

An Integrated Model for Investigating the Impacts of Telepresence on Cultural Heritage Attachment in Virtual Museum

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Abstract

The purpose of our study is to examine the influence of telepresence on cultural heritage attachment in the context of virtual museum. We determined the effect of telepresence on visitors' aesthetic and educational experiences and how these experiences affect visitors' perceptions of virtual museum service value. Moreover, we investigate the effect of perceived virtual museum service value on museum attachment and cultural heritage attachment. A total of 143 visitors were sampled through an online survey focusing on Chinese virtual museum visitors. The results show that all the paths presented significant effects. Additionally, it was found that telepresence indirectly influences cultural heritage attachment through education experience and perceived virtual museum value. The theoretical and practical implications are also provided. An important implication is that online virtual museum is essential to raise visitors' education experience and their cultural heritage attachment. Thus, virtual museum should take initiative to enhance virtual reality to ensure traditional culture education and formation their cultural heritage attachment.

Keywords: Telepresence, Aesthetic Experience, Education Experience, Museum Service Value, Museum Attachment, Cultural Heritage Attachment

1. Introduction

China has numerous forms of tangible and intangible cultural heritage (CH) presented in various forms, such as painting, music, performance, literature, crafts, etc. The research subjects in China in this regard include the historical and sociological context, aesthetic ideology, and physical preservation of CH [1]. Museums not only protect cultural heritage, but are also widely considered educational venues [2]. Due to the outbreak of COVID-19 and the combination of information technology and tourism, destination marketing based on virtual technology is progressively attracting more attention from scholars, who suggest the formulation of new destination marketing strategies [3]. As a key tourist destination, cultural heritage museums

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are also steadily introducing virtual technology to offer a new tourism experience in the hopes of attracting tourists and cementing their cultural heritage attachment [4].

As mentioned above, virtual reality has started to be used as a means to promote cultural heritage [4,5]. Previous studies have observed how virtual reality can be used to create 3D virtual worlds to promote users' perception of being in the real world; in museums, this has been deployed to immerse museum visitors in a digital world that re-creates the buildings and artefacts of a given historical time and place [6]. The wide usage of virtual reality allows for virtual traditional museum support to enhance cultural heritage education. Therefore, it is necessary to understand how to improve visitors' virtual traditional museum experiences to bolster their positive attitudes and behavior.

This study identifies three major virtual reality research gaps. Although the virtual reality museum concept has been explored in the marketing literature [7], the application of virtual reality in cultural heritage museums is still in its infancy. More specifically, the virtual reality cultural heritage museums that have been implemented tend to focus on providing entertaining or escapist experiences [8]. Little research has looked into the visitors' educational and aesthetic experiences [9]. Moreover, most of the previous studies applied the presence theory to understand tourists' experience, their positive attitude, and their behavior intention [10]. Although consumer attachment behavior is a positive behavior, few studies have illustrated how to leverage such behaviors to cultivate visitors' cultural heritage attachment [11-13]. This study intends to fill these gaps.

Firstly, this study aims to develop an integrated model to investigate a strategy to build cultural heritage attachment through virtual traditional museums. This study intends to investigate the influence of telepresence on aesthetic and educational virtual museum experiences, which then positively enhance visitors' perceived virtual museum service value. Then, we will examine the effect of perceived virtual museum value on museum and cultural heritage attachment. Finally, we aim to illustrate the virtual museum experience and perceived museum value mediation effect. It is hoped the study results will have theoretical implications for understanding virtual traditional museum visitors' behaviors, whilst also offering practical guidance for Chinese traditional museums to promote cultural heritage in China.

2. Theoretical Background and Hypotheses Development

2.1 Telepresence and virtual museum aesthetic experience, virtual museum education experience

Telepresence refers to the extent to which virtual reality users have a sense of actually being in the environment depicted [14]. In virtual museums, telepresence refers to the museum visitor's sense that they are in a real museum. Many studies have shown that virtual museum telepresence plays an important role in mediating visitors' experiences [15]. It has also been illustrated that telepresence assists users to enhance their senses, similar to how things are experienced in the real world [16,17]. Thus, virtual museum telepresence technology positively influences the visitor experience.

Virtual museums provide visitors with aesthetic and educational experiences. Aesthetic experience refers to the beauty that can be expressed through color, photographs, font style, and layout [18]. Meanwhile, educational experience refers to educational elements that explain the product.

A previous study argued that telepresence can provide visitors with aesthetic and educational experiences [19]. Other studies have found that virtual commercials with higher telepresence positively enhance visitors' educational and aesthetic experiences, which then influence visitors' positive behavior, such as revisit intention [20]. Based on these studies the following hypotheses are proposed:

Hypothesis 1 (H1a): Telepresence has a positive influence on virtual museum aesthetic experience.

Hypothesis 1 (H1b): Telepresence has a positive influence on virtual museum education experience.

2.2 Virtual museum aesthetic experience, virtual museum education experience and perceived museum service value

Perceived value has been emphasized in the tourism industry to enhance tourists' positive attitudes and behavior [21], which is defined as "the consumer's overall assessment of the utility of product (or service) based on perceptions of what is received and what is given"[22]. Perceived virtual museum service value refers to visitors' overall assessment of the museum based on perceptions of what is offered by a virtual museum. Previous studies have asserted that experience positively influences perceived value [23]. In this study, virtual museums offer aesthetic and educational experiences. Based on previous study, it argued that value was created by experience [24]. Thus, experience is positively related to consumer perceived value. Previous studies have also concluded that aesthetic and educational experiences positively influence perceived value [25,26]. Therefore, the following hypotheses are proposed:

Hypothesis 2 (H2a): Virtual museum aesthetic experience has a positive influence on perceived museum service value

Hypothesis 2 (H2b): Virtual museum education experience has a positive influence on perceived museum service value

2.3 Perceived museum service value, and museum attachment, cultural heritage attachment

Attachment is defined as the cognitive and emotional links that consumers establish with products. In the tourism industry, attachment can be explained as the cognitive and emotional links tourists form with the tourism destination [27]. Based on these references, museum attachment can be regarded as the cognitive and emotional linkage between tourists and museums. Moreover, cultural heritage attachment refers to the special relationship between tourists and cultural heritage.

Based on attachment theory, perceived value can enhance consumer attachment [28]. Meanwhile, in the tourism study, it investigated that perceived value has positive relationship with consumer attachment behavior [29]. The existing tourism research also predicts that perceived value positively influences consumer attachment [11]. Thus, the following hypotheses are proposed:

Hypothesis 3 (H3a): Perceived museum service value positively influences museum attachment

Hypothesis 3 (H3b): Perceived museum service value positively influences cultural heritage attachment

2.4 Museum attachment and cultural heritage attachment

Museum attachment may positively influence cultural heritage attachment. According to one study, visitors who experience higher festival attachment extend their attachment to the host location [30]. In other tourism studies, it argued that visitors could first gain attachment with a festival or place where they have visited and then transfer their experience to attachment with the place [31, 32]. With regard to attachment to traditional museums, it has been observed to transfer or extend to the visitors' attachment to cultural heritage. The following hypothesis is proposed:

Hypothesis 4 (H4): Museum attachment positively influences cultural heritage attachment

2.5 Research Model

Based on the theoretical background, this study research model is presented in Figure 1. As shown in Figure 1, all the hypotheses are summarized in the positive (+) influences that online virtual museum telepresence is supposed to have in explaining the esthetic experience and education experience. The experience positively

influences visitors' perceived museum service value, which then enhance museum attachment and cultural heritage attachment.

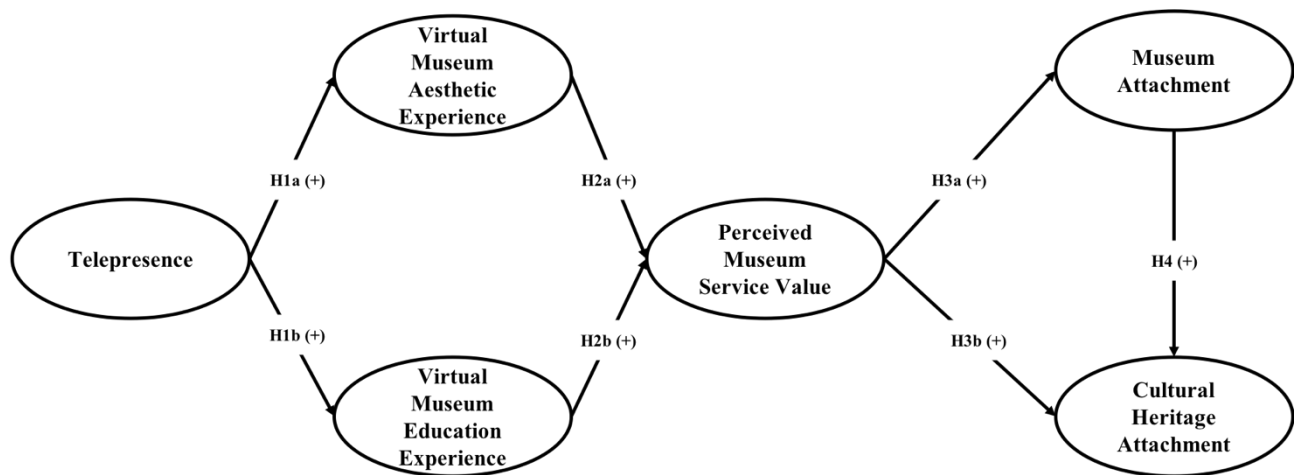


Figure 1. Research Model

3. Method

3.1 Measurement Development

This study utilized measurement tools developed from previous studies. Seven items were derived from [33] research to measure virtual museum telepresence. To measure virtual aesthetic experience and educational experience, the present study utilized items from [34] and [35]. Perceived museum service value was measured by five items based on [36]. Meanwhile, museum attachment and cultural heritage attachment were measured using four items. All items were measured using a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). All items were first developed in English and then translated into Chinese by the researcher and professors. Next, the translated Chinese measurements were back-translated into English by an English professor to confirm that the Chinese translation conveyed the same meaning. Then, the pre-test was conducted with 30 graduate school students to identify any meaning ambiguity. Finally, the Chinese version of the survey was produced.

3.2 Data Collection and Sample Characteristics

This study collected data for empirical analysis through online surveys. The survey respondents were limited to those who had experience using traditional cultural virtual museums. This study chose THE PALACE MUSEUM as its research target for several reasons: First, THE PALACE MUSEUM is China's largest museum and offers an online virtual museum for users to visit exhibitions. Second, THE PALACE MUSEUM focuses on holding exhibitions related to traditional Chinese culture. The survey contained a screening question asking if the participants had experience utilizing THE PALACE MUSEUM online virtual exhibition between 16 February and 10 March 2022. A total of 142 data points were used for the subsequent data analysis.

4. Results

4.1 Measurement Model

This study conducted exploratory factor analysis using SPSS to determine the factors. The Kaiser-Meyer-Olkin value was 0.913 and the Bartlett value was statistically significant ($p < 0.001$). The results of exploratory

factor analysis indicated that the selection of variables with six values of 1 or more. We then conducted a reliability analysis to verify the data's internal consistency. As shown in Table 1, all of the variable's Alpha values were higher than 0.7 [37] indicating that there are no internal consistency issues. We then conducted confirmatory factor analysis using AMOS. The results in Table 1 show that the goodness of fit of the measurement model was $X^2 = 1.992$, ($df = 309$, $P < .000$), $RMSEA = .081$, $CFI = .909$, $NFI = .829$, $GFI = .766$, indicating that the model was acceptable. To examine the reliability and validity, this study calculated the composite reliability (CR) and average variance extracted (AVE). As the CR value is higher than 0.7 and the AVE value is higher than 0.5 [38], the reliability and validity are confirmed. Finally, we conducted a discriminant validity analysis. According to previous studies, if the AVE values are higher than the correlation coefficients between the variables, discrimination is present.

Table 1. Reliability, Convergent Validity

	TELE	ES	ED	MUSEV	MUSEATT	CHATT
TELE	.660 (.812)					
ES	.597	.808 (.899)				
ED	.582	.581	.667 (.817)			
MUSEV	.644	.516	.547	.708 (.841)		
MUSEATT	.716	.430	.336	.582	.670 (.819)	
CHATT	.503	.388	.373	.549	.594	.621 (.788)
Mean	3.78	3.98	4.13	3.79	3.32	3.74
SD	.850	.772	.731	.849	1.02	.895
Reliability	.931	.926	.857	.923	.910	.891
Alpha	.926	.921	.850	.919	.908	.860

Goodness – of – Fit: $X^2 = 1.922$, ($df = 309$, $P < .000$), $RMSEA = .081$, $CFI = .909$, $NFI = .829$, $GFI = .766$
 Note. AVE is represented on the diagonal

a All correlations were significant at .01 level
 b TELE= Telepresence; ES= Virtual Museum Aesthetic Experience; ED= Virtual Museum Education Experience; MUSEV= Perceived Museum Service Value; MUSEATT=Museum Attachment; CHATT=Cultural Heritage Attachment

4.2 Structural Model

Structural equation modeling utilizing the maximum likelihood was used to evaluate the conceptual framework presented in this study. The analysis results set out in Table 2 and Figure 2 indicate that the model fit was $X^2 = 2.133$, ($df = 317$, $P < .000$), $RMSEA = .089$, $CFI = .887$, $NFI = .807$, $GFI = .748$, which is acceptable. To investigate H1, this study examined the influence of telepresence on virtual aesthetic and education experiences. According to the results, H1 had a significant influence on aesthetic ($\beta = .608$) and educational experience ($\beta = .617$). Based on the results, virtual museum aesthetic ($\beta = .316$) and education experiences ($\beta = .416$) had a significant effect on perceived museum service value. In verifying H3 and H4, the study indicated that perceived museum service value had a significant influence on museum attachment ($\beta = .580$) and cultural heritage attachment ($\beta = .312$), whilst museum attachment had a significant influence on cultural heritage attachment ($\beta = .408$).

Table 2. Results of Structural Model

Hypothesized relationship	Standardized estimates	t value	Results
H1a: Telepresence-> virtual museum aesthetic experience	.609	7.197***	Supported
H1b: Telepresence-> virtual museum education experience	.617	6.809***	Supported
H2a: Virtual museum aesthetic experience -> perceived museum service value	.316	3.683***	Supported

H2b: Virtual museum education experience -> perceived museum service value	.416	4.411***	Supported
H3a: Perceived museum service value -> museum attachment	.580	5.696***	Supported
H3b: Perceived museum service value -> cultural heritage attachment	.312	3.070**	Supported
H4: Museum attachment -> cultural heritage attachment	.408	3.771***	Supported
R ² (Virtual museum aesthetic) = .380	Goodness-of-fit: X ² /df = 2.133, (df = 317, P < .000), RMSEA = .089, CFI = .887, NFI = .807, GFI = .748		
R ² (Virtual museum education) = .371			
R ² (Perceived museum service value) = .371			
R ² (Museum attachment) = .337			
R ² (Cultural heritage attachment) = .412			
*** p < .001, ** p < .01, * p < .05			

4.4 Mediation Analysis

This study utilized mediation analysis by bootstrapping. Table 3 shows the indirect effect on the path. The indirect analysis indicated that telepresence had significant indirect effects on cultural heritage attachment through virtual museum education experience and museum attachment ($\beta_{TELE-ED-MUSEV-MUSEATT} = 0.050$, $p < .05$), although no significant indirect effects were observed relating to virtual museum aesthetic experience. This indicates that the mediating variables were partially proven within the theoretical framework.

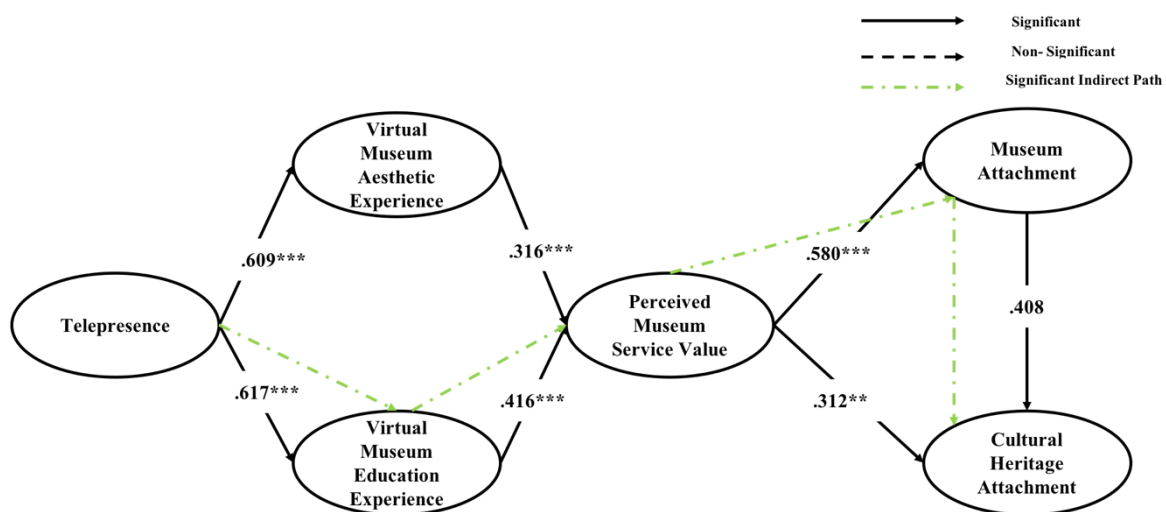
Table 3. Results of mediation effect

Indirect	Mediator		Bootstrapping		95% CI		p-values	Result
			Estimate	Lower	Upper			
TELE	ES-> MUSEV->MUAT	CHA	.037	-.001	.146	.061	Rejected	
TELE	ED-> MUSEV->MUAT	CHA	.050	.003	.149	.010	Supported	

^a Goodness-of-fit: X²/df = 2.113, (df = 317, P < .000), RMSEA = .089, CFI = .887, NFI = .807

^b TELE= Telepresence; ES= Virtual Museum Esthetic experience; ED= Virtual Museum Education Experience; MUSEV= Perceived Museum Service Value; MUSEATT=Museum Attachment; CHATT=Cultural Heritage Attachment

^c *** p < .001, ** p < .01, * p < .05



*** P < 0.001; ** p < 0.01; * P < 0.05

Figure 2. Research results

5. Discussion

Since the outbreak of the global COVID-19 pandemic, virtual museums have become a new, attractive form of exhibition. Virtual museums constitute a new means of promoting traditional Chinese cultural heritage. However, previous studies have paid little attention to building visitor cultural heritage attachment through virtual museum telepresence. Meanwhile, most of the existing museum experience studies have drawn on visitors' entertainment or utility experiences, with very few investigating the effect of educational experiences. Following these studies, this study intended to fill the gaps in the previous studies and illustrate the influence of telepresence on visitors' experience and attachment behavior. The results of this study aim to provide a strategy for virtual museum exhibition makers to promote cultural heritage.

This study collected data from visitors who had visited virtual traditional museums. The results determined that virtual museum telepresence positively impacts visitors' aesthetic and educational experiences, which were consistent with the previous studies [19,20]. Aesthetic and education experiences significantly enhanced visitors' perceptions of museum service. Previous studies also arrived at the same conclusions [24,25]. Meanwhile, perceived museum service value positively influenced museum attachment and cultural heritage attachment [11, 29]. Lastly, this study investigated whether telepresence indirectly influences cultural heritage attachment through educational experience, perceived museum service value, and museum attachment. The results have theoretical implications for further art exhibition research and managerial implications for professionals devising cultural heritage enhancing strategies.

6. Conclusion

The outbreak of COVID-19 expedited the development of virtual museums. The present study has theoretical and practical implications for a virtual traditional museum. We focus on the capacity of virtual traditional museums to enhance cultural heritage attachment. Previous studies have investigated the effect of telepresence on consumer experiences, attitudes, and behaviors. We extend the previous studies' research model on virtual traditional museums and determine how telepresence influences visitors' aesthetic experience, educational experience, perceived museum service museum, museum attachment, and cultural heritage attachment. Based on these results, we identified several practical implications. First, virtual traditional museums need to develop their technology to improve visitors' sense of being in the real museum. Moreover, education experience plays a critical role in enhancing visitors' museum attachment and cultural heritage attachment. Accordingly, virtual museum designers should provide information to develop visitors' knowledge of cultural heritage. Lastly, this study has several limitations: specifically, it did not consider any different consumer segments or investigate their differential preferences.

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