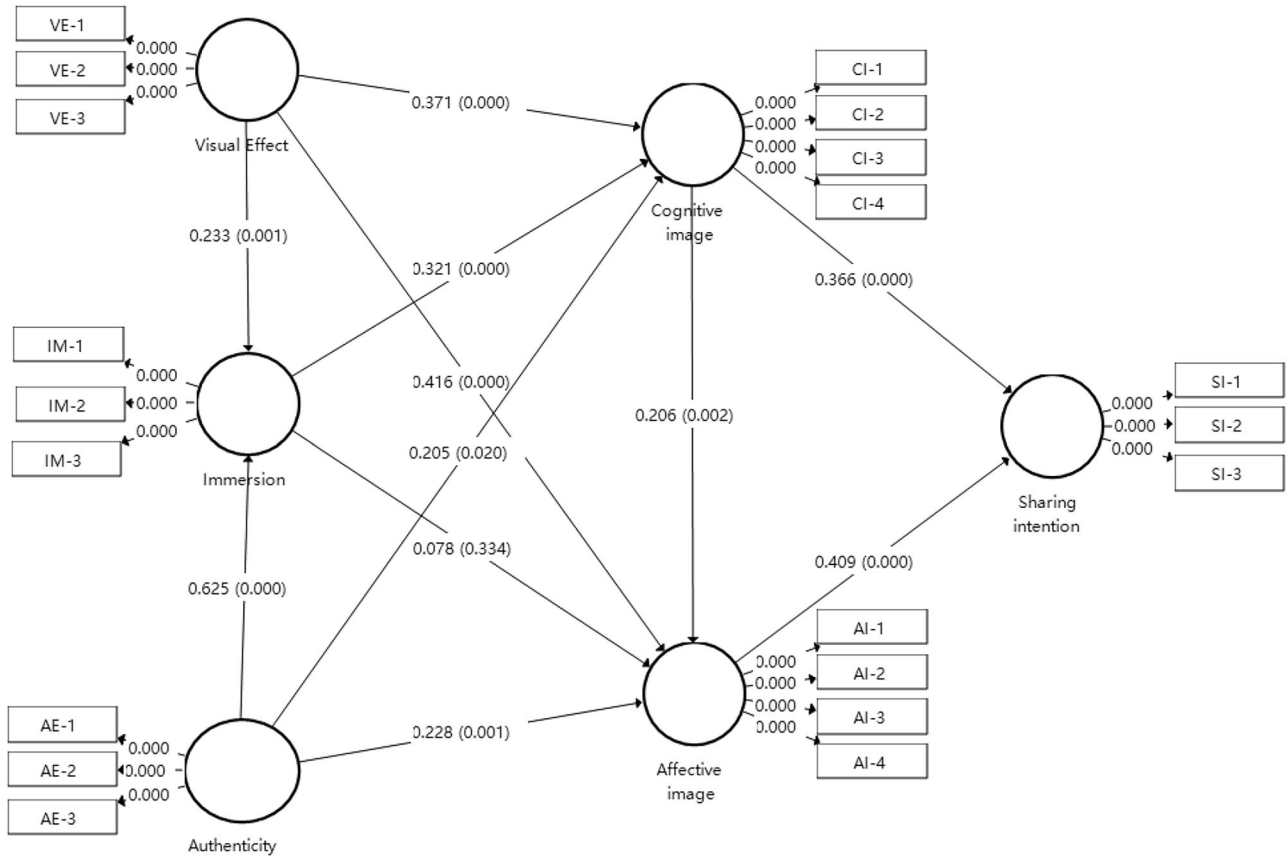


Fig. 2 | Results of PLS-SEM analysis (source: drawn by the author).

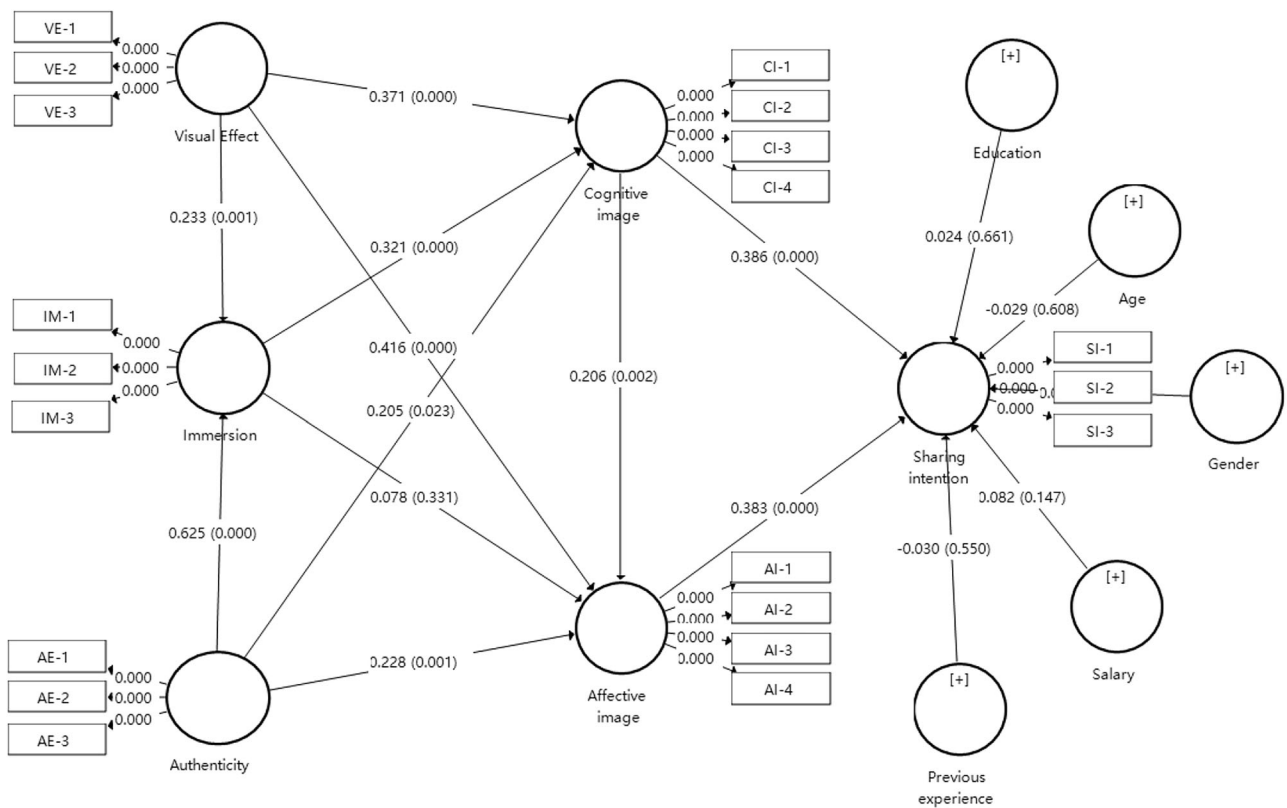


Fig. 3 | Results of PLS-SEM analysis with controlling variables (source: drawn by the author).

This study found that positive authenticity and visual effect can affect customers' formation of immersion, cognitive image and affective image. The tourism experience presented by the metaverse is subject to the integration of virtual technology and the natural environment¹⁸. For example, when tourists experience the environment of Zhangjiajie, tourists cannot only experience the real natural scenery of Zhangjiajie, but also have an enriched tourism experience through AR and VR technology. Whether it is physically real, or the 'real' experience provided by technology, the authenticity and visual effect must be well presented. Thus, this may explain why authenticity and visual effects positively influence consumers' destination image and immersion.

The Zhangjiajie tourist attraction presented through metaverse is the first attraction in mainland China that combines the metaverse and a heritage destination⁷³. Tourists can evaluate destination image through both emotion and objective experience⁴². For example, in the Zhangjiajie scenic area presented by the metaverse, tourists can understand the Zhangjiajie presented by the metaverse through sensory systems such as hearing. Such sensory marketing may improve tourists' perception of the destination⁵⁰. When tourists acquire a positive perception of the destination image, this perception will further influence their sharing intention. Nevertheless, the current interaction between the metaverse and heritage tourism is still in the development stage. Therefore, tourists' moods and states regarding the metaverse experience may be affected. Given that many immersive technologies have already been included in tourists' experience menus there may be a lack of sufficient interactive and unique experiences in metaverse presentations of heritage, which affects tourist immersion and which then influences affective image perception.

The present study has some limitations. First, in terms of sample size, the current study focuses on tourists from Mainland China, so the findings still need further empirical study to be verified for generalizability. Second, the participants of the current study are mostly 19-30 years old. Senior tourist groups also deserve attention, especially given their market potential. Metaverse tourism also provides some disabled tourists with the opportunity to experience otherwise inaccessible locations, but future research still needs to explore the attitudes of less able tourists towards metaverse tourism. Third, from a theoretical perspective, the current research only adopts cognitive appraisal theory, future research on metaverse tourism still needs further theoretical development. Finally, considering that demographic or behavioral characteristics may also influence tourists' experience of heritage tourism presented in the metaverse, future research can consider using these factors as moderating variables to evaluate research models.

Data availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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Competing interests

The authors declare no competing interests.

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