UNDERSTANDING DIGITAL MUSEUM VISITOR EXPERIENCE BASED ON MULTISENSORY CUES

by

Kexin Guo

A Thesis

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Master of Science

School of Hospitality & Tourism Management

West Lafayette, Indiana

August 2019

THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. Xinran Lehto, Chair

Department of Hospitality and Tourism Management

Dr. Alei Fan

Department of Hospitality and Tourism Management

Dr. Jonathon Day

Department of Hospitality and Tourism Management

Approved by:

Dr. Jonathon Day

Head of the Graduate Program

To my parents

ACKNOWLEDGMENTS

Upon the completion of this thesis, I am grateful to those who have offered me instruction and guidance during my study. The profound gratitude should go to my Committee Chair, Dr. Xinran Lehto. Her patient instructions and constructive suggestions are beneficial to me a lot throughout the process of completing the thesis. Her encouragements built my confidence to go further in academia. I would like to express my heartfelt thanks to my committee members: Dr. Alei Fan and Dr. Jonathon Day. Thank you to Dr. Alei Fan for her insightful comments and advice on methodology section, which have inspired me to a great extent. Thank you to Dr. Jonathon Day for providing enlightening ideas leading my research to a higher level. The thesis could not be finished without their patient guidance.

In addition, during the preparation of this thesis, I have received a lot of invaluable helps and support from many people in the School of Hospitality and Tourism Management. I want to express my heartfelt thanks to all the teachers who have helped and taught me in at Purdue University. Their courses have broadened my horizons and aroused my interest in tourism field. I am particularly grateful to Ayrielle Espinosa for helping me deal with problems.

Finally, I am indebted to my parents, Jianli Guo and Xiying Xu, for supporting and encouraging me to do whatever I want to. I also owe my sincere gratitude to my friends who have given me their help and their time in listening to me and encouraging me. I am very appreciated for their help and support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Author: Kexin, Guo. MS
Institution: Purdue University
Degree Received: August 2019
Title: Understanding Digital Museum Visitor Experience Based on Multisensory Cues
Major Professor: Xinran Lehto

Visitors' expectations of museums in the modern world consist of both utilitarian and hedonic aspects. Given visitors' diverse expectations and demands, traditional museums have taken actions to attract more visitors. Taking advantage of new technologies is the current action and trend in the museum industry. The emergence of digital museums is the reflection of this tendency, which use digital technologies such as projectors, surrounded sound, ambient lights, and multisensory cues to present a virtual environment. In the virtual environment, emotional state and sense of presence are considered to be useful to provide a more engaging experience. Therefore, this research empirically investigated digital museum visitor experience perceptions and the influence of emotional state and sense of presence on experience perceptions. The different impact of multisensory cues on experience and the relative mediation effect were also examined.

Data were collected with a scenario-based online survey conducted through Amazon Mechanical Turk (MTurk). A split-sample approach with a total of 382 respondents was used for analysis. Exploratory factor analysis and confirmatory factor analysis were used to explore visitor experience perceptions of the digital museum. Structural equation modeling was used to discover the impact of emotional state and sense of presence. One-way analysis of variance was used to compare the difference in impact of multisensory cues on overall visitor experience. This research also employed the PROCESS macro in SPSS for demonstrating the mediating effect of

emotional state and sense of presence through the impact of multisensory cues on overall visitor experience. The findings of this study revealed three experience perceptions—respectively, joviality, personal escapism, and localness experiences—of digital museums. Also, this research presented the positive effect of emotional state on joviality experience and negative effect of emotional state on localness experience. In addition, a notable positive impact of sense of presence on joviality, personal escapism, and localness experience perceptions was found. No significant effect of emotional state on personal escapism was found in this research. Moreover, visual and auditory cues together were confirmed as the most powerful indicator for triggering the greatest experience level. The impact was found to be valid due to the mediating role of emotional state and sense of presence.

This research contributed theoretically and practically to museum literature and experience research. Theoretical implications were discussed to indicate this research as the framework to measure digital museum visitor experience based on the proposed three-factor structure. Practical implications were provided for museum managers. Limitations and future research were discussed.

CHAPTER 1. INTRODUCTION

1.1 Research Background

Playing both a social and cultural role in society (Harada, Hideyoshi, Gressier-Soudan, & Jean, 2018), museums are learning spaces that offer information through exhibited artifacts and the supplementary materials that accompany the artifacts (Kosmopoulos & Styliaras, 2018). Tourists' expectations of a traditional museum experience include easiness and fun, cultural entertainment, personal identification, historical reminiscences, and escapism (Sheng & Chen, 2012). Typically, the experience in the museum environment combines education and entertainment, which is considered an "edutainment" experience (Pallud, 2017). More recently, with the emergence of some novel museums, the development of museum concepts has moved toward hedonism, focusing on edutainment, amusement, and joy rather than education and learning (Mirghadr, Farsani, Shafiei, & Hekmat, 2018). One such practice that reflects this movement is the use of virtualization and other digital technologies in traditional museums to attract tourists' attention, as these technologies are seen as efficient means to deliver value (Yang et al., 2015). These digital experiences are viewed as delivering a full and multidimensional experience through embodied participation and interaction on the part of visitors (Sylaiou, Mania, Karoulis, & White). This represents a significant effort for traditional museums to keep pace with the development of modern technologies.

Significant changes in the virtual environment have contributed to the creation of new types of activities to attract more audiences in museum settings (Barron & Leask, 2017). In the past few years, museums have engaged more and more sensory and emotive forms of exhibitions to enhance visitor experiences (Tzortzi, 2017). Many exhibitions provide the chance for visitors to connect with historic artifacts, as well as the contexts and stories behind these artifacts, by

adopting some multisensory facilities (Levent & Pascual-Leone, 2014). Recently, a new type of digital museum that takes advantage of projectors, stereo sound, and artificial intelligence, rather than traditional displays, received a lot of attention. The Mori Digital Art Museum in Tokyo and the Atelier des Lumières in Paris are two examples of such digital museum products that provide borderless displays, immersive environments, and creative experiences for visitors. These museums represent an unprecedented departure from the traditional object-based forms of exhibitions and even the concept of a museum itself. The digital museum visitor experience has yet to have empirical scrutiny. Little is known about how this new type of museum affects visitor experiences.

Recent research studies in the museum experience context have examined the use of technology in traditional museums (Ikei et al., 2015; Jung, Chung, & Leue, 2015; Pallud, 2017; Raptis, Fidas, & Avouris, 2018; tom Dieck & Jung, 2017). Falco and Vassos (2017) elaborated on the strengths and weaknesses of using digital technology in the museum setting. In terms of the advantages, traditional museums that incorporate digital technologies allow flexibility and interactivity of information presentations (Ikei et al., 2015). There was an arising interest in museum research that attempted to understand how visitors interact with and experience such digital interfaces in museums from both entertainment and education aspects (Pallud, 2017). For example, the use of augmented reality (AR) and virtual reality (VR) were found to allow online-to-offline real-time interactions between visitors and exhibitions, contributing to perceived museum exhibition quality (Jung et al., 2015). In addition, technology is considered to be effective in improving visitor satisfaction, generating positive word-of-mouth, and leading to positive learning outcomes (tom Dieck & Jung, 2017). The disadvantage addressed by scholars is that individual differences in perception and visual information processing might affect users'

experiences and immersion level in such visually enriched interaction context (Raptis et al., 2018). Additionally, the interactivity of the designs and displays depends on the assistance of social media and other mobile applications, which indicates that interaction could not work independently without the help of other tools (Pallud, 2017). In other words, the dependence of interactive designs was the deficiency of visual enriched interaction.

However, the digital museum uses digital technologies to measure, record, preserve, and display tangible and intangible collections (Li et al., 2014), which are construed as a combination of art and technologies. The application of digital exhibitions makes this kind of museum a highly inclusive replacement to a traditional visit (Falco & Vassos, 2017). Essentially, tourists typically seek and consume engaging experiences accompanied by service components provided by a destination (Oh, Fiore, & Jeoung, 2007). Therefore, it is necessary to have a deep insight into the digital museum visitor experience perceptions during the visit. Given the lacuna of research in visitor experience perceptions of digital museums, this research adopted Mody, Suess, and Lehto's (2017) eight-dimensional experiencescape to investigate the visitor experience perceptions in the digital museum, which was developed on the basis of Pine and Gilmore's (1999) concept of experience economy.

Furthermore, considering that the digital museum is leading visitors to a virtual world to explore artifacts, sense of presence indicates the perceived similarities between virtual and real objects when visitors experience, or interact with, virtual objects (Tussyadiah, Wang, Jung, & tom Dieck, 2018). Taking the combined and complex interactions between visual, auditory, olfactory, spatial, and other aspects of the visitor experience into account, museums could better cater to the diversified needs of visitors (Levent & Pascual-Leone, 2014), which achieves a high level of presence in virtual environments. In the view of Wagler and Hanus (2018), spatial

presence will increase the emotional engagement and contribution to tour outreach intention. However, there is a research gap to exam the relationship between sense of presence and visitor experience perceptions of the digital museum.

Tourism academics have long sought to study the role of emotion in experiences, and numerous studies have investigated the emotions experienced by tourists while planning during and after their trip (S. Li, Scott, & Walters, 2015). Based on a festival setting and theme park context, tourist emotion is positively related to perceived value, satisfaction, willingness to pay more, loyalty, and other behavioral intentions (Yang, Gu, & Cen, 2011; Bigné, Andreu, & Gnoth, 2005). However, the relationship between emotional state and experience perceptions during a museum tour receives less attention.

Some museums attempt to broaden multisensory interactions rather than split visitors and exhibitions (Morgan, 2017). Multisensory experience is described as the visitors' perceived experience based on visual, auditory, olfactory, taste, and haptic cues (Huang, Ali, & Liao, 2017). Recent research has shed light on the shaping power of the complicated interactions between the sensory modalities on perceived experiences (Eimer, 2004). Moreover, multisensory experiences provided more detailed tourists' impressions on destinations and, consequently, moderate visitors' perceptions, sentiments, and behavior intentions (Huang & Gross, 2010). Consequently, it is of interest to examine the role of multisensory cues on digital museum visitor experience perceptions.

1.2 Research Objectives

With the combination of education and entertainment in the museum context, there has been increased attention on examining the visitor experience in museums that employ visual technologies. However, visitor experience perceptions in virtual-based museums are not well

known. There is a lack of understanding of the role of multisensory cues, emotional state, and sense of presence in the virtual environment on visitor experience perceptions of digital museums. Therefore, in this study, the eight-dimensional experiencescape developed by Mody et al. (2017) was adopted to analyze visitor experience perceptions of the digital museum to explore the impact of multisensory cues, emotional states, and sense of presence on the experience perceptions. In summary, the objectives of this research are as follows:

1. To delineate the digital museum visitor experience;
2. To understand the role of visitor emotional states and sense of presence on digital museum visitor experience perceptions; and
3. To identify how multisensory cues can influence digital museum visitor experience perceptions.

1.3 Research Organization

This research is organized into six sections. Chapter 1 elaborates the background of this study and research objectives. Chapter 2 presents the related literature on tourism and museum experience, emotional state, sense of presence, and multisensory cues. At the end of this chapter, hypotheses and the conceptual model are presented. The methodology is explained in Chapter 3 and includes statistical methods, research design, sample size, the data collection process, and data analysis. Chapter 4 covers main findings and the relationships between these variables. The conclusion, limitations, and directions for future research are presented in Chapter 5.

CHAPTER 2. LITERATURE REVIEW

This chapter start from the experience literature, including tourism experience and museum experience. Afterwards, emotion literature related to definitions, measurements, and impacts are reviewed followed by literature on presence that consists of definitions, dimensions, antecedents, and consequences. Multisensory literature is included as the last review section of Chapter 2. The hypotheses and conceptual model that demonstrate the relationships among these variables are presented in the end.

2.1 Experience

2.1.1Tourism Experience

Tourism experiences occur when tourists engage with their destinations, participate in activities, and make sense of their interactions with their destinations emotionally, physically, intellectually, and spiritually (Morrison, Lehto, & Day, 2017). Tourist experience is considered the core position of tourism that positively affects tourists' satisfaction and revisit intention toward certain destinations (Buhalis & Amaranggana, 2015; Ruiz-Alba, Nazarian, Rodríguez-Molina, & Andreu, 2019). This is because every stage of tourism activity is an experiential phenomenon that provides a diverse and customized service for specific needs (Dash & Samantaray, 2018). Experience is defined as the individuals' engagement with a certain environment in a personal way (Pine & Gilmore, 1999). Walls (2013) claimed that a tourism experience is a collection of individual elements that accompany the involvement of visitors' emotion, intellect, and physiology.

Scholars have developed different dimensions of tourism experience. Hirschman (1984) posited three elements in pursuing experience: (a) cognition, (b) sensation, and (c) novelty.

Cavagnaro, Staffieri, and Postma (2018) proposed three main components of experience, which were the need to travel, the consummation of the experience itself, and its evaluation. Kim, Ritchie, and McCormick (2012) put forward a memorable tourism experience structure that comprised of seven dimensions, including hedonism, novelty, local culture, refreshment, meaningfulness, involvement, and knowledge. Some researchers have asserted that anticipation is part of the experience during the co-creation process (Ramaswamy & Ozcan, 2018).

The most often encountered structure of tourism experience is the experience economy realm developed by Pine and Gilmore (1999), which contains four experiences, including education, entertainment, esthetics, and escapism. These four experiences consist of a quadrant within two dimensions: (a) consumer participation, and (b) consumer connection with environment (Morrison et al., 2017). Educational experience refers to the desire of tourists to explore and learn something new. Entertainment is one of the oldest forms of experience and allows visitors to be involved in activities and interact with others. Moreover, it presents the most significant impact on optimal experiences of tourists (Morrison et al., 2017). Esthetics experience means the tourists' evaluation of the physical environment around them. Escapist experience is the visitors' need to escape daily routines, and it is a core motivation for attending an event (Slater, 2007).

The experience economy realm was employed in many tourism-related contexts. Quadri-Felitti and Fiore (2012) used this approach to understand the experiential nature of wine tourism. In the rural tourism setting, pleasant arousal and memory served as mediator role to the relationship between experience and behavioral intentions based on the experience economy model (Loureiro, 2014). Similarly, Sidali, Kastenholz, and Bianchi (2015) combined the intimacy model and the experience economy realm to develop the seven dimensions that

marketed food products in rural areas as a special niche of rural tourism. The experience economy realm was also used to decipher the influence of experiences on the perceptions of functional and emotional values in temple stays (Song et al., 2015). Furthermore, the experience economy realm was confirmed useful to understand visitor experiences in heritage museums. Among these experience perceptions, edutainment experience, the combination of educational and entertainment experiences, were the most powerful predictor of overall satisfaction and behavioral intentions (Radder & Han, 2015).

Based on the four experiences economy realm, Mody et al. (2017) developed the eight-dimensional experiencescape model to interpret the experience in an accommodation context. The new experiencescape created by Mody et al. consists of educational, esthetic, entertainment, escapism, serendipity, localness, communitas, and personalization. Serendipity means the unpredictable surprises encountered beyond the original visiting plan. Localness refers to activities or products that trigger the place attachment to local environments of certain destinations. Communitas is an everchanging feeling of communicating with friends, family, and strangers during a visit. Personalization indicates that visitors have memorable experiences according to their preference. The eight-dimensional experiencescape is broadly applied in sharing economy and hospitality domains, and it demonstrates the indispensable effect of hospitableness in facilitating favorable experiential and brand-related outcomes (Mody, Suess, & Lehto, 2019).

2.1.2 Museum Experience

The museum is considered an experiential consumption venue with education and learning functions, leisure and recreation functions, and a social interaction function (Chan, 2013; Rowley, 1999). Museums provide multiple experiences to different visitors based on the

diverse functions of the museum (Rentschler, 2007). Among the experiences, three experience dimensions—edutainment, escapism, and esthetics, respectively—were found based on Pine and Gilmore's (1999) four experience economy realm (Radder & Han, 2015).

Museum experiences that incorporate technologies are the mainstream in museum research. In general, previous research on museum experiences combined with technology lie in the educational domain (Chiou, Tseng, Hwang, & Heller, 2010; Ciolfi & Bannon, 2002; Kaptelinin, 2011; Pallud, 2017). The technologies employed by museums include augmented reality, virtual reality, media technologies, and web-based technologies. Some of the technologies are employed to be support tools to deliver information, increase interactions between visitors and exhibitions, provide convenience for pre and post museum visits, and enhance the entertainment level of the tour (Vom Lehn & Heath, 2005). Except for these technologies, there was another trending phenomenon in the museum industry. This new trends in museum was to take advantage of the integrated and complex interactions between visual, auditory, olfactory, spatial, and other environment stimuli to cater to the varying demand of visitors (Levent & Pascual-Leone, 2014). In addition, three-dimension (3D) information and exhibitions as interactive display methods are widely used tools in heritage museums (Hashim, Taib, & Alias, 2014). Therefore, more and more museums are applying new technologies to enhance visitor participation, heighten engagement levels with collections, and offer tailored information and services (Vom Lehn & Heath, 2005).

The most common technology in the museum field is augmented reality (AR) and virtual reality (VR; Carrozzino & Bergamasco, 2010; Chang et al., 2018; He, Wu, & Li, 2018; Tom & Jung, 2017; tom Dieck, Jung, & tom Dieck, 2018). Augmented reality is a reasonable way to preserve historical heritages, enhance visitor satisfaction, facilitate positive word of mouth

(considered to be conducive to market development), and contribute to an effective learning experience (tom Dieck & Jung, 2017). In an AR-enhanced museum, dynamic verbal cues lead to the increased visitors' willingness to pay more, and such effect is more profound with a high level of virtual presence (He et al., 2018). In addition, wearable augmented reality applications help visitors to see connections between paintings and personalize their learning experience (tom Dieck et al., 2018).

In terms of VR, the design features include interactivity, vividness, and realism, and these characteristics could impact immersion levels for all relic types (Chang et al., 2018), which indicates that immersive VR technology has the potential to become an effective means to communicate and exchange information in a culture-based context (Carrozzino & Bergamasco, 2010). In addition to using AR and VR separately, some museums combine these two technologies. Entertainment experiences from the combination of VR and AR can lead to enhanced overall tourist experience (Jung, tom Dieck, Lee, & Chung, 2016).

Unique user-centered visit experiences are the outcome of using technologies in museums (Bideci & Albayrak, 2018). Existing and emerging technologies offer visitors a surprising opportunity to co-create an experience (Jung & tom Dieck, 2017; Van Doorn et al., 2017). Accordingly, the effective application of multiple technologies in cultural heritage environments magnifies the co-creation of value for both cultural heritage organizations and visitors' previsit, onsite, and postvisit experience (Jung & tom Dieck, 2017). Similarly, information technology use in the museum contributes to higher enjoyment of visitors and satisfied learning results (Pallud, 2017). Moreover, perceived value of the stakeholders is another consequence of museum experience, involving the economic, experiential, social, epistemic, historical and cultural value, and educational value, as the Table 2.1 shows (tom Dieck & Jung, 2017).

Table 2.1 Perceived Values in Museums

Perceived value	Definition	Related literature
Economic value	Economic values refer to the investment value and involved cost, which could be explained as the consumption intention in the museum (Jiang & Kim, 2015).	Dynamic verbal cues in museums that employed AR make contributions to higher levels of willingness to pay more and such effect is more prominent when the museums could offer a high level of virtual presence (He et al., 2018).
Experiential value	The experiential value is considered as the co-creation process between the visitors and museums, which is closely intertwined with the aesthetic experience (Chung et al., 2018).	Experiential value is the crucial component to measure the entire museum experience (He et al., 2018).
Social value	Social values are associated with customers' public recognition of services or products to enhance fulfilment and impression of an individual (Gordon et al., 2015).	External stakeholders like teacher and visit groups bring up social value in museums, and social media plays an indispensable role to generate positive WOM and share unique experiences with companions (tom Dieck & Jung, 2017).
Epistemic value	The epistemic value provided by technologies is defined as the desire for knowledge (Litman, 2008).	It could have a positive effect on adoption intention for new things in technologies' enhanced context (Hong et al., 2016).
Historical and cultural value	The historical and cultural value of the museum is originated from its functions to preserve and interpret the museum collections (Dodd, 2000. p 81).	It is generally recognized that AR would increase cultural and historical value through the provision of additional information for all visitors in the museum and it brings the historic building back to life with the virtualization environment (tom Dieck & Jung, 2017).
Educational value	It refers to visitors' learning and knowledge increasing experience (tom Dieck & Jung, 2017).	AR makes it possible for visitors to gather information by themselves, at their own pace, which is seen as an apparent merit for a personalized educational experience (tom Dieck & Jung, 2017).

Since museums are a typical learning place where visitors acquire something new with the encountered objects, prior museum literature put more emphasis on educational value when

alluding to visitor experience (Ledford, 2015). However, with the extended functions of museums and the evolving motivations of museum visitors, some researchers claim that visitors have the desire to encounter new things and chase a learning-oriented entertainment experience instead of observing pieces of exhibitions (Bideci & Albayrak, 2018). Therefore, museums came across a distinctive transformation in terms of providing multiple experiences. Recently, museums present a notable change from collections- to community-centered environments (Vermeeren et al., 2018). Besides, some scholars identified that the application of VR and AR in museums provides a personalized guided tour in a virtual environment (Dattolo & Luccio, 2008; Huang, Liu, Lee, & Huang, 2012; Rocchi, Stock, Zancanaro, Kruppa, & Krüger, 2004). The related literature coincides with the eight-dimensional experiencescape identified by Mody et al. (2017). Consequently, the museum experience should take all eight dimensions of experience into account to examine the visitor experience instead of using the experience economy realm. Given that digital or virtual museums tend to possess an edutainment function and put more emphasis on hedonism rather than merely on education and teaching, it is essential to understand visitor experience based on the eight-dimensional experiencescape. As a result, it is reasonable to assume that visitors in the digital museum could have an eight-dimensional experiencescape. However, it has not been well understood what the digital museum visitor experience is. Therefore, it was the intention of this research to provide a deep insight of digital museum visitor experience based on the eight-dimensional experiencescape. Therefore, this research proposed the following research question:

RQ1: In the context of digital museum, what is the visitor experience?

2.2 Emotional State

2.2.1 Definition of Tourists' Emotion

As a psychological state, emotion is a combination of cognitive appraisals of events or thoughts and affective reactions from sentiments, sensations, or attitudes (Bagozzi, Gopinath, & Nyer, 1999). Therefore, researchers made use of valence and intensity to identify individuals' emotions (Bonnefoy-Claudet & Ghantous, 2013). In general, emotion is divided into positive and negative aspects felt by individuals that result from advantages and disadvantages perceived from miscellaneous stimuli in the external environment (Izard, 2013; Lazarus, 1991).

In this regard, previous researchers have claimed that environment, service encounters, service quality, and interactions could have an influence on individuals' emotions (Brunner-Sperdin, Peters, & Strobl, 2012; Kim, Chua, Lee, Boo, & Han, 2016; Lo & Wu, 2014; Yüksel, 2007). In the business research field, emotion is regarded as the crucial key of evaluation during or after consumption behavior (Westbrook & Oliver, 1991; Zins, 2002). In the tourism domain, José et al. (2019) revealed that service experience positively influences emotions after consumption. However, the relationship between emotion and experience perceptions of digital museum visiting remains to be determined.

2.2.2 Emotion Measurements

The measurements of emotions to stimulus exposure and visitor experience is of great interest to tourism scholars given the importance of emotions in tourism research (Malone, McKechnie, & Tynan 2017; Mauss & Robinson, 2009; Shoval, Schvimer, & Tamir 2017). Accordingly, Fontaine (2013) proposed three influential psychological approaches to the meaning of emotion—the dimensional emotion approach, basic emotion approach, and componential emotion approach. The dimensional emotion approach refers to emotions that

could be explained by a few continuous dimensions. The basic emotion approach refers to emotion as a discrete entity that consists of categorically different affect programs. For example, happiness, sadness, and anger are subsets of it (Chamberlain & Broderick, 2007). The componential emotion approach, also known as the cognitive approach, expresses emotion by the activities in each emotional component. In other words, the cognitive approach aims to discover the relationship between emotion and cognition in perceived activities (Oatley & Johnson-Laird 2014). Most of the measurements are categorized in dimensional and basic emotion approaches.

Dimensional approach simplifies the emotion into a sequence of affective dimensions, including the pleasure-arousal-dominance (PAD) model (Russell, 1980) and the positive affect negative affect schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PAD model is the most widely used construct in the tourism domain. The PAD model takes advantage of pleasure-displeasure, arousal-non-arousal, and dominance-submissiveness to measure sentiments, sensation, and other emotion-related notions (Russell, 1980). Pleasure–displeasure considers how a person feels pleased, joyful, hopeful, or satisfied in certain conditions. Arousal–non-arousal means how a person feels excited, inspired, stimulated, or cheerful in some circumstances. Dominance–submissiveness explains how an individual feel in charge of the situation. Another dimensional approach is PANAS, a 20-item self-report measure of positive affect (PA) and negative affect (NA; Crawford & Henry, 2004). Positive affect manifests the degree with which an individual experiences delightful engagement within the environment, while NA illustrates unpleasable engagement and anguish under certain circumstances.

The basic emotion approach comprises the Destination Emotion Scale (DES) and the Consumption Emotion Scale (CES). The DES adopts three components to measure tourists' emotional experiences: joy, love, and positive surprise. The DES was developed by Hosany and

Gilbert (2010) and only depicts positive emotions while taking tourists' and the destinations' characteristics into consideration. Convergent, discriminant, and homological validity and reliability of the DES were confirmed in the tourism field with international tourists' data from Petra, Jordan, and Thailand (Hosany, Prayag, Deesilatham, Cauševic, & Odeh, 2015). Another basic emotion approach proposed by Richins (1997) is CES, which was employed to ascertain consumption-related emotions. Richins described the CES as a series of descriptors to denote the emotions that consumers constantly experience during consumption. To illustrate consumption emotions, CES uses 16 subscales, including positive and negative emotions with 47 descriptors (Han & Back, 2007). Some researchers use an 18-item affective scale, 24-item affective scale, or a 4-positive and 5-negative emotion scale based on Izard's categorization (Izard, 2013; Jang & Namkung, 2009; Kyle & Lee, 2012; Pearce & Coghlan, 2010).

In addition, Park, Kim, and Ok (2018) visualized emotion by means of the combination of a Twitter geocode search, sentiment analysis with big data, hot spot analysis, and GIS mapping to investigate onsite customer experiences. Some studies took advantage of the psychophysiological measurements as alternative sources to examine emotions because the self-report measurement cannot express emotions accurately in all conditions, particularly for distinguishing subconscious or spontaneous emotions (S. Li et al., 2015). Psychophysiological measurements contain electrodermal analysis (EDA), facial electromyography (EMG), heart rate response, eye tracking, and vascular methods. These measurements allow real-time monitoring of emotion and avoid cognitive bias caused by memory.

This study made use of the PAD model because it is the most broadly applied in tourism research with confirmed validity and reliability. Furthermore, considering its benefits to examine tourists' emotion perception of environmental stimuli (Chebat & Michon, 2003), this study

adopted the PAD model to investigate the impact of emotional state on visitor experience perceptions in a multisensory environment with sensory stimuli.

2.2.3 The Impact of Tourists' Emotion

The extant tourism literature provided a few findings on the role of emotion in experiences in different contexts. Previous research identified a positive relationship between emotions and satisfaction (Bonnefoy-Claudet & Ghantous, 2013; Brunner-Sperdin et al., 2012; Han & Back, 2007; Ma, Scott, Gao, & Ding, 2017; Prayag, Hosany, Muskat, & Del Chiappa, 2017; Ruiz-Alba et al., 2019). Specifically, positive emotions contribute to expansion in customer satisfaction, and negative emotions result in reduction in customer satisfaction (Song & Qu, 2017).

In addition, researchers have claimed the positive influence of emotions on perceived value, perceived well-being, behavioral intention, willing to pay more, destination loyalty, destination image, and place attachment (Bigné et al., 2005; Bonnefoy-Claudet & Ghantous, 2013; Gao, Kerstetter, Mowen, & Hickerson, 2018; Hosany et al., 2015; Lo & Wu, 2014; Ruiz-Alba et al., 2019; Sharma & Nayak, 2018; Tsaur, Luoh, & Syue, 2015; Yang et al., 2011). Table 2.2 summarizes the recent studies in the tourism literature on tourists' emotion measured by the models in different settings.

Table 2.2 Summary of Prior Tourism and Hospitality Studies about Emotion

Authors	Measurement	Context	Main Findings
Lo & Wu (2014)	CES	Spa tourism	This study identified the vital function of consumption emotion on perceived value. The mediating role of positive emotion on connecting service quality and creating the perceived value and behavioral intention was defined.
Han & Back (2007)	CES	Hotel	Key emotion factors that have significant effects on customer satisfaction were identified, which are peacefulness, upset, romantic love, shame, excitement, surprise, and worrisome.
Bonnefoy-Claudet & Ghantous (2013)	CES	Ski tourism	The findings uncovered a strong mediating role of overall perceived value between consumption emotions and satisfaction.
Sharma & Nayak (2018)	DES	Yoga tourism	The relationship between tourists' emotions and overall image and satisfaction was confirmed.
Prayag et al. (2017)	DES	Island tourism	Tourists' emotional experiences acted as antecedents of perceived overall image and satisfaction evaluations.
Hosany et al. (2015)	DES	International tourism	Study results confirmed the reliability and validity of the DES. It also proved that emotions and place attachment are related.
Ruiz-Alba et al. (2019)	PAD	Museum	Emotion is of benefit to satisfaction and loyalty.
Yang et al. (2011)	PAD	Festival tourism	Tourists' emotion was a strong predictor of perceived value and behavioral intentions, and perceived value had a positive impact on behavioral intentions.
Tsaur et al. (2015)	PAD	Full-service restaurant	Positive emotions were significantly related to behavioral intentions.
Ma et al. (2017)	CAT	Theme park	This study distinguished between the emotions of satisfaction and delight according to their differences and the impact of emotions on loyalty intentions was found.
Brunner-Sperdin et al. (2012)	A single item	Hotel	Emotional states of customers in high-quality hotels was affected by leisure experience, hardware, and human ware, which in turn positively impacts satisfaction.

Previous researchers presented empirical evidence for the importance of customer emotions in one's satisfaction and behavioral intentions (Bonnefoy-Claudet & Ghantous, 2013; Brunner-Sperdin et al., 2012; Gao et al., 2018; Han & Back, 2007; Ma et al., 2017; Prayag et al., 2017; Ruiz-Alba et al., 2019). In addition, it is also acknowledged that consumers' emotions have a significant effect on evaluation of their experience (Hosany et al., 2015; Howard & Gengler, 2001). The emotions that customer displayed are key indicators of the customer overall service experience (Rahmani, Gnoth, & Mather, 2019). Therefore, emotions play a pivotal role on how tourists experience their destination (Kim & Fesenmaier, 2015). Furthermore, the emotional states generated by tourists for a certain tourism destination shape the satisfactory experience (Barsky & Nash, 2002). Similarly, other research illustrated the relationship using positive emotions. Positive and pleasurable emotions and feelings are indispensable and ubiquitous components of tourism experiences, especially in memorable experiences (Hosany et al., 2015; Tung & Ritchie, 2011). While the extant literature provides evidence about the importance of emotions on experience, studies assessing the specific influence of emotion, namely pleasure, arousal, and dominance on the eight-dimensional experiencescape, remains limited. Current studies mention visitor experience in a general conception rather than the respective dimensional. To fill the gap, one of the goals of this research is to investigate the impact of emotional state on digital museum visitor experience perceptions. Given the significance of emotion on experience, this research proposed the following research question.

RQ2: In the context of digital museum, how emotional states influence the digital museum visitor experience?

2.3 Sense of Presence

2.3.1 Definition and Dimensions of Sense of Presence

The virtual environment is created to arouse a sense of presence when participants interact with the virtual objects (Bystrom, Barfield, & Hendrix, 1999). In other words, the sense of presence is viewed as the principle of virtual environment (Baños et al., 2004). Presence is the pivotal aspect to represent the effectiveness of virtual technologies, which is defined as the sense of being in an environment (Tussyadiah et al., 2018; Steuer, 1995). Tussyadiah et al. (2018) interpreted presence as psychologically perceived similarities between real and virtual encounters when visitor experience the providing virtual objects. Sense of presence is regarded as being immersed in the experience of the virtual environment generated by a computer or other tools instead of the real physical location (Witmer & Singer, 1998). Moreover, sense of presence is classified into different levels in accordance with the way that attention is divided between the physical and the virtual world (Stavropoulos, Wilson, Kuss, Griffiths, & Gentile, 2017). Regarding the research about VR and AR, the notion of presence describes the feeling of "being there" in VR and AR enhanced environments that are virtual resemblances of real environments and actual consumption (Wei, Qi, & Zhang, 2019). Still, sense of presence is defined as a psychological state when visitors experience the virtual objects to stimulate the real ones in either sensory or non-sensory ways (Lee, 2004)

Presence is a multidisciplinary concept with multiple components (Jung et al., 2016). Generally, presence is categorized into a structural model and a descriptive model. The structural model focuses on how presence emerges in the participant's mind, while the descriptive model pays attention to verifying the underlying dimensions of presence (Diemer, Alpers, Peperkorn, Shiban, & Mühlberger, 2015). In terms of the structural model, it is indispensable for people to feel presence with attention and a mental representation of the VR environment (Schuemie, Van

Der Straaten, Krijn, & Van Der Mast, 2001; Sheridan, 1999; Witmer & Singer, 1998). With the expansion of the scope of presence, it is confirmed that presence depends on the constant prediction of interoceptive situations rather than external encounters (Seth, Suzuki, & Critchley, 2012). In terms of the descriptive model, Heeter (1992) divided sense of presence into three dimensions: personal presence, social presence, and environmental presence. Kim and Biocca (1997) gave the transportation metaphor of presence that describes the arrival and departure to a virtual environment. Lee (2004) redefined the subscale of presence as physical presence, social presence, and self-presence. Schubert, Friedmann, and Regenbrecht (1999) found the three components of sense of presence, including a spatial-constructive component, an attention component, and a component involving reality judgements. Afterwards, the researchers simplified the three components of presence into spatial presence, realness, and involvement, which is believed to be the typical descriptive model of presence (Diemer et al., 2015; Schubert, Friedmann, & Regenbrecht, 2001). Spatial presence reflects the confirmed definition of presence as the sense of being there. Realness is translated as the judgment of realism of the virtual environment. Involvement indicates the attention component of presence on awareness and attention processes. Subsequently, Wirth et al. (2007) made it clear that spatial presence is comprised of self-location and possible action. Self-location refers to the sensation of being situated in the virtual environment, and possible action reveals the perceived action possibilities of users. Despite the diverse structure of presence, spatial presence is the subtype that shares the closest meaning to the original formulation of presence (Ijsselstein et al., 2000), which could be explained as the feeling of being the place. Therefore, this study adopted spatial presence to measure the sense of presence.

2.3.2 Antecedent and consequence of sense of presence

In terms of the antecedent of presence, mental condition of participants and physical characteristics of environment could influence the sense of presence. As for the mental condition, both psychological states of involvement and immersion are necessary condition of presence (Witmer & Singer, 1998). Mental imagery is of great benefit to sense of presence (Bogicevic, Seo, Kandampully, Liu, & Rudd., 2019). To be clear, the quantity of images rather than the quality of images generated in the mind and involvement level influences sense of presence. As for the physical characteristics of environment, the external encounters such as the functional and experiential quality of VR in the theme park context could make difference (Wei et al., 2019). Functional quality includes efficacy, efficiency, effectiveness, and vividness. On the other hand, experiential quality is in relation to temporal dissociation, focused immersion, heightened enjoyment, control, curiosity, and participation. In summary, exceedingly immersive virtual environments stimulate a more intensive presence level (Rodríguez-Ardura & Martínez-López, 2014).

The impact of sense of presence on consumers' attitudes and intentions was confirmed in VR or AR contexts (Wei et al., 2019). During VR experiences, a higher sense of presence is associated with enjoyment of virtual environment participation and the feeling of pleasure of interacting with a virtual environment (Sylaiou et al., 2010). Similarly, Roth et al. (2012) found that a strong sense of presence can be of benefit to predict video game replay value. Moreover, sense of presence plays a significant role in tourists’ behavioral intention. In the view of Wagler and Hanus (2018), spatial presence will increase emotional engagement and then contribute to tour outreach intention. Furthermore, positive sense of presence indicates higher intention to revisit and recommend theme parks. Sense of presence in mixed reality (VR and AR) environments is a strong predictor of the four realms of experience economy (Jung et al., 2016).

For example, sense of presence will result in a positive destination experience linked to a higher level of affection, preference, and interest in the real destination (Tussyadiah et al., 2018). Also, sense of presence enhances the overall theme park experience and tourism brand experience (Bogicevic et al., 2019; Wei et al., 2019). However, previous literature focused on the sense of presence and the overall experience in VR or AR contexts, but the relationship between sense of presence and digital museum visitor perceptions has yet to be investigated. Based on literatures regarding the impacts of sense of presence, it is reasonable to assume that sense of presence positively affect digital museum visitor experience perceptions. Given the potential effects of sense of presence on experience in a virtual environment, this research proposed the following research question:

RQ3: In the context of digital museum, how sense of presence influence the digital museum visitor experience?

2.4 Multisensory Cues

2.4.1 Multisensory Cues and Experience

Tourism experience is an embodied experience, which consists of multisensory cues, including not only visual impressions, but also auditory, olfactory, tastes, and haptics stimuli (Agapito, Mendes, & Valle, 2013; Small, Darcy, & Packer, 2012). In this regard, the integrated multisensory experiences of tourists positively affect post-visit judgment (Krishna, 2012). Agapito, Valle, and Mendes (2014) identified four sensory-informed themes in rural areas and named them rural experience, generic beach-related experience, nature-based experience, and balanced experience. This literature has served as the evidence to assert the multisensory nature of rural tourism (Kastenholz & Lima, 2012). Previous literature related to multisensory cues with tourists' memories. Providing an involving environment, multisensory cues make it possible that

tourism experience tended to be more memorable in emotional and immersive surroundings (Martins et al., 2017). When a tourist had a richer perception of multisensory experiences, the longer the individual's experience memory lasted, which in turn triggered advantageous behavioral intentions towards destinations (Agapito, Pinto, & Mendes, 2017). In addition, multisensory cues play an indispensable role in co-creation of experiences because of the permanent imprint on memory (Campos et al., 2015).

Multisensory cues are closely associated with destination management, especially in destination image and destination marketing strategies (Agapito et al., 2013). Multisensory images, combined with multisensory cues as a crucial component of destination image, are unique selling propositions for destinations (Xiong, Hashim, & Murphy, 2015). Multisensory processing of interactions induces visitors' empathy and positively related with destination image, and then contributes to willingness to visit a destination (Kim & Kerstetter, 2016). The multisensory marketing perspective provides a theoretical background for experiences development and service transformation in the hospitality and tourism industry (Diţoiu & Că runtu, 2014). Multisensory marketing, which aims to make the consuming experience more engaging, immersive, informative, and enjoyable, is a useful tool for practitioners to distinguish their brand from the competitive environment in the whole market (Hultén, 2011; Petit, Velasco, & Spence, 2019). In addition, profuse sensory experiences are tightly connected with destination loyalty (Agapito et al., 2017). However, there is a gap for examining the different role of multisensory cues.

The application of multisensory cues in the museum context received lot of attentions recently. Multisensory cues could increase the effects of learning and contribute to higher engagement, enhanced information intention, and better language skills (Levent & Pascual-

Leone, 2014). This results from the tendency of museums' increasing engagement of visitors with multisensory, embodied forms of exhibitions to amplify personal experience because embodied and multisensory cues shape the way visitors explore museum space and displays (Tzortzi, 2017). Another explanation is that multisensory cues provide assistance to illuminate the art appreciation in museums (Joy & Sherry, 2003).

2.4.2 Multisensory cues impact emotional state and sense of presence

Extant literature ascertained that multisensory cues have prevalent effects on consumers' memories, perceptions, choices, and consumption (Ghosh & Sarkar, 2016). In the virtual environment, researchers confirmed the usefulness of multisensory cues on emotion states and sense of presence. In terms of emotional states, human senses closely connect with memory and reflect emotions (Isacsson, Alakoski, & Bäck, 2009). In this aspect, direct multisensory experience precipitates the visitors' emotional judgements inasmuch as the exploitation of multisensory cues are of benefit to attract visitors' sensations, establish positive emotions, and forge long-lasting memories (Agapito et al., 2017; Schifferstein et al., 2013). Specifically, visual, haptic, and olfactory cues could modify destination emotion and tourists' capacity for imagination moderates (Ghosh & Sarkar, 2016). In addition, the usage of novel mid-air technology can alter emotional art engagement and stimulation (Vi et al., 2017).

In terms of the influence on sense of presence, increasing the modalities of multisensory cues usage in a virtual environment can facilitate both the sense of presence and memory for objects in the environment (Brade et al., 2017). Overall sense of presence increased with the additional input of haptic cues through visual and auditory cues, and haptics cues enhanced the sense of presence and efficiency in virtual simulations (Ramsamy et al., 2006). Still, prediction accuracy of haptic information has a significant impact on the perceived realness and sense of

presence (Gonçalves et al., 2019). However, the relationship between multisensory cues, emotional states, sense of presence, and visitor experiences remain to be examined. There is a need to make up the lacuna to identify these relationships.

Previous researchers have generally studied cues in isolation, including or excluding some sensory cues when examining their effects (Spence et al., 2014). However, because the multisensory nature of tourism and sensory cues are not independently presented (Marks, 2014), it is essential to integrate them to identify the comprehensive outcome (Helmefalk & Berndt, 2018). It is acknowledged that different cues play distinct roles in digital contexts and the degree of application of each sensory cue varies in different marketing contexts (Ghosh & Sarkar, 2016). For example, it is evident that some cues (virtual and auditory) are easier to present than others (taste, olfactory, and haptic) so they are regarded as the enhancement of informational contents in a virtual environment (Cooper et al., 2018). Because haptic and taste cues are of benefit to elevate above other senses, they are examined frequently in previous research to compared with virtual cues only (Levent & Pascual-Leone, 2014). Haptic cues could intensify the interaction and immersion in the digital environment by allowing visitors to touch virtual objects that are simulated (Ramsamy et al., 2006). In a museum, the combination of haptic and auditory cues could provide an uplifting experience (Vi et al., 2017). Haptic imagery and sense of self-location during a virtual tour positively impact flow experience (Huang & Liao, 2017). Taste cues and olfactory cues are strong indicators of personal or collective memories that tighten the connection of visitors within intangible heritage (Miotto, 2016; Verbeek & van Campen, 2013). However, a lacuna exists to compare the difference in multisensory cues in the digital museum. Therefore, this research intent to shed the light of the different role of multisensory cues and relationships between multisensory cues, emotional states, sense of presence and digital museum

visitor experience perceptions. Given the importance of multisensory cues in a virtual environment and its impact on emotional states and sense of presence, this research proposes the following research questions.

RQ4a: How do different multisensory cues influence digital museum visitor experience perceptions?

RQ4b: If the multisensory cues do have different impacts on digital museum visitor experience, what is the underlying mechanism that may explain such impacts? Will the enhanced emotional states and sense of presence induced by the multisensory cues be the mediators that explain such impacts?

2.5 Hypotheses and Conceptual Model

Based on literature review section of museum experience, emotional state, sense of presence, and multisensory cues, this research hypothesized the following statements:

H1: Emotional state positively influence digital museum visitor experience;

H2: Sense of presence positively influence digital museum visitor experience;

H3: Multisensory cues positively affects visitors' emotional state;

H4: Multisensory cues positively affects visitors' sense of presence;

H5: There is a significant indirect effect of emotional states, sense of presence in the relationship between different multisensory cues and digital museum visitor experience.

These hypotheses are consistent with research questions. The correspondence between research questions and hypotheses is shown in Table 2.3.

Table 2.3. Research Questions and Hypotheses of Present Research

Research questions	Hypotheses
RQ1: In the context of digital museum, what is the visitor experience?	N/A
RQ2: In the context of digital museum, how emotional states influence on digital museum visitor experience?	H1: Emotional state positively influence digital museum visitor experience.
RQ3: In the context of digital museum, how sense of presence influence on digital museum visitor experience?	H2: Sense of presence positively influence digital museum visitor experience.
RQ4a: How do different multisensory cues influence digital museum visitor experience?	N/A
RQ4b: If the multisensory cues do have impacts on visitor experience, what is the underlying mechanism that may explain such impacts? Will the enhanced emotional states and sense of presence induced by the multisensory cues be the mediators that explain such impacts?	H3: Multisensory cues positively affects visitors' emotional state. H4: Multisensory cues positively affects visitors' sense of presence. H5: There is a significant indirect effect of emotional states, sense of presence in the relationship between different multisensory cues and digital museum visitor experience.

Based on the hypotheses, a conceptual model that summarized the relationships among multisensory cues, emotional state, sense of presence, and experience is proposed in Figure 2.1.

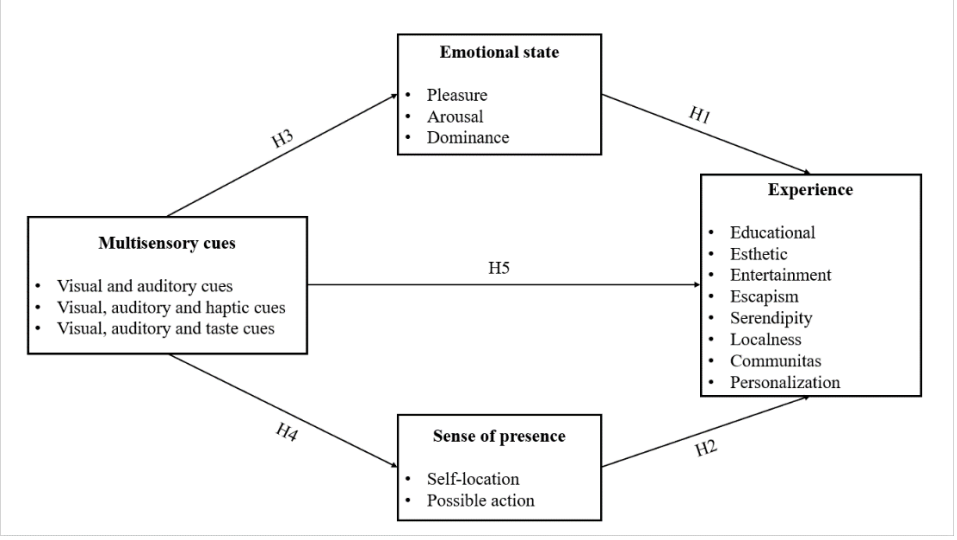

Figure 2.1. The Conceptual Model

CHAPTER 3 METHDOLOGY

Chapter 3 presents the statistical methodology used in this research. Structural equation modeling, exploratory factor analysis, confirmatory factor analysis, one-way analysis of variance, and PROCESS macro are introduced at the beginning. It then incorporates the scenario-based design, measurement, pilot testing, data collection and sample, as well as data analysis.

3.1 Description of Statistical Methodologies

3.1.1 Structural Equation Modeling

Recently, structural equation modeling (SEM) has grown enormously in popularity in the tourism research field (Jose, 2013) and is a collection of statistical techniques that grant diverse relationships between one or more independent variables and dependent variables to be assessed in one model (Ullman & Bentler, 2003). Not only was the SEM procedure a suitable solving method for measuring the proposed causal relationships among the latent variables and observed variables, but it is also possible to estimate and compare multiple group models (Su, Hsu, & Swanson, 2017; Ullman & Bentler, 2003). In this study, SEM was adopted to examine the relationships between sense of presence, emotional state, and experience perceptions.

3.1.2 Exploratory Factor Analysis and Confirmatory Factor Analysis

Exploratory factor analysis and confirmatory factor analysis were employed to identify the eight-dimensional experiencescape in the digital museum setting. Aiming to determine the underlining distinct constructs examined by numbers of measures, factor analysis is widely used and broadly exploited in social sciences (Fabrigar & Wegener, 2011; Osborne, Costello, &

Kellow, 2008). Exploratory factor analysis (EFA) is a satisfactory technique for variable reduction in terms of scales identification (Yu, Chancellor, & Cole, 2011). Confirmatory factor analysis (CFA) has become one of the most commonly used procedures in applied research, which is a type of a structural equation modeling that deals specifically with the relationships between observed factors and latent variables (Brown, 2014). Compared to the EFA, CFA is a theory-driven technique that requires the researchers to prospect all aspects of the model to assert the theoretical relationships among the variables (Schreiber et al., 2006). In social work research, CFA is used to test whether the original measurements could work efficiently in another group of sample, with multiple purposes including psychometric evaluation of measures, investigating construct validations, assessing method effects, and examination of measurement invariance (Brown, 2014; Harrington, 2009). Since the main objective of this study was to examine the visitor experience in a digital museum, CFA is used to verify the identified experience scale based on the eight-dimensional experiencescape.

3.1.3 One-Way Analysis of Variance

Analysis of variance (ANOVA) provides a useful method for statistical tests of factors especially for univariate data (Anderson, 2001). The one-way ANOVA is designed to define whether there are any statistically significant differences between means among independent groups. In addition, multigroup analysis could help determine how the hypothesized model makes sense in each group (Fakih et al., 2016). Therefore, in this study, the one-way ANOVA was employed to investigate the different experiences under different multisensory cues, respectively, visual, auditory, haptic, and taste cues. This approach also tested the extent to which the segments of the multisensory cues had the most obvious impact on visitor experience by using the multiple group comparison.

3.1.4 PROCESS Macro

Mediation analysis examined the underlining mechanisms of the relationship between an exposure variable and an outcome variable and it also applied to identify how these variables related to the intermediate variable, which was defined as the mediating variable (Valeri & VanderWeele, 2013). In other words, the mediating variable help to transfer the impact of independent variables on dependent variables (MacKinnon, Fairchild, & Fritz, 2007). In this study, the mediation analysis was tested in PROCESS macro to identify the mediating effect of emotional state and sense of presence.

3.2 Research Design

In order to answer the research questions proposed in Chapter 2, the current study adopted a scenario-based quantitative survey to collect data. The questionnaire collected information about sense of presence, emotional state, eight-dimensional experiencescape, and socio-demographic factors. Survey questions were developed based on previous literature in related areas. Pilot testing was conducted first with a convenience sample of 20 responses from students and the students' relatives. The results were used to modify the survey and ensure its reliability and validity. Then, the survey was distributed via Amazon Mechanical Turk, or MTurk.

3.2.1 Cue-Based Scenario Design

This study adopted a cue-based scenario design with three different scenarios. Participants in Scenario 1 received visual and auditory cues. In the electronic survey, participants were told to imagine that they were visiting a digital museum and a short video featuring multisensory cues was presented to stimulate the real environment and help respondents to get

the sense of being in the digital museum situation. Videos were borrowed from the official YouTube Channel of Mori Digital Museum, which is famous for its digital exhibits (teamLab, 2017, 2018a, 2018b).

Participants in Scenario 1 watched a video with colorful and dynamic lights accompanied with background music. Example was shown in Figure 3.1. In Scenario 2, participants were given visual, auditory, and haptic cues. Example was shown in Figure 3.2. In this video, participant watched people climbing the lighting pillar with background music. In Scenario 3, visual, auditory, and taste cues were provided to the participants. Example was shown in Figure 3.3. Under this circumstance, participants watched video regarding a tea house. People was served with a cup of tea with a lighting flower blooming on the surface of tea in a soft music surrounding. Each participant was randomly assigned to one of three scenarios. For each scenario, they were required to rate sense of presence, emotional state, eight-dimensional experiencescape, and also give their basic demographic information.

Figure 3.1. Example of Scenario 1---Wander Through the Crystal World.

Figure 3.2. Example of Scenario 2---Light Forest.

Figure 3.3. Example of Scenario 3---The EN TEA HOUSE.

Manipulation check for different cues was based on the video with one question that asked if the participant saw specific content that they are subjected to in the scenario they are in, such like a cup of tea or climbing trees in the video. Only those participants who selected the right answer were used for the final analysis. People who failed to answer manipulation check question correctly were forced to stop finishing the survey and these respondents was deleted in the total sample.

3.2.2 Museum Case: Mori Digital Art Museum

The videos used in this research were come from the Mori Digital Art Museum in Tokyo. Mori Digital Art Museum is one of the examples of digital museum in the world. Opened in

2018, this museum applied totally digital exhibitions to construct an immersive and borderless environment for visitors. Located in Japan, the group of artworks reflect the local Japanese culture in modern style. There are five sections in this museum including Borderless World; Athletics Forest; Future Park; Forest of Lamps; and the En Tea House. Every exhibition is interactive, responding to visitors' movements to build an everchanging display of colorful light and background music. Under each section, this museum provides special artworks for visitors, which can move freely, form connections and relationships with people, sometimes intermingle with other artworks. Therefore, the immersive environments were transformed according to the presence of visitors. As visitors meld themselves into this unified world, this museum explores a new relationship that transcends the boundaries between people and the exhibitions in the immersive environment.

3.2.3 Procedure and Measurement

The objectives of this study were to examine the digital museum visitor experience and the impacts of sense of presence and emotional state on the experience as well as to explore the difference in multisensory cues. To achieve that, this study used a self-administered questionnaire that was divided into five sections.

The first section presented the short video with the manipulation check question for each scenario. Participants who gave the wrong answer to the manipulation check question were skipped to the end of the survey.

The second section asked questions regarding sense of presence. This study focused on sense of presence and its impact on the digital museum visitor experience in the virtual environment. Therefore, sense of presence was defined and measured with spatial presence, namely self-location and possible actions. According to Wirth et al. (2007), self-location is the

feeling of being immersed in the virtual environments and the possible action refers to the perceived action possibilities in the virtual environment. The eight statements were learned from Tussyadiah et al. (2018) and measured by a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

The third part measured the emotional state. Russell (1980) proposed three basic dimensions of emotional state that are known as pleasure, arousal, and dominance (PAD). Pleasure is regarded as the degree of joy and satisfaction in the situation. Arousal refers to the level of excitement and stimulation in the given environment. Dominance indicates the extent to which the person feels in control in the circumstance (Yüksel, 2007). The statements of pleasure, arousal, and dominance were borrowed from Mazaheri, Richard, and Laroche (2011) and modified to fit for the digital museum setting with the verified acceptable reliability. Emotional state was measured by 7-point semantic differential scale for pleasure and arousal and 7-point Likert scale for dominance with a range of 1 (*strongly disagree*) to 7 (*strongly agree*).

The fourth section referred to experience. The eight-dimensional experiencescape consists of educational, entertainment, esthetic, escapism, serendipity, localness, communitas, and personalization experience. Educational experience triggers visitors to learn something new. Entertainment experience requires that the provider needs to maintain the customers' attention during their visit (Oh et al., 2007). The esthetics experience is related to the customers' interpretation and observation of the physical environment. Escapism experience illustrates the need of tourists to escape to a specific place to actively involve and immerse themselves (Mody et al., 2017). Serendipity experience implied some positive surprises that happen unexpectedly (Tung & Ritchie, 2011). Localness is a kind of experience that helps tourists differentiate the destination and be immersed in local communities (Oates, 2015a). Communitas experience could

be defined as interpersonal relationships with other human beings (Wang, 2004). Personalization means the customized experience based on the tourists' preferences (Shen & Ball, 2009). The eight-dimensional experiencescape was measured by a 7-point Likert scale with a range of 1 (*strongly disagree*) to 7 (*strongly agree*). Age, gender, and educational level were asked in this questionnaire as the final section. All the measurements are provided in Table 3.1.

Table 3.1. Measurement Items

Constructs	Subconstructs	Measurements
Presence	Self-location	1. I felt like I was actually there in the immersive environment provided by this digital museum. 2. It seemed as though I actually took part in the action of involving in the immersive environment. 3. It was as though my true location had shifted into the immersive environment provided by this digital museum. 4. I felt as though I was physically present in the immersive environment provided by this digital museum.
Presence	Possible action	1. The immersive environment provided this digital museum gave me the feeling that I could do things within it. 2. I had the impression that I could be active in the immersive environment provided by digital museum. 3. I felt like I could move around in the immersive environment provided by this digital museum. 4. It seemed to me that I could do whatever I wanted in the immersive environment provided by this digital museum.
Emotional state	Pleasure	1. Annoyed-pleased 2. Unhappy-happy 3. Dissatisfied-satisfied 4. Despairing-hopeful
Emotional state	Arousal	1. Depressed-cheerful 2. Calm-excited
Emotional state	Dominance	1. I felt that I had a lot of control over my visiting experience at this digital museum 2. While I was on this site, I could choose freely what I wanted to see 3. While I was on the digital museum, I had absolute control over I could do during the tour 4. While I was on the digital museum, my actions decided the kind of experiences I got on this tour 5. While I was on this digital museum, I controlled what happened in my on-site information searches

Table 3.1. Continued

Constructs	Subconstructs	Measurements
Experience	Educational	1. I learned something new visiting the digital museum 2. The experience made me more knowledgeable 3. It stimulated my curiosity to learn new things
Experience	Esthetic	1. Visiting the digital museum was very attractive 2. The display in the digital museum played close attention to detail 3. Visiting the digital museum was very pleasant
Experience	Entertainment	1. Visiting the digital museum was amusing 2. Visiting the digital museum was captivating 3. Visiting the digital museum was fun
Experience	Escapism	1. I felt I played a different character when visiting the digital museum 2. I felt I was living in a different time or place 3. I completely escaped from reality
Experience	Serendipity	1. Visiting the digital museum allows me to experience the "spur of moment." 2. I spontaneously experienced things I never thought I was going. 3. I experienced pleasant surprise in visiting the digital museum.
Experience	Localness	1. Visiting the digital museum allows me to engage with local people 2. Visiting the digital museum allows me to experience the local Japanese culture through the displays 3. Visiting the digital museum allows me to experience what locals do
Experience	Communitas	1. Visiting the digital museum allows me to turn strangers into friends 2. I felt I was the part of the place 3. Visiting the digital museum makes me feel I belong to a special travel community
Experience	Personalization	1. Visiting the digital museum is a tailored experience for me 2. Visiting the digital museum customized to my needs 3. Interaction with the digital museum makes me feel that I am a unique customer

3.2.4 Pilot Testing

Pilot testing was conducted with a convenience sample among university students and students' relatives to examine the structure and wording of questions. It took place on April 9,

2019 and gathered 20 responses (7 respondents in Scenario 1, 5 respondents in Scenario 2, and 8 respondents in Scenario 3). Pilot testing was used to improve the expression of survey statements to ensure that questions were specific and clear to participants and to check the duration of the survey. After checked the reliability and validity, some of the statements in the questionnaire were reworded and reorganized to make it easier for respondents to answer.

Pilot testing was also used for calculating sample size to ensure the power. This research selected the Scenario 1 and Scenario 3 for calculation because these two scenarios pertained relative equivalent sample. Accordingly, based on the correlation of the experience score in Scenario 1 and Scenario 3 ($r = 0.15$), the minimum sample size was calculated with power equaling to 0.8 at the significance level equals to 0.05, which manifested that the acceptable sample size was 350 responses to avoid a Type II error.

3.2.5 Data Collection and Sample

The current study composed the questionnaire in Qualtrics and distributed it through Amazon MTurk, which is one of the more widely used online crowdsourcing options in social science (Cheung et al., 2017). In the data collection process, data quality was confirmed by establishing specific criteria that survey takers must have to complete the survey (Torres et al., 2019). Because each survey is regarded as the human intelligence task (HIT), the HIT Approval Rate (%) for all Requesters' HITs greater than 98% was used as the qualification requirement in this research. Respondents who completed the online survey with acceptable results were paid 0.3 dollars. The total sample size was 399 for this research. In the data clean procedure, 17 data were deleted because the respondent failed to pass the manipulation check question or gave constant answers towards variables. Therefore, a total of 382 data were used for further analyzing. Sample size in each scenario was summarized in Table 3.2.

Table 3.2. Scenarios and Sample Size

Scenario	Treatment	Sample size
1	Visual and auditory cues	129
2	Visual, auditory, and haptic cues	130
3	Visual, auditory, and taste cues	123

3.2.6 Data Analysis

The data analysis was completed in five steps. Firstly, a descriptive analysis was conducted to characterize the general demographic information (gender and age) and background (level of education) of the sampled participants with the mean and frequency. Secondly, due to the small sample for pilot testing, this research adopted the split-sample approach to investigate the visitor experience perceptions of a digital museum. Using the minority part of the sample, principal components analysis in exploratory factor analysis with varimax rotation was conducted to exploit the perceptions of the digital museum visitor experience, and then confirmatory factor analysis using the majority part of data was applied to verify the result of EFA before the SEM process.

Validity and reliability were examined in SPSS 25. The IBM SPSS Statistics program is a powerful statistical package with outstanding functions. Version 25 is the most recent version available (Aldrich, 2018). Validity is the degree to which the scale measures the concept of its intent to measure (Hosany et al., 2015). Convergent validity was determined by composite reliability and the average variance extracted was used for assessing discriminant validity. Reliability is the statistical measure of how reproducible the survey instrument's data are (Litwin, 1995). In this study, Cronbach's alpha was adopted to measure the internal consistency.

Thirdly, the structural equation modeling was employed to analyze the relationships between the independent variables and dependent variable in SPSS AMOS 25. Similarly, composite reliability and average variance extracted were used of examining the validity and reliability of the SEM model. Fourthly, in order to identify the different roles of multisensory cues, this research took advantage of the one-way ANOVA to verify the difference among three scenarios. Finally, the PROCESS macro (version 3.3) in SPSS was used to test the mediation effect of emotional states and sense of presence the relationship between multisensory cues and digital museum visitor experience.

CHAPTER 4. RESULTS

Chapter 4 provides the main findings of this research. The respondent profiles are described firstly, followed by the EFA and CFA results. Then the outcomes of structural equation modeling and the one-way analysis of variance are reported. The last section is the mediation test results.

4.1 Sample Profile

About 51.3% of the survey respondents were males and 48.7% were females. Approximately 43.2% were between the age of 25-34 years old, followed by 35-44 (23.8 %), 18-24 (12.0 %), 45-54 (12.0%), and over 55 (8.9 %). More than half of the respondents (66.7 %) had college degrees and above. High school and less than high school education level occupied about one third (33.3%) of the total respondents. Results were reported in Table 4.1.

Table 4.1 Sample Profile

Characteristics	Frequency	Percentage (%)
Gender		
Male	196	51.3
Female	186	48.7
Age		
18-24 years	46	12.0
25-34	165	43.2
35-44	91	23.8
45-54	46	12.0
Over 55	34	8.9
Education Level		
Less than high school	3	0.8
High school	124	32.5
Bachelor's degree	208	54.5
Master's degree	40	10.5
PhD or higher	7	1.8
Total	382	100

4.2 Visitor Experiences

4.2.1 Exploratory Factor Analysis

Utilizing the eight-dimensional experiencescape, 24 items were used to assess the digital museum visitor experience in this study. The descriptive analysis is shown in Table 4.2.

Table 4.2. Items for Visitor Experience

Items	*M*	*SD*
1. I learned something new visiting the digitalize museum.	4.51	1.695
2. The experience made me more knowledgeable.	4.40	1.723
3. It stimulated my curiosity to learn new things.	4.98	1.610
4. Visiting the digital museum was very attractive.	5.38	1.526
5. The display in the digital museum played close attention to detail.	5.30	1.477
6. Visiting the digital museum was very pleasant.	5.32	1.608
7. Visiting the digital museum was amusing.	4.86	1.682
8. Visiting the digital museum was captivating.	5.33	1.575
9. Visiting the digital museum was fun.	5.28	1.616
10. I felt I played a different character when visiting the digital museum.	3.88	1.883
11. I felt I was living in a different time or place.	4.14	1.939
12. I completely escaped from reality.	4.29	1.929
13. Visiting the digital museum allows me to experience the “spur of moment.”	4.57	1.611
14. I spontaneously experienced things I never thought I was going.	4.37	1.644
15. I experienced pleasant surprise in visiting the digital museum.	5.08	1.645
16. Visiting the digital museum allows me to engage with local people.	3.59	1.793
17. Visiting the digital museum allows me to experience the local Japanese culture through the displays.	4.02	1.723
18. Visiting the digital museum allows me to experience what locals do.	4.04	1.790
19. Visiting the digital museum allows me to turn strangers into friends.	3.41	1.887
20. I felt I was the part of the place.	4.28	1.798
21. Visiting the digital museum makes me feel I belong to a special travel community.	3.88	1.911
22. Visiting the digital museum is a tailored experience for me.	3.98	1.852
23. Visiting the digital museum customized to my needs.	3.87	1.877
24. Interaction with the digital museum makes me feel that I am a unique customer.	4.12	1.883

The digital museum visitor experience scale was developed using a randomly selected subsample of 133 respondents. This sample size, with the subject to item ration of 5.54:1, followed the appropriate subject to items ratio (5:1) of previous researchers (Osborne et al., 2008). With KMO value equaled to 0.923 ($p < 0.001$), these 133 pieces of sample was suitable for exploratory factor analysis. The principal components analysis was used as the extraction method and Varimax was used as the mean of rotation. Six items were eliminated because of cross loading on more than one factor, or having low factor loading value or freestanding items (Osborne et al., 2008). Afterwards, 18 items were retained with factor loading higher than 0.50.

The principal component analysis generated three factors with the eigenvalue greater than 1. These three factors explained 79.7% of variances. Therefore, visitors turned out to have three experience perceptions rather than the eight-dimensional experience proposed by Mody et al. (2017) or the basic experience economy realm proposed by Pine and Gilmore (1999). Labeled as joviality, personal escapism, and localness in this research, these three factors accounted for 35.7%, 25.6%, and 18.4%, respectively, of the variances. Factor joviality includes the esthetic, entertainment, and serendipity of the eight-dimensional experiencescape, which refers to the delighted experience and euphoria situation perceived in the digital museum. Personal escapism consists of the two experience dimensions of escapism and personalization of the eight-dimensional experiencescape, which means the visitors' perception of getting rid of the daily routine and the intention to be special in the digital museum. Indicating the chance of visitors to interact with the local society, the third factor reflected the localness dimension, which is consistent with the localness experience of the eight-dimensional experiencescape. The results of principal component analysis are displayed in Table 4.3.

Table 4.3. Principal Component Analysis

	Component		
	F1	F2	F3
Joviality			
J1. Visiting the digital museum was very attractive.	.907	.189	.042
J2. The display in the digital museum played close attention to detail.	.786	.184	.257
J3. Visiting the digital museum was very pleasant.	.881	.281	.089
J4. Visiting the digital museum was amusing.	.737	.206	.268
J5. Visiting the digital museum was captivating.	.875	.254	.126
J6. Visiting the digital museum was fun.	.836	.300	.137
J7. Visiting the digital museum allows me to experience the “spur of moment.”	.662	.283	.456
J8. I spontaneously experienced things I never thought I was going.	.608	.272	.453
J9. I experienced pleasant surprise in visiting the digital museum.	.846	.270	.214
Personal escapism			
S1. I felt I played a different character when visiting the digital museum.	.267	.812	.250
S2. I felt I was living in a different time or place.	.315	.838	.126
S3. I completely escaped from reality.	.433	.718	.214
S4. Visiting the digital museum is a tailored experience for me.	.309	.742	.438
S5. Visiting the digital museum customized to my needs.	.196	.749	.459
S6. Interaction with the digital museum makes me feel that I am a unique customer.	.268	.774	.430
Localness			
L1. Visiting the digital museum allows me to engage with local people.	.151	.513	.728
L2. Visiting the digital museum allows me to experience the local Japanese culture through the displays.	.199	.299	.870
L3. Visiting the digital museum allows me to experience what locals do.	.246	.305	.816

4.2.2 Confirmatory Factor Analysis

Confirmatory factor analysis was utilized for the assessment of the measurement model in SEM following the 2-step process (Caplan, 2010; Lo & Wu, 2014). A CFA was conducted to examine the validity of the three-factor structure determined by the EFA process using the 249 respondents of the total sample. The result of CFA proved the applicability of the three factors structure to explain digital museum visitor experience. The fitness of the measurement model was measured by the relevant statistics and the results were displayed in Table 4.4. Due to the an unpleasant chi-square result (χ^2 = 352.877, *df* = 127, $p < 0.000$), this research adopted the χ^2/df as an assessment of overall model fit because this statistic helps to mitigate the sensitivity of chi-square test to sample size (Lehto, 2013). The measurement model for three-factor structure showed an acceptable fit with the χ^2/df = 2.779, goodness of fit index (GFI) = 0.864, adjusted goodness of fit index (AGFI) = 0.817, root mean square error of approximation (RMSEA) = 0.085, and comparative fit index (CFI) = 0.942. The result is summarized in Table 4.4. These fit indices indicated the three-factor structure from EFA process was statistically suitable.

Table 4.4. Measurement Model Fit Result

Model fit index	CFA model	Recommended standard
Chi-square	352.877	N/A
Chi-square/*df*	2.779	< 3
GFI	0.864	> 0.9
AGFI	0.817	> 0.8
CFI	0.942	> 0.9
RMSEA	0.085	0.05 < RMSEA < 0.08

In general, the three-factor structure presented a good fit with the standardized factor loading value ranging from 0.623 to 0.914. Cronbach's alpha was used to assess the reliability of

the three factors. The results were 0.929, 0.937, and 0.908, respectively, and they were greater than the recommended threshold of 0.5, indicating the good internal consistency of the items for one construct. Construct reliability was measured by composite reliability (CR > 0.7) and average variance extracted (AVE > 0.5; Lo & Wu, 2014). In this research, with the composite reliability ranging from 0.911 to 0.933 and average variance extracted ranging from 0.592 to 0.773, the construct reliability was acceptable. Therefore, the results indicate that digital museum visitors have joviality, personal escapism and localness experience, which answered the first research question. The results are presented in Table 4.5.

Table 4.5. Reliability and Validity of the Confirmatory Factor Analysis

Experience Perceptions	Standardized Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Joviality		0.929	0.928	0.592
J1	0.832			
J2	0.677			
J3	0.824			
J4	0.754			
J5	0.866			
J6	0.872			
J7	0.662			
J8	0.623			
J9	0.773			
Personal escapism		0.937	0.933	0.699
S1	0.762			
S2	0.757			
S3	0.765			
S4	0.891			
S5	0.909			
S6	0.914			
Localness		0.908	0.911	0.773
L1	0.846			
L2	0.893			
L3	0.897			

Next, the discriminant validity, which is indicates the extent to which the variable is not similar to other variables (Ramayah, Yeap, & Ignatius, 2013). The low correlations between the three factors not exceeding the square root of the AVE illustrated the good discriminant validity (Ramayah et al., 2013). It is evident that the discriminant validity was acceptable with the square

root of the AVE (diagonal values) of each factor larger than its corresponding correlation coefficients (Table 4.6).

Table 4.6. Discriminant Validity and Correlations among Three Factors

	1	2	3
1. Joviality	0.769		
2. Personal escapism	0.689	0.836	
3. Localness	0.530	0.758	0.879

4.3 Analysis Results

4.3.1 Emotional State, Sense of Presence, and Experience

Structural equation modeling was conducted to examine the relationships between the variables using the maximum likelihood technique. The structural model worked as the second step after the measurement model was acquired following the two-step process. Research Question 2 and Research Question 3 proposed that emotional state and sense of presence have an effect on the experience perceptions. Furthermore, this research hypothesized that emotional state and sense of presence positively affect the joviality, personal escapism, and localness experience. The descriptive results of emotional state, sense of presence and experience perceptions were displayed in Table 4.7. Among the three emotional state, pleasure received the highest score (5.249), followed by arousal (5.026) and dominance (4.347). Respondents perceived similar score for self-location and possible action, respectively 3.489 and 3.605 for sense of presence. Among the three-factor structure of experience perception, joviality experience had the highest score (5.297) followed by personal escapism (4.384) and localness experience (4.102).

Table 4.7. Descriptive Analysis for Variables in SEM

Variables	*M*	*SD*
Pleasure	5.249	1.241
PL1	5.28	1.465
PL2	5.33	1.327
PL3	5.16	1.521
PL4	5.23	1.270
Arousal	5.026	1.241
AR1	5.30	1.305
AR2	4.75	1.642
Dominance	4.347	1.549
DO1	4.44	1.606
DO2	4.29	1.790
DO3	4.24	1.809
DO4	4.39	1.756
DO5	4.39	1.742
Self-location	3.489	1.063
SL1	3.60	1.077
SL2	3.53	1.160
SL3	3.38	1.239
SL4	3.44	1.247
Possible Action	3.605	0.971
PA1	3.75	1.044
PA2	3.74	1.104
PA3	3.59	1.133
PA4	3.34	1.244
Joviality	5.297	1.112
Personal Escapism	4.384	1.576
Localness	4.102	1.627

Afterwards, the reliability was calculated using Cronbach's alpha, composite reliability and average variance extracted. The results of the validation for independent variables were reported in Table 4.8.

Table 4.8. Validation Results for Independent Variables

Items	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Emotional state	0.780	0.810	0.601
Sense of presence	0.842	0.813	0.686

Based on the path diagram, the SEM results were reported in Table 4.9.

Table 4.9. Testing Results for Hypotheses 1 and 2.

Hypotheses	Standardized estimates
Hypothesis 1	
Emotional state impacts joviality experience	0.678, $p < 0.001$
Emotional state impacts personal escapism experience	0.056, $p = 0.184$
Emotional state impacts localness experience	-0.206, $p < 0.001$
Hypothesis 2	
Sense of presence impacts joviality experience	0.428, $p < 0.001$
Sense of presence impacts personal escapism experience	0.915, $p < 0.001$
Sense of presence impacts localness experience	0.880, $p < 0.001$

Emotional state had positive impact on joviality experience and personal escapism experience with standardized estimates equaled 0.678 and 0.056. Sense of presence had positive relationship with joviality, personal escapism and localness experience with standardized estimates equaled to 0.428, 0.915and 0.880 respectively. Emotional state and localness experience presented a weak negative relationship with standardized estimates equaled to -0.206.

The estimation result indicated there was no significant relationship between emotional state and personal escapism experience (standardized estimates = 0.056, $p = 0.184$). The results were reported in Figure 4.1.

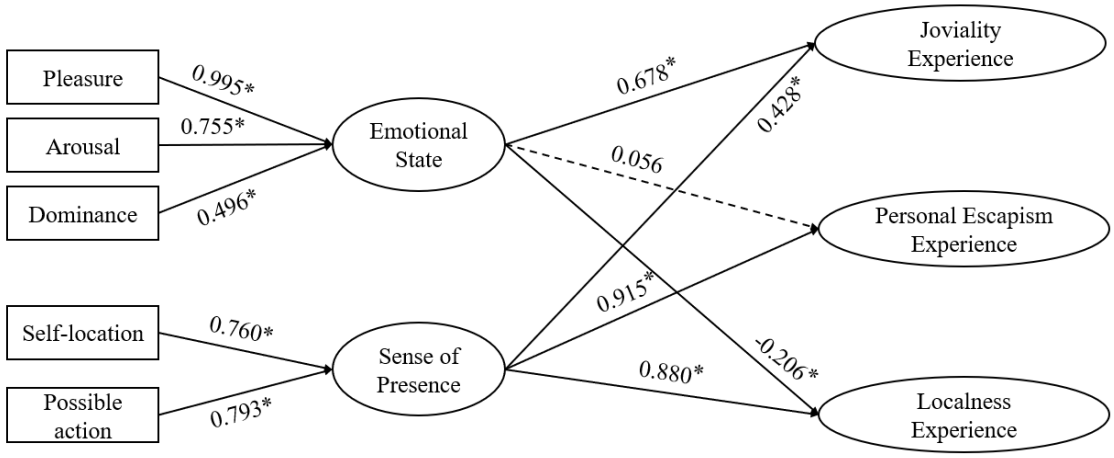

Figure 4.1. The Results of Structural Equation Modeling (Note: $^{*}p < 0.001$.)

Due to the insignificance of emotional state and personal escapism experience, this research removed the relationship between emotional state and personal escapism experience. After deleting the relationship between the two variables, emotional state had positive influence on joviality experience with standardized estimation value equaled to 0.680. While it negatively impacted the localness experience with estimation value equaled -0.312. Pleasure was confirmed to be most powerful observed variable for emotional state (standardized estimation = 0.957). In terms of the impact of sense of presence, it had the strongest effect on personal escapism experience (standardized estimation = 0.969). The impact of sense of presence on localness experience was slightly weaker than personal escapism (standardized estimation = 0.873). Sense of presence had the delicate effect on joviality experience with standardized estimation of 0.194. Self-location and possible action are both highly influence sense of presence with standardized

estimation of 0.834 and 0.822 respectively. to the structural model fit was examined. The results of the updated model are presented in Figure 4.2.

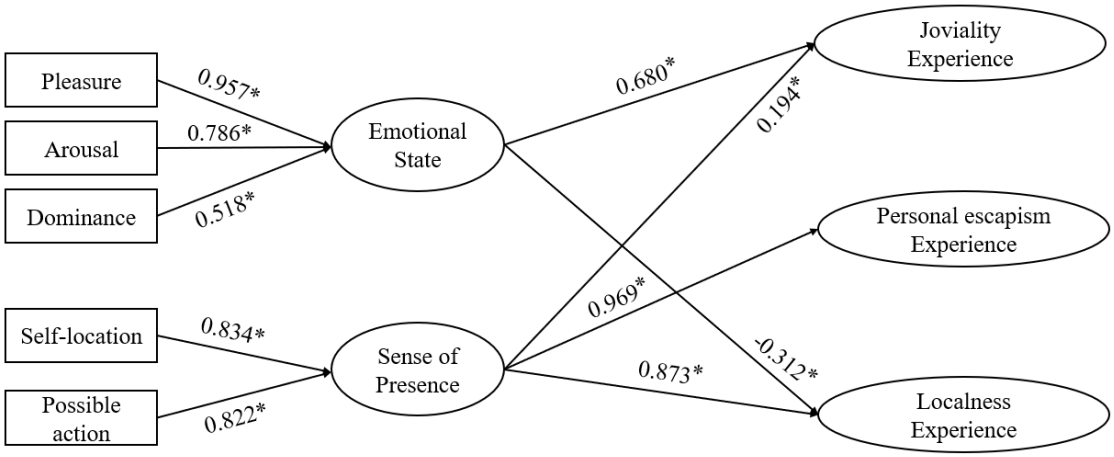

Figure 4.2. The Results of Updated Structural Equation Modeling (Note: *indicates p <0.001.)

A comparison of the standardized factor loadings of the measurement and structural models revealed the suitability of the measurement items used in the structural model (Lo & Wu, 2014). The comparison result is presented in Table 4.10 and it revealed the goodness of measurement items.

Table 4.10. A Comparison of Standardized Loadings

Experience Perceptions	Standardized loading in measurement model	Standardized loading in structural model
Joviality		
J1	0.832	0.835
J2	0.677	0.677
J3	0.824	0.827
J4	0.754	0.748
J5	0.866	0.873
J6	0.872	0.866
J7	0.662	0.666
J8	0.623	0.619
J9	0.773	0.767
Personal escapism		
S1	0.762	0.763
S2	0.757	0.755
S3	0.765	0.763
S4	0.891	0.887
S5	0.909	0.907
S6	0.914	0.917
Localness		
L1	0.846	0.853
L2	0.893	0.888
L3	0.897	0.891

With the satisfied χ^2/df value equaled to 2.223 and RMSEA at 0.070, the structural model was proven to be good fit. The detailed model fit index is reported in Table 4.11. Although Goodness of fit indicator (GFI) still less than 0.9 (0.854), other model fit indices were located in an acceptable range. Therefore, the three-factor structure of experience that consists of joviality,

personal escapism and localness defined in this research were confirmed valid in digital museum context.

Table 4.11. Structural Model fit Result

Model fit index	SEM model	Recommended standard
Chi-square	480.123	N/A
Chi-square/df	2.223	< 3
GFI	0.854	> 0.9
AGFI	0.813	> 0.8
CFI	0.948	> 0.9
RMSEA	0.070	0.05 < RMSEA < 0.08

Therefore, the measurement model and structural model were confirmed useful to demonstrate the relationships among emotional state, sense of presence, and digital museum visitor experience perceptions. To be clear, emotional state had a positive impact on joviality experience and it has a negative impact on localness experience. Also, sense of presence was found to be a strong predictor for personal escapism and localness experience. It had slight impact on joviality experience.

4.3.2 Multisensory Cues and Experience

In order to clarify the influence power of the multisensory cues, a one-way ANOVA with a multiple comparison was used for detecting the difference among the multisensory cues on experience. To simplify the calculation result, this research utilized the average experience of joviality, personal escapism, and localness experience instead of the three experiences separately. In order to see if there were any variances in mean values between the three scenarios, further verification was sought using ANOVA with a multiple comparison. Upon conducting the

multiple comparison, it is necessary to examine the homogeneity of dispersion (No & Kim, 2015). With the homogeneity failed to achieve, a Dunnett's T3 test was used for comparing the mean value of experience for three scenarios in this research as the multiple comparison methodology.

The results are shown in Table 4.12, 4.13, and 4.14. The ANOVA Table 4.12 revealed that there was an experience difference in Scenario 1 and Scenario 2. ANOVA Table 4.13 indicated that there was an experience difference in Scenario 1 and Scenario 3. However, there was no significant difference in Scenario 2 and Scenario 3. The mean value of experience in three scenarios were showed in Figure 4.3.

Table 4.12. One-way ANOVA Test of Scenario 1 and Scenario 2

Source	*df*	Sum of Squares	Mean Square	*F*	Significance
Treatment	1	8.391	8.391	5.125	0.025
Error	167	273.441	1.637		
Total	168	281.833			

Table 4.13. One-way ANOVA Test of Scenario 1 and Scenario 3

Source	*df*	Sum of Squares	Mean Square	*F*	Significance
Treatment	1	9.332	9.322	6.758	0.010
Error	163	225.073	1.381		
Total	164	234.405			

Table 4.14. One-way ANOVA Test of Scenario 2 and Scenario 3

Source	*df*	Sum of Squares	Mean Square	*F*	Significance
Treatment	1	0.037	0.037	0.021	0.884
Error	162	281.799	1.740		
Total	163	281.837			

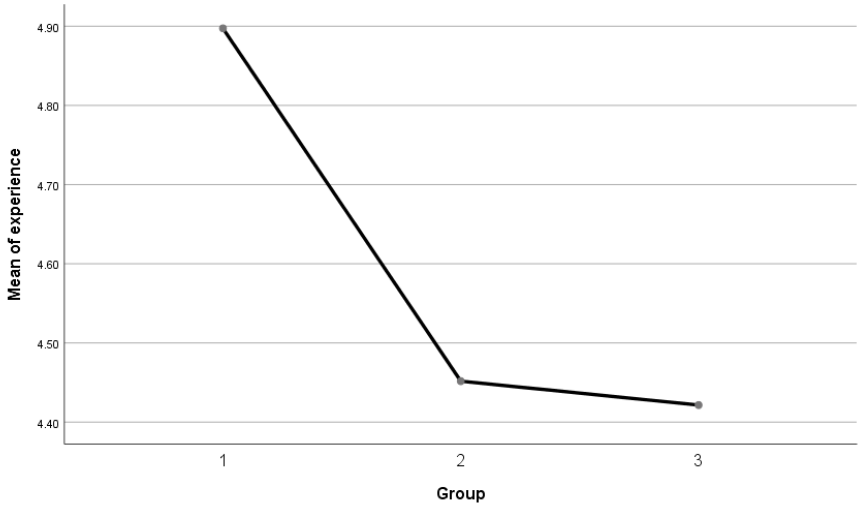

Figure 4.3. Means Plots for Experience of Three Scenarios

The multiple comparison table was showed in Table 4.15. Since the *p* value was less than 0.05, the mean value of experience failed to achieve homoscedasticity. The results of Dunnett's T3 test indicated that experience value in Scenario 1 have statistically significant difference from the experience value in Scenario 3. However, experience value in Scenario 1 and Scenario 2 revealed statistically insignificant difference. Also, result of Dunnett's T3 test between the experience value in Scenario 2 and Scenario 3 was consistent with the ANOVA Table 4.14. Details of results were reported in Table 4.16.

Table 4.15. Homogeneity Test for Experience Value

Experience value	Levene Statistic	Df1	Df2	Sig.
Based on Mean	4.004	2	246	.019
Based on trimmed mean	3.991	2	246	.020

Table 4.16. Result of Dunnett's T3 test

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	.44567	.19711	.073	-.0298	.9212
	3	.47586*	.18342	.031	.0334	.9183
2	1	-.44567	.19711	.073	-.9212	.0298
	3	.03019	.20529	.998	-.4650	.5254
3	1	-.47586*	.18342	.031	-.9183	-.0334
	2	-.03019	.20529	.998	-.5254	.4650

Note: *indicates the mean difference is significant at the 0.05 level.

In this research, with the purpose of investigating which scenario provided the highest experience level, the descriptive mean value of experience in each Scenario was calculated and was shown in Table 4.17. The highest average experience score of 4.90 indicated that Scenario 1 with visual and auditory cues provided the most pleasant experience. Scenario 2 with visual, auditory, and haptics cues had an average experience score of 4.45. While Scenario 3 provided the taste cues, it presented the lowest experience score. The mediation effect was assessed to investigate why visual and auditory cues had the highest experience level.

Table 4.17. Experience Scores in Three Scenarios

Scenario	Quantity	Average	Confidence Interval		MIN	MAX
			LLC	ULC		
1	85	4.90	4.6524	5.1424	1.81	6.96
2	84	4.45	4.1457	4.7578	1.26	6.78
3	80	4.42	4.1510	4.6920	1.26	6.33
Total	249	4.59	4.4352	4.7531	1.26	6.96

4.3.3 Mediation role of emotional states and sense of presence

Hayes (2013) developed PROCESS macro in SPSS and it is widely used for examining the mediation and moderation effect (Hayes, Montoya, & Rockwood, 2017). The PROCESS macro (version 3.3) Model 4 with embedded bootstrap technique in SPSS was used to further detect the impact of multisensory cues on visitor experiences in a digital museum. In this research, dummy coding was created for multisensory scenarios with one referent, which is also known as the indicator coding designed by Hayes and Preacher (2014). Hayes and Preacher defined the term relative to demonstrate the total, direct, and indirect effects with multicategorical independent variable. Therefore, Scenario 1 (visual and auditory cues) was determined as the control group so that the direct and indirect effects in other scenarios (visual, auditory, and haptic cues and visual, auditory, and taste cues) were compared with the referent. The bootstrapping technique involved 10, 000 resamples and the statistical significance was determined according to 95% confidence intervals. The results of mediation analysis are displayed in Figure 4.4.

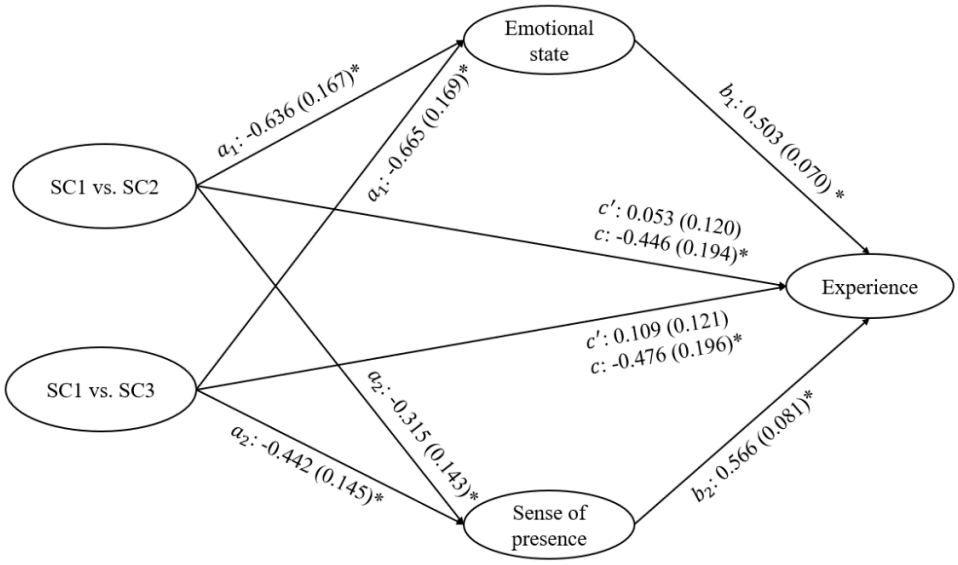

Figure 4.4. The Results of Mediation Analysis (Note: *indicates p <0.05.)

In terms of the mediating effect of emotional state, visitors in Scenario 1 (visual and auditory cues) perceived 0.251 units of experience more than Scenario 2 (visual, auditory, and haptic cues). Similarly, visitors Scenario 1 perceived 0.263 units of experience more than Scenario 3 (visual, auditory, and taste cues). In terms of the mediating effect of sense of presence, visitors in Scenario 1 perceived 0.14 units of experience more than Scenario 2. Likewise, visitors in Scenario 1 perceived 0.197 units of experience more than Scenario 3. In other words, the highest experience score in Scenario 1 resulted from the influence of emotional state and sense of presence. Therefore, the relative indirect results provided a further explanation for the reason why the visitor experience score of Scenario 1 was higher than Scenarios 2 or 3. This analysis confirmed that the highest experience score is due to the enhanced impact of emotional state and sense of presence in Scenario 1. The relative mediation results are reported in Table 4.18.

Table 4.18. Relative Indirect Effects of Multisensory Cues on Experience

Groups	Effect	BootSE	BootLLCI	BootULCI
Emotional state				
SC1 vs. SC2	-0.251	0.084	-0.432	-0.106
SC1 vs. SC3	-0.263	0.084	-0.450	-0.117
Sense of presence				
SC1 vs. SC2	-0.140	0.065	-0.279	-0.024
SC1 vs. SC3	-0.197	0.069	-0.342	-0.074

CHAPTER 5. DISCUSSION

Chapter 5 is reported the key findings beginning with the conclusion section. Afterwards, the digital museum visitor experience perceptions are explained in detail. Based on the experience perceptions and impact of multisensory cues, emotional state, and sense of presence, the digital museum visitor experience was defined clearly. Theoretical and managerial implications are discussed. Limitations and future research are mention as the last section.

5.1 Conclusion

This research is one of the few studies focusing on digital museum visitor experience. The findings make contributions to the understanding of the experience of digital museum visitors in the research literature. The exploratory factor analysis results partially coincided with the experience factor of previous researchers (Mody et al., 2017; Pine & Gilmore, 1999). This research investigated the underlying digital museum visitor experience, which are joviality, personal escapism, and localness experience based on Mody et al.'s (2017) eight-dimensional experiencescape model. The digital museum visitor experience perceptions are showed in Figure 5.1. The SEM results illustrated that emotional state positively influence joviality experience while it had negative impacts on localness experience. Sense of presence was confirmed as a strong predictor of joviality, personal escapism, and localness experience. The results of rotating ANOVA with Dunnett's T3 test and the descriptive mean score of experience explained that visual and auditory cues were the most effective cues in terms of the influence of digital museum visitor experience. The mediation analysis provided the further explanation of the underlying mechanism of the relationship between multisensory cues and digital museum visitor experience.

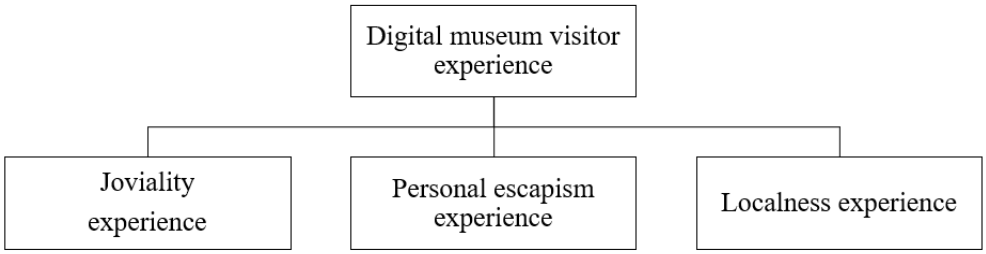

Figure 5.1. Digital Museum Visitor Experience Perceptions

5.1.1 Joviality

The first experience dimension of the digital museum is joviality, which possessed the highest mean (5.30) and explained a considerable percentage of variance of experience among the three factors (35.7%). It consisted of the esthetic, entertainment, and serendipity experience and focused on the interesting aspects of the digital museum experience. The labeled name was consistent with measurements items, such as visiting the digital museum was attractive, amusing, fun, and pleasant surprising. In this regard, a digital museum delivers its exhibitions in an aesthetically pleasing, amusing, and surprising way, which reflects the three aspects of the joviality experience.

The first aspect is esthetics, representing the state that visitors feel immersed in the digital environment without any interaction (Neuburger & Egger, 2017). The esthetic realm of the digital museum confirmed a common phrase in Chinese, “It can be only appreciated distantly but not touched blasphemously.” The esthetic experience helps to build the perceived beauty of exhibitions and cultivates the concept of artistic aesthetics through a museum journey in the digital museum.

The second aspect of the joviality experience is entertainment including the leisure and amusement perception in the digital museum. In a recent research, entertainment experience

appeared along with educational experience and was called edutainment (Pallud, 2017). Edutainment has become increasingly influential and pushes museums in the entertainment direction (Komarac, Ozretic-Dosen, & Skare, 2017; Mirghadr et al., 2018; Radder & Han, 2015). This aspect pay attention on the most hedonic value of a museum visit, such as "visiting the digital museum was captivating, funny, and amusing."

The third aspect of joviality is serendipity in the digital museum. Serendipity experience illustrates the novelty and surprising encounters in the digital museum journey. Surprising situations and encounters in tourism could provide an opportunity for impressive tourists-environment exchange, and then results in unique connections between visitors and their destination (Morrison et al., 2017). A previous study denoted that promoting serendipitous interaction could improve the experiences of digital museum visitors and enhance the retention of subsequent visits (Dahroug et al., 2017). Serendipity preserved the positive "pleasant surprises" beyond visitors' expectations, which highlighted the digital museum visitor experience is novel and amazing.

Together, all three aspects contribute to and demonstrate the underlining joviality experience of the digital museum. It is of great importance for museum managers and curators to take all three aspects into consideration when designing and creating museum products regarding the interesting and delighted digital museum experience.

5.1.2 Personal Escapism Experience

Representing the perception level of being mentally and physically away from real life routines and the unique meaning of the digital museum experience for the visitor, personal escapism experience concerns the escapism and personalization experience of the eight-dimensional experiencescape. This experience has the mean score at 4.38 and it explain 25.6% of

variance. With the combination of the two aspects, personal escapism reflected the special situation provided by the digital museum. The given name is consistent with a previous literature illustrated that the distinguishing characteristics of tourism experiences were comprised to unique, personalized and extraordinary experiences (Hosany, 2016).

The first aspect, escapism experience is similar to the esthetic experience, which depicts the immersion level of digital museum visitors and the visitors' active participation (Neuburger & Egger, 2017). In the virtual and immersive environment provided by a digital museum, visitors can "escape from reality" occupied with the banalities of daily life. Besides, they could enter a different realm such as "they were living in a different time or place" and they have access to imaginative space for a moment because of the ability to engage fully with the digital environment and step away from their real-life routines and mandates (Neuburger & Egger, 2017).

The second facet of personal escapism experience is personalization experience. This experience comes from the expectation of visitors to seek customized and tailored experiences rather than ordinary and homogenous tourism products (Brunner-Sperdin, 2008). It is the reflection of the desires of visitors for individuality and uniqueness in the digital museum (Morrison et al., 2017). Visitors believed the digital museum tour is a "tailored experience" and the digital museum visit made them feel they were "unique customer."

The two facets together constitute the framework of personal escapism experience, and they provide inspiration for designating experience. In other words, it is necessary to premeditate escapism and personalized experience for visitors to be competitive among other museums by providing special and unique museum products.

5.1.3 Localness Experience

Localness is the third dimension of the digital museum's experience. Localness experience have the lowest mean (4.10), and it explains a small amount of percentage of the variance (18.4%). This experience stressed the level of how visitors "engage with local people" and "perceived the local Japanese culture." It is consistent with the localness experiencescape of the eight-dimensional model, which indicates the experience of understanding the local culture, history, local people, or local societal norms (Mokhtar & Kasim, 2011). The localness experience alludes to the demand of authenticity in the local destination (Morrison et al., 2017). In the digital museum, localness experience is experienced due to the distinctive exhibitions showcasing local art. To some extent, localness experience is beneficial for building destination image (Mokhtar & Kasim, 2011; Stephenson, 2014). Consequently, helping visitors feel being local could be considered an effective approach to market the destination to current and potential visitors.

5.1.4 Lacking Educational and Communitas Experiences

Digital museum visitor experiences were lacking the educational and communitas experiences. The reason behind the absence of an educational experience may be a result of the trend for museums to enhance their entertainment functions to offer a more appealing experience to visitors (Sylaiou et al., 2010). Information type could also make a difference in museum context. Dynamic verbal cues provided higher perceived experiential value in an AR museum as verbal cues had a significant effect on visitors' aesthetic experience (He et al., 2018). Moreover, the absence of educational experience may lie in the video contents showed to respondents. The videos acquired from the official YouTube channel may capture less educational exhibitions or information to some extent. Therefore, the respondents may not have been able to give enough

feedback of educational experience of the digital museum due to the perception of video watching.

Contrary to my expectations, the communitas experience was not present in the research findings, which is inconsistent with previous literature (Vermeeren et al., 2018). The missing communitas experience may result from the special conditions to satisfy the touristic communitas, including equality, acceptance, and the ludic nature of interaction (Kim & Jamal, 2007; Ryu, Hyun, & Shim, 2015). However, these conditions are hard to present through a short video with a written description to some degree. Also, communitas refers to the phenomenon that tourists can become friends or family with each other or locals and experience interpersonal authenticity (Wang, 1999). Nevertheless, the online survey was not equipped with the conditions to allow participants to interact with each other and achieve communitas.

5.1.5 Impacts of Emotional State and Sense of Presence

This research also examined the influence of emotional state and sense of presence. The positive impact of emotional state on joviality experience is consistent with previous researches that indicated emotion is the strong predictor to experience (Hosany et al., 2015; Howard & Gengler, 2001; Kim & Fesenmaier, 2015; Rahmani et al., 2019; Tung & Ritchie, 2011). Contrary to my expectations, the findings did not reveal a significant influence of emotional state on personal escapism experience. Several reasons may explain why emotional state had an insignificant impact on personal escapism experience. First, the personal escapism experience existed because the special museum products, and it can be observed or perceived by the visitors no matter what emotion they have in the certain environment. Although they may not notice their emotions at that moment, the escapism and personalization experience are truly interpreted through the exhibitions or special service encounters. Second, the survey was distributed in an

online platform using the scenario-based research design, thus, the quality of video watching may have presented various outcomes. Given that emotions emerged only with certain situation modifications, attention deployments, and cognitive reframing of a situation (Hofmann, Carpenter, & Curtiss, 2016), 30-second videos may be too short to trigger enough emotional feeling for respondents in this research. Due to the relatively strict conditions to form a certain emotion and the variety of results of escapism and personalization experiences, it is hard to define an exact impact of emotional state and personal escapism experience.

Although previous researchers found that emotions contributed to the structure of place attachment for a destination (Hosany et al., 2017), this research verified the negative impact of emotional state on localness experience. This negative relationship may result from the objection of localness. Localness is defined as the objective reflection of local culture, people, and society, while emotion was summarized as involving a coherent reaction towards covariation of subjective experience and physiology (Brown et al., 2019). Therefore, localness experience depends on the perceived degree of understanding of the local culture, people, and society rather than the fluctuation of internal sentiments and feelings. In other words, when visitor maintain a low level of emotional state, they may perceive the authenticity of local scenario without some biases. This could serve as the explanation of why this study demonstrate a negative impact of emotional state and localness experience.

This research proved that sense of presence has a significant impact on the joviality, personal escapism and localness experiences (Jung et al., 2016; Sylaiou et al., 2010; Tussyadiah et al., 2018; Wei et al., 2019), which found that a high level of presence results in positive visitors' esthetic, entertainment, and escape experience, overall enjoyment, likeness, preference, and interest in the destination.

5.1.6 Impact of Multisensory Cues on Experience and the Mediation Effects

This research explored the difference between multisensory cues on visitor experiences and revealed the highest experience level in Scenario 1 that contained visual and auditory cues. This finding is supported by the result of previous research on visual and auditory cues that found that these cues could provide absorbing virtual experience (Li, Daugherty, & Biocca 2002; Yim, Chu, & Sauer 2017). Nevertheless, previous researchers also assert the usefulness of haptic cues and taste cues (Huang & Liao, 2017; Levent & Pascual-Leone, 2014; Miotto, 2016; Ramsamy et al., 2006; Verbeek & van Campen, 2013; Vi et al., 2017). The reason why the scenarios in this study using haptic and taste cues led to lower experience scores may lie in the conflicts between realness of haptic and taste cues and the virtuality of videos to stimulate real situations. Short videos have shortcomings including a low resolution of reality, a limited field-of-view, and user disorientation to some extent (Van & Poelman, 2007). Provided the shortcomings of video stimulation, respondents could not fully imagine the given scenario consistently with the real environment, especially given that haptic and taste cues are truly touch-based senses.

Finally, the mediation effect was confirmed to be useful in understanding the impact of multisensory cues on experience. The results represented a strong support of research that has ascertained the positive relationship between multisensory cues on emotional state (Agapito et al., 2017; Ghosh & Sarkar, 2016; Isacsson et al., 2009; Schifferstein et al., 2013), the positive relationship between multisensory cues on presence (Animesh et al., 2011; Brade et al., 2017; Gonçalves et al., 2019; Klein, 2003; Nah, Eschenbrenner, & Dewester 2011; Ramsamy et al., 2006), the positive influence of emotional state (Gnoth, & Mather, 2019; Hosany et al., 2015; Howard & Gengler, 2001; Kim & Fesenmaier, 2015; Tung, & Ritchie, 2011), and sense of presence (Jung et al., 2016; Tussyadiah et al., 2018).

5.2 Theoretical Implications

In recent years, there is an increase interests in research about visitor experiences in museum because of the trend in traditional museums adopting new technologies to cater to the various demands of visitors and to enhance the hedonistic value of museum trips (Mirghadr et al., 2018; Yang et al., 2015). Studies in traditional museums using new technologies were based on the original experience economy model of Pine and Gilmore (1999). According to Mody et al.'s (2017) research, there is an expansion of experiencescape taking place to include new factors. However, the new eight-dimensional experiencescape model was proposed for accommodation experiences. Therefore, through the exploratory factor analysis and confirmatory factor analysis using the eight-dimensional experiencescape model, this study presented theoretical implications that further the literature on visitor experience perceptions of the digital museum by providing a valid measurement. It is evident that these experience perceptions could support museum researches to examine the underlining dimensions of an effective digital museum visitor experience in a systematical and comprehensive way.

As demonstrated in literature review sections, previous researches mainly focused on visitor experience of traditional museum with or without the applications of new technologies. The brand new digital museum visitor experience has received less research attention. This research is inspired by the need to ascertain the underlying construct for digital museum experience and thus contributing to the new practice in museum industry. The result of this research presented a conceptual three factor structure including joviality, personal escapism and localness, which provided an extension of existing museum experience identified by previous literature. Compared with the experience economy realm (Pine & Gilmore, 1999), this three-factor structure captured more subdimensions of visitor experience, which expanded the knowledge of museum experience. Compared with eight-dimensional experiencescape model,

the three-factor structure confirmed the usefulness of this model in digital museum context with assured validity and reliability.

Apart from museum experience literature, this research made contributions in other research fields. First, by using emotional state and sense of presence as independent variables, this research made a notable contribution by confirming the impact of emotional state on digital museum visitor experience perception and providing undated findings for the multisensory and experience research literature. The results of this study contribute to the literature on emotional cues by exploring the effect of emotional state on joviality experience of a digital museum. This research also confirmed the mediating role of emotional state in the relationship between multisensory cues and digital museum visitor experience perceptions. The research findings revealed that it is dispensable to consider emotional factors when planning and designing museum environments for joviality experiences of digital museums with multisensory stimuli.

Second, this research contributes to the ongoing process of enhancement of sense of presence in virtual environments due to the confirmed facilitating effect of sense of presence on personal escapism and localness experiences. This research provided empirical evidence for the impact of sense of presence on experience perceptions and the mediating effect. Consequently, it reminds the administrators of digital museums to be conscious of the important role that sense of presence plays as the indicator of personal escapism and localness experiences in the virtual environment with multisensory inputs.

Finally, by demonstrating the superior effect of visual and auditory cues compared with other cues, this research advanced the implementation of multisensory cues of the digital museum. This is the first literature to demonstrate the usefulness of visual and auditory cues in the digital museum. It provides a strong support that using visual and auditory cues could create

a higher experience level, which in turn increases the visiting engagement level of visitors in the digital museum.

This research provided significant results for the initial structure of digital museum visitor experience. Insights into visitor experiences are enhanced, and the knowledge of the direct and indirect impact of multisensory cues, emotional state, and sense of presence is enriched. Therefore, the findings of this research may be inspirational to the study of the dimensional experience in the digital museum context.

5.3 Practical Implications

This research has practical implications because the findings addressed crucial understandings about experience design, experience management and marketing strategies for digital museums from museum practitioners' perspective.

In terms of museum experience design, this research provides feasible approaches for generating memorable and remarkable museum experience by identifying the three-factor structure of digital museum visitor experience. During the experience design process, it is crucial for museums to present elements with their own characteristic especially for the commercial-oriented museums. For example, museums could use technical elements that consistent with their exhibitions or the city they located. To be specific, the first experience perception that experience designers need to carefully consider is joviality experience. In order to provide high level of joviality experience, emotional state deserves deeper consideration. Activities, service encounters, technologies that can increase visitors' emotional state are worth to investing and applying. Furthermore, when considering positive emotions, it is an acceptable approach for digital museums to focus on and combine interesting and entertaining exhibitions during museum tours and to avoid offensive or uncomfortable content. Besides, increasing sense of

presence can contribute to the enhancement of joviality experience level. With the purposes of increasing personal escapism and localness experience, virtual reality and augmented reality that elicit enhanced presence level are of benefit to the creation of an immersive and engaging environment for visitors to develop their sense of existence in the environment. Moreover, it is imperative for experience designer to consider providing attractive visual stimuli and appealing background music for better experience level.

In terms of experience management, museums managers need to take a holistically integrated approach to creating a memorable and long-lasting experience through diverse and sequential stages of experience. Using appropriate multisensory cues to facilitate emotional state and sense of presence, museums can create an immersive and interactive atmosphere to improve overall experience perception. By adjusting emotional state and sense of presence of visitors, digital museums could transfer the museum experience into delightful art experience with the increase of immersion level. Apart from designing museum experience unilaterally, it is necessary for museum managers to take the co-creation process of experience into consideration within the interaction between visitors and external encounters in digital museums, which can lead to a sustainable experience that can be life transforming or perspective transforming (Hwang & Seo, 2016). As a consequence, the enhanced experience perceptions will transfer to the revisit and recommendation intentions.

In terms of marketing strategies, the results recommended that marketers could take advantage of suitable multisensory cues with the purpose of arousing higher destination experience for the visitors. Given the findings that different multisensory cues have different influence on experience perception, this study infers that using appropriate sensory strategies on virtual and auditory cues may enhance experience perceptions of digital museum visitors.

Sensory marketing strategies incorporated with higher emotional state and sense of presence are considered as the helpful tools to differentiate a museum from its competitors. Virtual and auditory cues are believed to have the strongest impact on visitors' overall experience. This research notes that it is feasible for managers to deploy appropriate multisensory cues in their museums in order to provide diverse stimuli. Marketers can not only increase the quantity and expand the class of visual and auditory cues, but they can also optimize and upgrade certain cues by exploiting new technologies or other interactive designs. Post visit experience is another focus of museum marketing. Social media is an appropriate choice for museum marketers to keep in touch with visitors by posting recent news and positive visitors' feedbacks. Furthermore, the three-factor structure also provide insight of museum positioning. With the increasingly fierce competition in museum industry (Belenioti & Vassiliadis, 2017), understanding the visitor experience could help museum marketers to clarify its targeted visitors. By providing differential exhibitions delivered multiple experience, digital museum could earn special market share and make themselves more competitive. Ultimately, visitors could deepen their impressions and memories by experiencing multisensory cues during their visit and interacting with others using social media after their visit.

As such, the results offer valuable information for museum practitioners to consider during the decision-making process. Findings in this research provide guideline for museum practitioners to transfer informative results into lucrative and pleasant outcomes as well as to distinguish their museums from the competitors.

5.4 Limitations and Future Research

Admittedly, empirical results of this research should be considered in the light of some potential limitations. First, this research is based on the Mori digital art museum located in Japan.

This museum provided only digital paintings in Japanese style. However, other museum type such as historical and natural museums are excluded in this research. Therefore, this limitation call for in-depth research regarding the digital museum visitor experience with diverse museum cases. The second limitation is related to sample size. Due to the limited budget, this research collected data from 399 participants for running models. With the spilt approach, 249 pieces of data with 37 items of measurement used for the structural equation modeling is not enough to meet the standardized rule of 10 in SEM, which is determined as the adequacy of sample for generating significant outcomes and powerful tests (Westland, 2010). Although this research satisfied the 5:1 guideline ratio for model testing, the results may turn out to be insignificant for certain variables to some extent (Bentler & Chou, 1987; Wolf et al., 2013). Thirdly, this study analyzed museum experiences with only quantitative data. However, qualitative data collected with an open-ended survey question could give more insights of digital museum visitor experience perceptions. The last limitation concerns the research design utilizing videos to stimulate the real multisensory environment for respondents through an online survey platform. Given the geographical restrictions and language barrier with the digital museum in Japan, this research used videos and online surveys rather than field study. Although previous researchers claimed that videos are acceptable stimuli in generating consumers' imagery and Amazon MTurk is a widely used online crowdsourcing option in social science (Cheung et al., 2017; Kim, Kim, & Bolls, 2014), conducting the survey for the visitor who actually visited the digital museum is recommended for analyzing visitor experience for future research.

This current study only took multisensory cues, emotional state, and sense of presence into account for the exploration of visitor experience. Future studies could consider the role of situational factors potentially affecting visitor experience at the digital museum, including

seasonal limited displays in the museum, length of the tour, and social interactions like companionship (Lehto, 2013). In addition, this research used the PAD model as the measurement of emotion, which only measures positive emotion (S. Li et al., 2015). However, emotion could also be negative like anger, disappointment, or stressful. Future researchers may consider opportunities to study negative emotion and use psychophysiological methodologies, such as eye tracking or heart rate response as alternative measurements for examining visitors' emotion. These methods could be of great importance to implement impact research. Also, the motivations and benefits sought by visitors in digital museums deserve more attention. Understanding visitors' motivations and benefits is beneficial for museum managers and curators to improve museum design, management, and marketing. Apart from the digital museum experience, it is of interest to compare experiences in digital museums and traditional museums that have applied new technologies. This research could be considered as guidance for future museum management and decision makers for technology investment.

REFERENCES

Agapito, D., Mendes, J., & Valle, P. (2013). Exploring the conceptualization of the sensory dimension of tourist experiences. *Journal of Destination Marketing & Management*, *2*(2), 62-73.

Agapito, D., Pinto, P., & Mendes, J. (2017). Tourists' memories, sensory impressions and loyalty: In loco and post-visit study in Southwest Portugal. *Tourism Management*, *58*, 108-118.

Agapito, D., Valle, P., & Mendes, J. (2014). The sensory dimension of tourist experiences: Capturing meaningful sensory-informed themes in Southwest Portugal. *Tourism Management*, *42*, 224-237.

Aldrich, J. O. (2018). *Using IBM® SPSS® Statistics: An interactive hands-on approach*. Thousand Oaks, CA: Sage.

Anderson, M. J. (2001). A new method for non-parametric multivariate analysis of variance. *Austral Ecology*, *26*, 32-46.

Bagozzi, R. P., Gopinath, M., & Nyer, P. U. (1999). The role of emotions in marketing. *Journal of the Academy of Marketing Science*, *27*, 184-206.

Baños, R. M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and emotion: their impact on the sense of presence. *Cyberpsychology & Behavior*, *7*, 734-741.

Barron, P., & Leask, A. (2017). Visitor engagement at museums: Generation y and ‘lates’ events at the national museum of Scotland. *Museum Management and Curatorship, 32*(3), 1-18.

Barsky, J., & Nash, L. (2002). Evoking emotion: Affective keys to hotel loyalty. *Cornell Hotel and Restaurant Administration Quarterly*, *43*, 39-46.

Belenioti, Z. C., & Vassiliadis, C. A. (2017). Branding in the new museum era. In *Strategic Innovative Marketing*, 115-121. Springer, Cham.

Bideci, M., & Albayrak, T. (2018). An investigation of the domestic and foreign tourists' museum visit experiences. *International Journal of Culture, Tourism and Hospitality Research*, *12*, 366-377.

Bigné, J. E., Andreu, L., & Gnoth, J. (2005). The theme park experience: An analysis of pleasure, arousal and satisfaction. *Tourism Management, 26*, 833-844.

Bogicevic, V., Seo, S., Kandampully, J. A., Liu, S. Q., & Rudd, N. A. (2019). Virtual reality presence as a preamble of tourism experience: The role of mental imagery. *Tourism Management*, *74*, 55-64.

Bonnefoy-Claudet, L., & Ghantous, N. (2013). Emotions' impact on tourists' satisfaction with ski resorts: The mediating role of perceived value. *Journal of Travel & Tourism Marketing, Marketing*, *30*, 624-637.

Brown, T. A. (2014). *Confirmatory factor analysis for applied research*. New York, NY: Guilford.

Brunner-Sperdin, A. (2008). Experience products in hospitality and tourism. Successful staging and quality measurement. Berlin: Erich Schmidt Verlag.

Brunner-Sperdin, A., Peters, M., & Strobl, A. (2012). It is all about the emotional state: Managing tourists' experiences. *International Journal of Hospitality Management*, *31*, 23-30.

Buhalis, D., & Amaranggana, A. (2015). Smart tourism destinations enhancing tourism experience through personalisation of services. *In Information and communication technologies in tourism 2015*, 377-389. Springer, Cham.

Bystrom, K. E., Barfield, W., & Hendrix, C. (1999). A conceptual model of the sense of presence in virtual environments. *Presence: Teleoperators & Virtual Environments, 8*, 241-244.

Campos, A. C., Mendes, J., Valle, P. O. D., & Scott, N. (2018). Co-creation of tourist experiences: A literature review. *Current Issues in Tourism*, *21*(4), 369-400.

Cavagnaro, E., Staffieri, S., & Postma, A. (2018). Understanding millennials' tourism experience: Values and meaning to travel as a key for identifying target clusters for youth (sustainable) tourism. *Journal of Tourism Futures, 4*, 31-42

Chamberlain, L., & Broderick, A. J. (2007). The application of physiological observation methods to emotion research. *Qualitative Market Research: An International Journal*, *10*, 199-216.

Chan, J. K. L. (2013). The consumption of museum service experiences: Benefits and value of museum experiences. In *Marketing of Tourism Experiences* (pp. 81-104). Routledge.

Chang, H. L., Shih, Y. C., Wang, K., Tsaih, R. H., & Lin, Z. (2018). Using Virtual Reality for Museum Exhibitions: The Effects of Attention and Engagement for National Palace Museum. In *PACIS*.

Chebat, J.-C., & Michon, R. (2003). Impact of ambient odors on mall shoppers' emotions, cognition, and spending: A test of competitive causal theories. *Journal of Business Research, 56*, 529 – 539.

Cheung, J. H., Burns, D. K., Sinclair, R. R., & Sliter, M. (2017). Amazon Mechanical Turk in organizational psychology: An evaluation and practical recommendations. *Journal of Business and Psychology*, *32*, 347-361.

Chiou, C. K., Tseng, J. C., Hwang, G. J., & Heller, S. (2010). An adaptive navigation support system for conducting context-aware ubiquitous learning in museums. *Computers & Education, 55*, 834-845.

Chronis, A. (2012). Tourists as story-builders: Narrative construction at a heritage museum. *Journal of Travel & Tourism Marketing, 29*, 444-459.

Chung, N., Lee, H., Kim, J. Y., & Koo, C. (2018). The role of augmented reality for experience-influenced environments: the case of cultural heritage tourism in Korea. *Journal of Travel Research, 57*, 627-643.

Ciolfi, L., & Bannon, L. (2002, September). Designing Interactive Museum Exhibits: Enhancing visitor curiosity through augmented artefacts. *In Eleventh European Conference on Cognitive Ergonomics*.

Coghlan, A., & Pearce, P. (2010). Tracking affective components of satisfaction. *Tourism and Hospitality Research*, *10*, 42-58.

Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, *43*, 245-265.

Dash, P. C., & Samantaray, M. N. (2018). Exploring determinants of a successful tourism experience–the Nabakalebara event. *International Journal of Event and Festival Management, 9*, 104-119.

Dattolo, A., & Luccio, F. L. (2008, May). Visualizing personalized views in virtual museum tours. In *2008 Conference on Human System Interactions* (pp. 109-114). IEEE.

Diemer, J., Alpers, G. W., Peperkorn, H. M., Shiban, Y., & Mühlberger, A. (2015). The impact of perception and presence on emotional reactions: a review of research in virtual reality. *Frontiers in Psychology*, *6*. 26.

Duff, W., Carter, J., Dallas, C., Howarth, L., Ross, S., Sheffield, R., & Tilson, C. (2009). The changing museum environment in North America and the impact of technology on museum work. Proceedings: Cultural Heritage online. *Empowering Users: An Active Role for User Communities*, 103-107.

Economou, M. (2008). A world of interactive exhibits. *Museum Informatics: People, Information, and Technology in Museums, 2*, 137-156.

Eimer, M. (2004). Multisensory integration: how visual experience shapes spatial perception. *Current biology*, *14*(3), 115-117.

Falco, F. D., & Vassos, S. (2017). Museum experience design: a modern storytelling methodology. *Design Journal*, 20(Supp. 1), S3975-S3983.

Fontaine, J. (2013). The dimensional, basic, and componential emotion approaches to meaning in psychological emotion research. In J. Fontaine, K. Scherer, & C. Soriano (Eds.) *Components of emotional meaning: A sourcebook*, 31-45. Oxford University Press.

Gao, J., Kerstetter, D. L., Mowen, A. J., & Hickerson, B. (2018). Changes in tourists' perception of well-being based on their use of emotion regulation strategies during vacation. *Journal of Travel & Tourism Marketing*, *35*, 567-582.

Han, H., & Back, K. J. (2007). Assessing customers' emotional experiences influencing their satisfaction in the lodging industry. *Journal of Travel & Tourism Marketing*, *23*, 43-56.

Harada, T., Hideyoshi, Y., Gressier-Soudan, E., & Jean, C. (2018). Museum experience design based on multi-sensory transformation approach. *In DS92: Proceedings of the DESIGN 2018 15th International Design Conference*, 2221-2228.

Harrington, D. (2009). *Confirmatory factor analysis*. New York, NY: Oxford University Press.

Hashim, A. F., Taib, M. Z. M., & Alias, A. (2014). The integration of interactive display method and heritage exhibition at museum. *Procedia-Social and Behavioral Sciences*, 153, 308-316.

He, Z., Wu, L., & Li, X. R. (2018). When art meets tech: The role of augmented reality in enhancing museum experiences and purchase intentions. *Tourism Management, 68*, 127-139.

Heeter, C. (1992). Being there: The subjective experience of presence. *Presence: Teleoperators & Virtual Environments, 1*, 262-271.

Hirschman, E. C. (1984). Experience seeking: A subjectivist perspective of consumption. *Journal of Business Research, 12*, 115-136.

Hofmann, S. G., Carpenter, J. K., & Curtiss, J. (2016). Interpersonal emotion regulation questionnaire (IERQ): Scale development and psychometric characteristics. *Cognitive therapy and research*, *40*(3), 341-356.

Hong, J. C., Hwang, M. Y., Tai, K. H., & Kuo, Y. C. (2016). Crystallized intelligence affects hedonic and epistemic values to continue playing a game with saliency-based design. *Computers & Education, 95*, 75-84.

Hosany, S. (2016). The effects of self-image congruence, tourists' experiences and satisfaction on behavioral intention. *Travel and Tourism Research Association: Advancing Tourism Research Globally*. 4.

Hosany, S., & Gilbert, D. (2010). Measuring tourists' emotional experiences toward hedonic holiday destinations. *Journal of Travel Research*, *49*, 513-526.

Hosany, S., Prayag, G., Deesilatham, S., Cauševic, S., & Odeh, K. (2015). Measuring tourists' emotional experiences: Further validation of the destination emotion scale. *Journal of Travel Research*, *54*, 482-495.

Howard, D. J., & Gengler, C. (2001). Emotional contagion effects on product attitudes. *Journal of Consumer Research*, *28*, 189-201.

Huang, M., Ali, R., & Liao, J. (2017). The effect of user experience in online games on word of mouth: A pleasure-arousal-dominance (PAD) model perspective. *Computers in Human Behavior*, *75*, 329-338.

Huang, S., & Gross, M. J. (2010). Australia's destination image among mainland Chinese travelers: An exploratory study. *Journal of Travel & Tourism Marketing*, *27*(1), 63-81.

Huang, Y. M., Liu, C. H., Lee, C. Y., & Huang, Y. M. (2012). Designing a personalized guide recommendation system to mitigate information overload in museum learning. *Journal of Educational Technology & Society*, *15*, 150-166.

Hwang, J., & Seo, S. (2016). A critical review of research on customer experience management: Theoretical, methodological and cultural perspectives. *International Journal of Contemporary Hospitality Management*, *28*, 2218-2246.

IJsselsteijn, W. A., De Ridder, H., Freeman, J., & Avons, S. E. (2000). Presence: concept, determinants, and measurement. In *Human vision and electronic imaging V* ,3959, 520-529. International Society for Optics and Photonics.

Ikei, Y., Shimabukuro, S., Kato, S., Komase, K., Hirota, K., Amemiya, T., & Kitazaki, M. (2015, August). Experience simulator for the digital museum. *In International Conference on Human Interface and the Management of Information*, 436-446. Springer, Cham.

Izard, C. E. (2013). *Human emotions*. New York, NY: Springer Science & Business Media.

Jang, S. S., & Namkung, Y. (2009). Perceived quality, emotions, and behavioral intentions: Application of an extended Mehrabian–Russell model to restaurants. *Journal of Business Research*, *62*, 451-460.

Jose, P. E. (2013). *Doing statistical mediation and moderation*. New York, NY: Guilford Press.

Jung, T., Chung, N., & Leue, M. C. (2015). The determinants of recommendations to use augmented reality technologies: The case of a Korean theme park. *Tourism management*, *49*, 75-86.

Jung, T., tom Dieck, M. C., Lee, H., & Chung, N. (2016). Effects of virtual reality and augmented reality on visitor experiences in museum. *In Information and Communication Technologies in Tourism 2016* (pp. 621-635). Springer, Cham.

Kaptelinin, V. (2011). Designing technological support for meaning making in museum learning: an activity-theoretical framework. *In System Sciences (HICSS), 2011 44th Hawaii International Conference on*. 1-10. IEEE.

Kastenholz, E., & Lima, J. (2012). The integral rural tourism experience from the tourist's point of view–a qualitative analysis of its nature and meaning. *Tourism & Management Studies*, *7*, 62-74.

Kim, H. C., Chua, B. L., Lee, S., Boo, H. C., & Han, H. (2016). Understanding airline travelers' perceptions of well-being: The role of cognition, emotion, and sensory experiences in airline lounges. *Journal of Travel & Tourism Marketing*, *33*, 1213-1234.

Kim, J., & Fesenmaier, D. R. (2015). Measuring emotions in real time: Implications for tourism experience design. *Journal of Travel Research*, *54*, 419-429.

Kim, J., Ritchie, J., & McCormick, B. (2012). Development of a scale to measure memorable tourist experience. *Journal of Travel Research*, 51, 12-25.

Kim, T., & Biocca, F. (1997). Telepresence via television: Two dimensions of telepresence may have different connections to memory and persuasion. *Journal of Computer-Mediated Communication, 3*, JCMC325.

Kosmopoulos, D., & Styliaras, G. (2018). A survey on developing personalized content services in museums. *Pervasive and Mobile Computing*.

Krishna, A. (2012). An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior. *Journal of consumer psychology*, *22*(3), 332-351.

Lazarus, R. S. (1991). Cognition and motivation in emotion. *American Psychologist*, *46*, 352-367.

Ledford, A. K. (2015). *Applying the experience economy framework to better understand the visitor experience at the Natural History Museum of Utah*. The University of Utah.

Lee, J., Kyle, G., & Scott, D. (2012). The mediating effect of place attachment on the relationship between festival satisfaction and loyalty to the festival hosting destination. *Journal of Travel Research*, *51*, 754-767.

Lee, K. M. (2004). Presence, explicated. *Communication Theory, 14*, 27-50.

Levent, N., & Pascual-Leone, A. (Eds.). (2014). *The multisensory museum: Cross-disciplinary perspectives on touch, sound, smell, memory, and space.* Lanham, MD: Rowman & Littlefield.

Li, L., Hasegawa, K., Fukumori, T., Wakita, W., Tanaka, S., Nishiura, T., . . . Tanaka, H. T. (2014, June). Digital museums of cultural heritages in Kyoto: The Gion Festival in a virtual space. *In International Conference on Human Interface and the Management of Information* (pp. 523-534). Springer, Cham.

Li, S., Scott, N., & Walters, G. (2015). Current and potential methods for measuring emotion in tourism experiences: A review. *Current Issues in Tourism*, *18*, 805-827.

Litman, J. A. (2008). Interest and deprivation factors of epistemic curiosity. *Personality and Individual Differences, 44*, 1585-1595.

Litwin, M. S. (1995). *How to measure survey reliability and validity* (Vol. 7). Thousand Oaks, CA: Sage.

Lo, A. S., & Wu, C. (2014). Effect of consumption emotion on hotel and resort spa experience. *Journal of Travel & Tourism Marketing*, *31*, 958-984.

Loureiro, S. M. C. (2014). The role of the rural tourism experience economy in place attachment and behavioral intentions. *International Journal of Hospitality Management*, *40*, 1-9.

Ma, J., Scott, N., Gao, J., & Ding, P. (2017). Delighted or satisfied? Positive emotional responses derived from theme park experiences. *Journal of Travel & Tourism Marketing*, *34*, 1-19.

Malone, S., McKechnie, S., & Tynan, C. (2018). Tourists' emotions as a resource for customer value creation, cocreation, and destruction: A customer-grounded understanding. *Journal of Travel Research*, *57*, 843-855.

Martins, J., Gonçalves, R., Branco, F., Barbosa, L., Melo, M., & Bessa, M. (2017). A multisensory virtual experience model for thematic tourism: A Port wine tourism application proposal. *Journal of destination marketing & management*, *6*(2), 103-109.

Marty, P. F. (2008). Museum websites and museum visitors: digital museum resources and their use. *Museum Management and Curatorship, 23*, 81-99.

Mauss, I. B., & Robinson, M. D. (2009). Measures of emotion: A review. *Cognition and Emotion*, *23*, 209-237.

Mazaheri, E., Richard, M. O., & Laroche, M. (2011). Online consumer behavior: Comparing Canadian and Chinese website visitors. *Journal of Business Research*, *64*, 958-965.

Mirghadr, L., Farsani, N. T., Shafiei, Z., & Hekmat, M. (2018). Identification of key components of visitor education in a museum. *Museum Management and Curatorship, 33*, 223-234.

Mody, M. A., Suess, C., & Lehto, X. (2017). The accommodation experiencescape: A comparative assessment of hotels and Airbnb. *International Journal of Contemporary Hospitality Management, 29*, 2377-2404.

Mody, M. A., Suess, C., & Lehto, X. (2019). Going back to its roots: Can hospitableness provide hotels competitive advantage over the sharing economy? *International Journal of Hospitality Management, 76*, 286-298.

Morgan, J. (2017). The multisensory museum. (United Kingdom), J. (2022). The Multisensory Museum. *Bulletin of The Institute Of Ethnography SASA, 60*(1), 65-77. Retrieved from http://www.ei.sanu.ac.rs/index.php/gei/article/view/421

Morrison, M. A., Lehto, Y. X., & Day, G. J. (2017). *The tourism system* (8th ed). 298.

No, E., & Kim, J. K. (2015). Comparing the attributes of online tourism information sources. *Computers in Human Behavior*, *50*, 564-575.

Oates, G. (2015a). Evolution of local in hospitality in 2015. Retrieved from https://trends.skift.com/trend/ evolution-of-local-in-hospitality-in-2015/

Oatley, K., & Johnson-Laird, P. N. (2014). Cognitive approaches to emotions. *Trends in Cognitive Sciences*, *18*, 134-140.

Oh, H., Fiore, A. M., & Jeoung, M. (2007). Measuring experience economy concepts: Tourism applications. *Journal of travel research*, *46*, 119-132.

Pallud, J. (2017). Impact of interactive technologies on stimulating learning experiences in a museum. *Information & Management, 54*, 465-478.

Park, S. B., Kim, H. J., & Ok, C. M. (2018). Linking emotion and place on Twitter at Disneyland. *Journal of Travel & Tourism Marketing*, *35*, 664-677.

Pine, B. J., II, & Gilmore, J. (1999). The experience economy: Work is theatre and every business a stage. Cambridge, MA: Harvard Business School Press.

Prayag, G., Hosany, S., Muskat, B., & Del Chiappa, G. (2017). Understanding the relationships between tourists' emotional experiences, perceived overall image, satisfaction, and intention to recommend. *Journal of Travel Research*, *56*, 41-54.

Quadri-Felitti, D., & Fiore, A. M. (2012). Experience economy constructs as a framework for understanding wine tourism. *Journal of Vacation Marketing*, *18*, 3-15.

Radder, L., & Han, X. (2015). An examination of the museum experience based on Pine and Gilmore's experience economy realms. *Journal of Applied Business Research, 31*, 455-470.

Rahmani, K., Gnoth, J., & Mather, D. (2019). A psycholinguistic view of tourists' emotional experiences. *Journal of Travel Research*, *58*, 192-206.

Ramaswamy, V., & Ozcan, K. (2018). What is co-creation? An interactional creation framework and its implications for value creation. *Journal of Business Research*, *84*, 196-205.

Ramayah, T., Yeap, J. A., & Ignatius, J. (2013). An empirical inquiry on knowledge sharing among academicians in higher learning institutions. *Minerva*, *51*, 131-154.

Raptis, G. E., Fidas, C., & Avouris, N. (2018). Effects of mixed-reality on players' behaviour and immersion in a cultural tourism game: A cognitive processing perspective. *International Journal of Human Computer Studies, 114*, 69-79.

Rentschler, R. (2007). Museum marketing: Understanding different types of audiences. In R. Sandell & R. R. Janes (Eds.), *Museum Management and Marketing* (pp. 345-365). Abingdon: Routledge.

Richins, M. L. (1997). Measuring emotions in the consumption experience. *Journal of Consumer Research*, *24*, 127-146.

Rocchi, C., Stock, O., Zancanaro, M., Kruppa, M., & Krüger, A. (2004, January). The museum visit: generating seamless personalized presentations on multiple devices. In *Proceedings of the 9th international conference on Intelligent user interfaces* (pp. 316-318). ACM.

Roth, C., Vermeulen, I., Vorderer, P., Klimmt, C., Pizzi, D., Lugrin, J. L., & Cavazza, M. (2012). Playing in or out of character: user role differences in the experience of interactive storytelling. *Cyberpsychology, Behavior, and Social Networking, 15*, 630-633.

Rowley, J. (1999). Measuring total customer experience in museums. *International journal of contemporary Hospitality management*, *11*(6), 303-308.

Ruiz, J. P., Chebat, J. C., & Hansen, P. (2004). Another trip to the mall: a segmentation study of customers based on their activities. *Journal of Retailing and Consumer Services*, *11*, 333-350.

Ruiz-Alba, J. L., Nazarian, A., Rodríguez-Molina, M. A., & Andreu, L. (2019). Museum visitors' heterogeneity and experience processing. *International Journal of Hospitality Management*, *78*, 131-141.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*, 1161–1178

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *Journal of Educational Research*, *99*, 323-338.

Schubert, T. W., Friedmann, F., & Regenbrecht, H. T. (1999, April). Decomposing the sense of presence: Factor analytic insights. *In 2nd international workshop on presence* (Vol. 1999).

Schubert, T. W., Friedmann, F., & Regenbrecht, H. (2001). The experience of presence: Factor analytic insights. *Presence: Teleoperators & Virtual Environments, 10*, 266-281.

Schuemie, M. J., Van Der Straaten, P., Krijn, M., & Van Der Mast, C. A. (2001). Research on presence in virtual reality: A survey. *CyberPsychology & Behavior*, *4*, 183-201.

Seth, A. K., Suzuki, K., & Critchley, H. D. (2012). An interoceptive predictive coding model of conscious presence. *Frontiers in Psychology*, *2*, 395.

Sharma, P., & Nayak, J. K. (2018). Testing the role of tourists' emotional experiences in predicting destination image, satisfaction, and behavioral intentions: A case of wellness tourism. *Tourism Management Perspectives*, *28*, 41-52.

Shen, A., & Ball, A. D. (2009). Is personalization of services always a good thing? Exploring the role of technology-mediated personalization (TMP) in service relationships. *Journal of Services Marketing, 23*, 80-92.

Sheng, C. W., & Chen, M. C. (2012). A study of experience expectations of museum visitors. *Tourism Management, 33*, 53-60.

Sheridan, T. B. (1999). Descartes, Heidegger, Gibson, and God: toward an eclectic ontology of presence. *Presence*, *8*, 551-559.

Shoval, N., Schvimer, Y., & Tamir, M. (2018). Tracking technologies and urban analysis: Adding the emotional dimension. *Cities*, *72*, 34-42.

Sidali, K. L., Kastenholz, E., & Bianchi, R. (2015). Food tourism, niche markets and products in rural tourism: Combining the intimacy model and the experience economy as a rural development strategy. *Journal of Sustainable Tourism*, *23*, 1179-1197.

Slater, A. (2007). 'Escaping to the gallery': understanding the motivations of visitors to galleries. *International Journal of Nonprofit and Voluntary Sector Marketing, 12*, 149-162.

Small, J., Darcy, S., & Packer, T. (2012). The embodied tourist experiences of people with vision impairment: Management implications beyond the visual gaze. *Tourism Management*, *33*(4), 941-950.

Song, J., & Qu, H. (2017). The mediating role of consumption emotions. *International Journal of Hospitality Management*, *66*, 66-76.

Song, H. J., Lee, C. K., Park, J. A., Hwang, Y. H., & Reisinger, Y. (2015). The influence of tourist experience on perceived value and satisfaction with temple stays: The experience economy theory. *Journal of Travel & Tourism Marketing*, *32*(4), 401-415.

Soren, B. J. (2009). Museum experiences that change visitors. *Museum Management and Curatorship, 24*, 233-251.

Stavropoulos, V., Wilson, P., Kuss, D., Griffiths, M., & Gentile, D. (2017). A multilevel longitudinal study of experiencing virtual presence in adolescence: the role of anxiety and openness to experience in the classroom. *Behaviour & Information Technology, 36*, 524-539.

Steuer, J. (1995). Defining virtual reality: Dimensions determining telepresence. *Communications in the Age of Virtual Reality*, 33-56.

Su, L., Hsu, M. K., & Swanson, S. (2017). The effect of tourist relationship perception on destination loyalty at a world heritage site in China: The mediating role of overall destination satisfaction and trust. *Journal of Hospitality & Tourism Research*, *41*, 180-210.

Sylaiou, S., Mania, K., Karoulis, A., & White, M. (2010). Exploring the relationship between presence and enjoyment in a virtual museum. *International Journal of Human-Computer Studies, 68*, 243-253.

teamLab. (2018). Light Forest Three-dimensional Bouldering / 光の森の 3D ボルダリング [Video]. Retrieved from https://www.youtube.com/watch?v=XY2cvCsmOOc&list=PL-TLQIsBItKKO5NQ3wqIMVzaUT_lNS-s7&index=25&t=0s

teamLab. (2017). EPSON teamLab Borderless, EN TEA HOUSE / チームラボ ボーダレス、EN TEA HOUSE - 幻花亭 [Video]. Retrieved from https://www.youtube.com/watch?time_continue=2&v=_wlvFnEnp0U

teamLab. (2017). Wander through the Crystal World [Video]. Retrieved from https://www.youtube.com/watch?v=htGsCscBRIk&index=5&list=PL-TLQIsBItKKO5NQ3wqIMVzaUT_lNS-s7

tom Dieck, M. C., & Jung, T. H. (2017). Value of augmented reality at cultural heritage sites: A stakeholder approach. *Journal of Destination Marketing & Management, 6*, 110-117.

Torres, E. N., Wei, W., Hua, N., & Chen, P. J. (2019). Customer emotions minute by minute: How guests experience different emotions within the same service environment. *International Journal of Hospitality Management*, *77*, 128-138.

Tsaur, S. H., Luoh, H. F., & Syue, S. S. (2015). Positive emotions and behavioral intentions of customers in full-service restaurants: does aesthetic labor matter?. *International Journal of Hospitality Management*, *51*, 115-126.

Tung, V. W. S., & Ritchie, J. B. (2011). Exploring the essence of memorable tourism experiences. *Annals of Tourism Research*, *38*, 1367-1386.

Tussyadiah, I. P., Wang, D., Jung, T. H., & tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism Management, 66*, 140-154.

Tzortzi, K. (2017). Museum architectures for embodied experience. *Museum Management and Curatorship, 32*(875), 1-18.

Ullman, J. B., & Bentler, P. M. (2003). Structural equation modeling. *Handbook of psychology* (pp. 607-634).

Van Doorn, J., Mende, M., Noble, S. M., Hulland, J., Ostrom, A. L., Grewal, D., & Petersen, J. A. (2017). Domo arigato Mr. Roboto: Emergence of automated social presence in organizational frontlines and customers' service experiences. *Journal of Service Research*, *20*(1), 43-58.

Van Krevelen, D., & Poelman, R. (2007). Augmented reality: Technologies, applications, and limitations. *Vrije Univ. Amsterdam, Dep. Comput. Sci*.

Vermeeren, A. P., Calvi, L., Sabiescu, A., Trocchianesi, R., Stuedahl, D., Giaccardi, E., & Radice, S. (2018). Future museum experience design: crowds, ecosystems and novel technologies. In *Museum Experience Design*, 1-16. Springer, Cham.

Vom Lehn, D., & Heath, C. (2005). Accounting for new technology in museum exhibitions. *International Journal of Arts Management*, 11-21.

Wagler, A., & Hanus, M. D. (2018). Comparing virtual reality tourism to real-life experience: Effects of presence and engagement on attitude and enjoyment. *Communication Research Reports*, 1-9.

Walls, R., 2013. A cross-sectional examination of hotel consumer experience and relative effects on consumer values. *International Journal of Hospitality Management, 32*, 179–192.

Wang, N. (2004). Rethinking authenticity in tourism experience. *Annals of Tourism Research, 26*, 349-370.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063-1070.

Wei, W., Qi, R., & Zhang, L. (2019). Effects of virtual reality on theme park visitors' experience and behaviors: A presence perspective. *Tourism Management*, *71*, 282-293.

Westbrook, R. A., & Oliver, R. L. (1991). The dimensionality of consumption emotion patterns and consumer satisfaction. *Journal of consumer research*, *18*(1), 84-91.

Wirth, W., Hartmann, T., Böcking, S., Vorderer, P., Klimmt, C., Schramm, H., . . . Biocca, F. (2007). A process model of the formation of spatial presence experiences. *Media Psychology*, *9*, 493-525.

Witmer, B. G., & Singer, M. J. (1998). Measuring presence in virtual environments: A presence questionnaire. *Presence, 7*, 225-240.

Yang, J., Gu, Y., & Cen, J. (2011, February). Festival tourists' emotion, perceived value, and behavioral intentions: A test of the moderating effect of festivalscape. *Journal of Convention & Event Tourism, 12*, 25-44.

Yang, Y., Zhang, H., & Jiang, Y. (2015). The development and educational application of editable university digital museum. *International Journal of Online Engineering, 11*(1).

Yüksel, A. (2007). Tourist shopping habitat: Effects on emotions, shopping value and behaviours. *Tourism Management*, *28*, 58-69.

Zhang, H., Meng, W., Qi, J., Wang, X., & Zheng, W. X. (2019). Distributed load sharing under false data injection attack in an inverter-based microgrid. *IEEE Transactions on Industrial Electronics, 66*, 1543-1551.

Zins, A. H. (2002). Consumption emotions, experience quality and satisfaction: a structural analysis for complainers versus non-complainers. *Journal of Travel & Tourism Marketing*, *12*(2-3), 3-18.

APPENDIX. DIGITAL MUSEUM VISITOR EXPERIENCE SURVEY

Scenario 1

QS1. Imagining you are visiting a museum with the environment like the video, and you are wandering in the museum like the people in this video. In this video, you are receiving visual and auditory cues. Please answer the following questions.

Video links: teamLab. (2017). Wander through the Crystal World [Video]. Retrieved from https://www.youtube.com/watch?v=htGsCscBRIk&index=5&list=PL-TLQIsBItKKO5NQ3wqIMVzaUT_lNS-s7

MC1 Did you see a cup of tea in the video?

- ○ Yes
- ○ No

Skip To: End of Survey If Did you see a cup of tea in the video? = Yes
Skip To: Q1 If Did you see a cup of tea in the video? = No

Scenario 2

QS2. Imagining you are visiting a museum like the video, and you are participating the tree climbing. You are receiving the visual, auditory and haptic cues, please answer the following questions.

Video links: teamLab. (2018). Light Forest Three-dimensional Bouldering / 光の森の 3D ボルダリング [Video]. Retrieved from https://www.youtube.com/watch?v=XY2cvCsmOOc&list=PL-TLQIsBItKKO5NQ3wqIMVzaUT_lNS-s7&index=25&t=0s

MC2 Did you see a cup of tea in the video?

- ○ Yes
- ○ No

Skip To: End of Survey If Did you see a cup of tea in the video? = Yes
Skip To: Q1 If Did you see a cup of tea in the video? = No

Scenario 3

QS3. Imagining you are visiting a museum with the environment like the video, and you will drink the tea shown in the video. You are receiving the visual, auditory and taste cues, please answer the following questions.

Video link: teamLab. (2017). EPSON teamLab Borderless, EN TEA HOUSE / チームラボ ボーダレス、EN TEA HOUSE - 幻花亭 [Video]. Retrieved from https://www.youtube.com/watch?time_continue=2&v=_wlvFnEnp0U

MC3 Did you see people climbing in the video?

- ○ Yes
- ○ No

Skip To: End of Survey If Did you see people climbing in the video? = Yes
Skip To: Q1 If Did you see people climbing in the video? = No

Q1 To what extent that you agree with the following statements about self-location in the digital museum?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I felt like I was actually there in the immersive environment provided by this digital museum.	○	○	○	○	○
It seemed as though I actually took part in the action of involving in the immersive environment.	○	○	○	○	○
It was as though my true location had shifted into the immersive environment provided by this digital museum.	○	○	○	○	○
I felt as though I was physically present in the immersive environment provided by this digital museum.	○	○	○	○	○

Q2 To what extent that you agree with the following statements about possible actions in the digital museum?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The immersive environment provided by this digital museum gave me the feeling that I could do things within it.	○	○	○	○	○
I had the impression that I could be active in the immersive environment provided by digital museum.	○	○	○	○	○
I felt like I could move around in the immersive environment provided by this digital museum.	○	○	○	○	○
It seemed to me that I could do whatever I wanted in the immersive environment provided by this digital museum.	○	○	○	○	○

Q3 How does the video experience make you feel? Please share your feelings about pleasure level with us based on a scale of 1 to 7.

	Annoyed	(2)	(3)	(4)	(5)	(6)	Pleased
After experiencing that, I feel	○	○	○	○	○	○	○

Q4 How does the video experience make you feel? Please share your feelings about pleasure level with us based on a scale of 1 to 7.

	Unhappy	(2)	(3)	(4)	(5)	(6)	Happy
After experiencing that, I feel	○	○	○	○	○	○	○

Q5 How does the video experience make you feel? Please share your feelings about pleasure level with us based on a scale of 1 to 7.

	Dissatisfied	(2)	(3)	(4)	(5)	(6)	Satisfied
After experiencing that, I feel	○	○	○	○	○	○	○

Q6 How does the video experience make you feel? Please share your feelings about pleasure level with us based on a scale of 1 to 7.

	Despairing	(2)	(3)	(4)	(5)	(6)	Hopeful
After experiencing that, I feel	○	○	○	○	○	○	○

Q7 How does the video experience make you feel? Please share your feelings about arousal level with us based on a scale of 1 to 7.

	Depressed	(2)	(3)	(4)	(5)	(6)	Cheerful
After experiencing that, I feel	○	○	○	○	○	○	○

Q8 How does the video experience make you feel? Please share your feelings about arousal level with us based on a scale of 1 to 7.

	Calm	(2)	(3)	(4)	(5)	(6)	Excited
After experiencing that, I feel	○	○	○	○	○	○	○

Q9 To what extent that you agree with the following statements about your feelings of dominance level in the digital museum?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I felt that I had a lot of control over my visiting experience at this digital museum.	○	○	○	○	○	○	○
While I was on this site, I could choose freely what I wanted to see.	○	○	○	○	○	○	○
While I was on the digital museum, I had absolute control over I could do during the tour.	○	○	○	○	○	○	○
While I was on the digital museum, my actions decided the kind of experiences I got on this tour.	○	○	○	○	○	○	○
While I was on this digital museum, I controlled what happened in my on-site information searches.	○	○	○	○	○	○	○

Q10 To what extent do you agree with the educational experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I learned something new in the digital museum.	○	○	○	○	○	○	○
The experience made me more knowledgeable.	○	○	○	○	○	○	○
It stimulated my curiosity to learn new things.	○	○	○	○	○	○	○

Q11 To what extent do you agree with the esthetic experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Visiting the digital museum was very attractive.	○	○	○	○	○	○	○
The display in the digital museum payed close attention to detail.	○	○	○	○	○	○	○
Visiting the digital museum was very pleasant.	○	○	○	○	○	○	○

Q12 To what extent do you agree with the entertainment experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Visiting the digital museum was amusing.	○	○	○	○	○	○	○
Visiting the digital museum was captivating.	○	○	○	○	○	○	○
Visiting the digital museum was fun.	○	○	○	○	○	○	○

Q13 To what extent do you agree with the escapism experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I felt I played a different character in the digital museum.	○	○	○	○	○	○	○
I felt I was living in a different time or place.	○	○	○	○	○	○	○
I completely escaped from reality.	○	○	○	○	○	○	○

Q14 To what extent do you agree with the serendipity experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Visiting the digital museum allowed me to experience the "spur of moment".	○	○	○	○	○	○	○
I spontaneously experienced things I never thought I was going.	○	○	○	○	○	○	○
I experienced pleasant surprise in visiting the digital museum.	○	○	○	○	○	○	○

Q15 To what extent do you agree with the localness experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Visiting the digital museum allowed me to engage with local people.	○	○	○	○	○	○	○
Visiting the digital museum allowed me to experience the local culture through the displays.	○	○	○	○	○	○	○
Visiting the digital museum allowed me to experience what locals do.	○	○	○	○	○	○	○

Q16 To what extent do you agree with the communitas experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Visiting the digital museum allowed me to turn strangers into friends.	○	○	○	○	○	○	○
I felt I was the part of the place.	○	○	○	○	○	○	○
Visiting the digital museum made me feel I belong to a special travel community.	○	○	○	○	○	○	○

Q17 To what extent do you agree with the personalization experience in the digital museum.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Visiting the digital museum was a tailored experience for me.	○	○	○	○	○	○	○
Visiting the digital museum was customized to my needs.	○	○	○	○	○	○	○
Interaction with the digital museum made me feel that I am a unique customer.	○	○	○	○	○	○	○

Q18 Please rate the overall experience of your visit to this digital museum.

- ○ Extremely bad
- ○ Moderately bad
- ○ Slightly bad
- ○ Neither good nor bad
- ○ Slightly good
- ○ Moderately good
- ○ Extremely good

Demographic Questions

QD1 What is your age?

- ○ 18-24 years old
- ○ 25-34 years old
- ○ 35-44 years old
- ○ 45-54 years old
- ○ Over 55

QD2 What is your gender?

- ○ Male
- ○ Female

QD3 What is your highest degree or level of school you have complete?

- ○ Less than a high school diploma
- ○ High school or equivalent
- ○ Bachelor’s degree
- ○ Master's degree
- ○ Doctorate or higher