EXPLORING THE EFFECT OF IMMERSIVE EXTENDED REALITY VERSUS 2D VIRTUAL TOUR ON POTENTIAL MUSEUM VISITORS' MEMORABILITY AND INTENTION TO VISIT

by

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Dalhousie University is located in Mi'kma'ki, the
ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

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ABSTRACT

Cultural heritage institutions, including museums, are faced with the challenge of enriching visitor experiences to remain competitive and appealing to diverse audiences in an ever-evolving global tourism landscape. This research investigates the transformative potential of Extended Reality (XR) technologies in enhancing potential museum visitors' experiences and shaping their intentions to visit physical museums. Using a field experiment and online survey, data were collected from 344 participants globally, who were exposed to a museum artifact through either XR or 2-dimension (2D) virtual museum tours via the museum website. The study employs Partial Least Squares (PLS) analysis to explore the relationships among presentation mode, narrative transportation, three experiential realms (esthetic, entertainment, escapism), memorability, and potential visitors' intentions to visit museums in person. Findings highlight the significant influence of the manipulated presentation mode on narrative transportation and specific experiential dimensions. Notably, narrative transportation emerges as a pivotal factor, strongly linked to potential visitor experiences. The pivotal role of memorability emerges as a critical mediator, bridging immediate experiences to future intentions. This research emphasizes the significance of XR technologies in the tourism industry, specifically highlighting their potential for virtual museum offerings. Effective use of XR can broaden the audience base, providing engaging and memorable encounters with museum artifacts.

Keywords: cultural heritage, visitor's experience, extended reality, intention to visit, museum artifact, two-dimensional virtual museum tour, narrative transportation, memorability

LIST OF ABBREVIATIONS USED

XR	Extended Reality
VR	Virtual Reality
AR	Augmented Reality
AI	Artificial intelligence
NT	Narrative Transportation
PLS	Partial Least Square
ExpEnt	Entertainment Experience
ExpEsc	Escapism Experience
ExpEst	Esthetic Experience
MemHedo	Memorability, Hedonism
MesRef	Memorability, Refreshment
MemExc	Memorability, Exciting-ness
MemMea	Memorability, Meaningfulness
MemNov	Memorability, Novelty
NTDev	Narrative Transportation, Development of mental imagery
NTLos	Narrative Transportation, Loss of reality and time
NTProj	Narrative Transportation, Projection in the narrative universe
IntV	Intention to Visit
NT2ndO	Narrative Transportation Second Order
Mem2ndO	Memorability Second Order
SEM	Structural Equation Modeling
WOM	Word of Mouth
EFA	Exploratory Factor Analysis
4E	Four Realms of Experience
CFA	Confirmatory Factor Analysis

PC	Personal Computer
App	Application
2D	Two Dimensional
CB-SEM	Covariance-Based Structural Equation Modeling

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CHAPTER 1 INTRODUCTION

Cultural heritage encompasses a rich array of tangible and intangible elements preserved by societies to protect their historical legacy. Museums, in this context, play pivotal roles. According to the International Council of Museums (ICOM), a division of UNESCO, museums hold a profound mission to acquire, preserve, research, communicate, and exhibit both tangible artifacts and intangible aspects of human heritage (ICOM, 2007). With approximately 104,000 museums worldwide dedicated to this important mission, as Statista (2021) reported, these institutions serve as vital custodians and communicators of historical knowledge, reaching diverse populations and fostering a deeper appreciation of our shared cultural heritage.

However, in recent years, museums have encountered increasing pressure due to the competitive and diversifying leisure marketplace (Han and Hyun, 2017). These institutions deal with the task of maintaining their relevance and attractiveness to visitors, amid changing societal dynamics (Germak et al., 2021). Museums have also faced criticism for enforcing rigid rules of behaviour that limit visitor interactions with artifacts. Many find the museum experience unenjoyable and lacking in entertainment value, while experts believe it could offer more engaging experiences to visitors (Dal Falco and Vassos, 2017). Offering enhanced interactive services can make museums more enjoyable for visitors and assist museums in showcasing their importance in drawing tourists to cities (Han and Hyun, 2017), and meeting the evolving needs of visitors.

To make their services more interactive and enhance visitor experience, museums actively explore alternative approaches using modern technologies such as interaction design and interactive storytelling (Dal Falco and Vassos, 2017). Museums are reshaping their mission by combining historical knowledge about their artifacts with technology-driven innovation (Trunfio et al., 2022). Interactive kiosks, digitally linked audio guides, interactive games, extended reality (XR), and imaging technologies are among some of these technologies (Styliani et al., 2009). They serve multifaceted roles, assisting visitors in pre-visit planning, exploration, on-site guidance, and post-visit memory recall (Komianos, 2022). XR as the main focus of this study is a technological frontier that has gained prominence in recent years. XR serves as an umbrella term encompassing various

immersive technologies, including Virtual Reality (VR), Augmented Reality (AR), Augmented Virtuality (AV), Mixed Realities (MR), and even potential future realities (Guo et al., 2022). XR represents computer technology and wearable devices that merge virtual and real environments, alongside human-machine interactions (Santoso et al., 2022).

In recent years, XR has experienced rapid growth and adoption, particularly within the tourism industry. It has proven advantageous in enhancing the overall tourism experience across various stages of the traveler's journey (Fan et al., 2022). This surge in adoption is evident in IDC's projections, forecasting global spending on AR and VR to soar from USD 12.0 billion in 2021 to an estimated USD 72.8 billion in 2024 (Fan et al., 2022). The tourism sector has readily embraced XR, with applications spanning diverse areas (Guo et al., 2022). While XR has made significant inroads in the tourism sector, its application within the realm of museums has only recently gained traction. This study aims to address this gap by exploring the impact of XR on potential museum visitor experiences, with the goal of uncovering new insights into the potential of XR in museums.

In addition to embracing immersive technologies as a response to the challenges of diversifying their visitor base and enhancing interactivity within their exhibits (Han and Hyun, 2017; Dal Falco and Vassos, 2017), museums are exploring innovative strategies to provide engaging and enriching experiences. Storytelling, characterized by Nielsen (2017) as a narrative that fosters engagement, has emerged as a compelling approach to enhancing the museum experience (Bedford, 2001; Van Laer et al., 2019). Museums, as custodians of cultural heritage and historical narratives, inherently possess a vast reservoir of stories ready to be shared (Bedford, 2001). Research has consistently linked storytelling to positive tourist experiences (Moscardo, 2010) and has demonstrated its capacity to increase visitor engagement and emotional involvement, ultimately leading to deeper and more memorable encounters (Van Laer et al., 2019). Recognizing that museums are fundamentally storytellers, Hooper-Greenhill (2000) underscores the centrality of storytelling to the museum's mission of identifying, preserving, and disseminating these narratives.

While the field of museum storytelling has seen substantial research, a predominant focus has been on the psychological aspects, leaving a notable gap in the examination of the intersection between storytelling and technology, particularly from the perspective of immersive experiences. Few existing studies have highlighted the exploration of emerging technologies such as VR and Artificial Intelligence (AI) in museum storytelling research, despite their potential to elevate narrative immersion and engagement (Van Laer et al., 2019). Within this landscape, XR emerges as an underexplored domain with the potential to revolutionize the museum narrative experience by creating immersive story worlds (Van Laer et al., 2019). As such, a noticeable research gap exists regarding the utilization of XR in museum storytelling, resulting in a scarcity of insights into how this technology can effectively captivate and engage (potential) museum visitors, which is addressed by this study.

In the contemporary landscape of the global economy, there has been a profound shift towards prioritizing the creation of exceptional experiences as a key competitive advantage (Hosany et al., 2022). This transformation holds particularly true for the tourism industry, where experiences have become the focal point of value creation (Kim and So, 2022). Tourism experiences are characterized by their temporary (Volo, 2009), engaging, and memorable nature (Oh et al., 2007). Museums, recognizing the paramount importance of enhancing visitor experiences, have actively embraced technology and the art of storytelling as tools to enrich tourists' experience. However, it's crucial to acknowledge that enhancing the visitor experience during their visit represents just one facet of the equation. In the realm of consumer behavior, memory serves as a pivotal mediator of future behavioral intentions (Kim et al., 2012). Extant research underscores that satisfactory experiences alone may not guarantee future loyalty or behavioral intentions (Kim et al., 2012). Therefore, to comprehensively grasp the factors shaping future intentions, it is imperative to shift the focus beyond mere experience and explore the realm of memorability.

While museums strive to enhance visitor experiences, most previous studies have focused on on-site experiences, exploring the effects of on-site technology and storytelling on visitors' cognitive and behavioral responses within the physical museum environment.

However, there remains a gap in the literature pertaining to the utilization of XR for "*potential"* visitors' off-site experience. This research aims to address this gap by investigating whether XR, in an off-site context, can significantly enhance potential museum visitors' overall experiences in a manner that influences their intention to physically visit the museum. This leads us to the fundamental questions that guide this study: *1) how does the impact of Immersive XR technologies when used off-site on potential museum visitors' narrative transportation and experience differ from the impact of a 2D-virtual museum tour on a museum's website? 2) how does their experience with XR or 2D-virtual museum tour affect their memorability and intention to visit the museum in person?*

To answer these questions, a field experiment, followed by survey data collection, was conducted to investigate the impact of XR (treatment) vs. 2D-virtual museum tour through the museum's website (i.e., 2D-tour, hereinafter) (control) on the narrative transportation, experience, memorability, and intention to visit of the potential 'Van Gogh Museum' visitors. A total of 344 data were collected using the Prolific online survey platform and were tested using Partial Least Squares (PLS) technique. The findings reveal the significant impact of presentation mode, whether XR or 2D-tour, on potential museum visitors' experience and narrative transportation. Narrative transportation is one of the determinants of potential visitors' experience. Additionally, potential museum visitors' experience has strong connections with memorability, and memorability plays a critical role as a mediator, bridging experience to future behavioral intentions. This highlights the importance of not only enhancing the potential visitor's experience but also focusing on creating memorable moments for physical museum visit intention and long-term engagement.

This research offers significant theoretical insights into XR's impact on smart tourism, especially in cultural heritage sites like museums. It enhances our understanding of how XR can transform potential visitors' experiences and shape their intentions to visit museums in-person. On a practical level, cultural heritage institutions are encouraged to adopt XR technologies in their virtual offerings. XR has the potential to enhance museum experiences, create lasting memories, and spark interest in physical visits. By using these

technologies effectively, cultural heritage sites can reach a wider audience, offering immersive and meaningful encounters with their artifacts.

The structure of this document is designed to provide a thorough exploration of the key topics related to this research. In Chapter 2, I delve into the existing literature, covering essential areas such as XR in the tourism industry, storytelling in museums, museum visitor experiences, and memorable tourism experiences. Chapter 3 presents the offered theoretical model in this study and its background, along with hypotheses that shed light on the factors influencing potential museum visitors' intentions to visit. Chapter 4 and 5 are dedicated to a detailed discussion of the research methodology and presents the findings. I also provide insights into the theoretical and practical implications arising from this study.

CHAPTER 2 LITERATURE REVIEW

2.1 Extended Reality in the Tourism Industry

Extended reality (XR), an umbrella term covering virtual reality (VR), augmented reality (AR), and mixed reality (MR), can be defined using Milgram and Kishino's (1994) reality-virtuality continuum (Althewaynee et al., 2022) (figure 1). In this continuum, reality refers to the actual environment, including both direct and indirect views of real scenes, while virtuality relates to computer-generated environments featuring nonexistent objects (Milgram and Kishino, 1994). XR serves as a connecting link between the real and virtual worlds, covering the entire spectrum from reality to virtuality (Silva and Teixeira, 2021). XR encompasses computer technology and wearable devices that integrate interactions between virtual and real environments, along with human-machine interfaces (Fast-Berglund et al., 2018).

Virtual Reality (VR) was first introduced by Ivan Sutherland in the mid-1960s (Cipresso et al., 2018) and stands as a transformative technology that immerses users into simulated environments, facilitating interaction with computer-generated content (Komianos, 2022). It creates a lifelike virtual world where users can fully immerse themselves in real-time experiences (Santoso et al., 2022). All definitions of VR center around three key elements, as noted by Cipresso et al. (2018): *immersion, the sensation of being present in the environment, and the ability to interact within it*.

VR systems vary in their degree of immersion, with distinctions between non-immersive, semi-immersive, and immersive systems (Cipresso et al., 2018). Non-immersive systems are the simplest, typically employing a PC to replicate the world. In contrast, immersive systems offer complete simulated experiences, incorporating sensory output devices like head-mounted displays (HMDs) for enhanced stereoscopic views, audio, and haptic feedback. Semi-immersive systems fall in between, providing a stereo image of a three-dimensional scene viewed on a monitor with perspective projection linked to the observer's head position (Ware et al., 1993).

VR experiences are facilitated by various input and output devices. Input devices encompass tools enabling user communication with the virtual environment, from basic

joysticks and keyboards to gloves capturing finger movements and trackers registering postures. On the other hand, output devices offer sensory perceptions within the virtual world, ranging from standard computer monitors to immersive VR glasses, helmets, head-mounted displays (HMDs), or even CAVE systems (Cave Automatic Virtual Environment) for the most profound sense of immersion (Cipresso et al., 2018).

Augmented Reality (AR) offers a distinct approach to enhancing the user experience. While VR immerses users entirely in computer-generated environments, AR enhances the real world by overlaying computer-generated information (Loureiro et al., 2020; Santoso et al., 2022). This fundamental difference in approach is underscored by the historical development of these technologies. VR has a research history spanning over 25 years, while AR is a relatively more recent innovation (Wexelblat, 2014). The origins of AR can be traced back to the early 1990s when Boeing Corporation created the first prototype of an AR system to instruct employees in assembling wiring tools (Carmigniani et al., 2011). AR systems are characterized by several key features, such as the alignment of real-world information and virtual content, real-time interactivity, and the superimposition of virtual elements onto the physical environment (Hu et al., 2021). These systems typically incorporate essential components. These include a camera for tracking user movements and merging virtual objects with the real world, as well as a visual display, such as specialized glasses, through which users perceive virtual content superimposed on their immediate surroundings (Cipresso et al., 2018). And finally, according to Bec et al. (2021), Mixed Reality (MR), as clear from its name, represents the parts of the continuum where reality and virtuality co-exist.

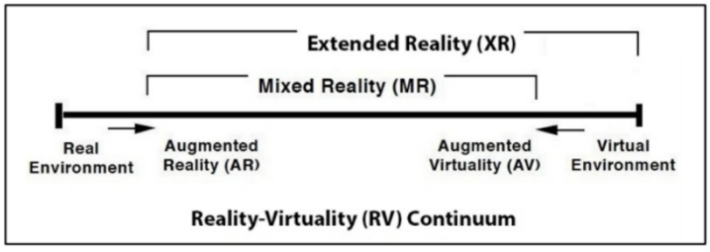

Figure 1: Reality-Virtuality Continuum (adapted from Milgram and Kishino (1994))

XR technology finds various applications across the spectrum of the tourism industry. XR has been effectively deployed in cultural and heritage tourism (Chung et al., 2018; Jung et

al., 2018), enhancing the exploration of historical sites and artifacts. Additionally, it plays a pivotal role in nature and ecotourism (Karadimitriou, 2019), offering immersive encounters with natural environments and wildlife. In the realm of amusement parks, XR enhances various park features to create unforgettable experiences (Santoso et al., 2022). Moreover, hotels have harnessed XR to elevate guests' overall stay experience (Orús et al., 2021). XR's reach extends to diverse sectors within tourism, encompassing food services, museums, heritage sites, urban tourism, travel and hotels, theme parks, and tourism-related mobile applications. The broad spectrum of XR applications highlights its ability to meet various tourist preferences, ultimately enhancing the overall travel experience. Table 1 provides a summary of recent studies conducted between 2015 and 2023 in different tourism areas.

Table 1 Literature review on the use of XR in tourism industry

Author(s) (Yeas)	Context / Data Collection Site	Type of XR	Theory	Independent Variable(s)	Mediating Variable(s)	Moderating Variable(s)	Dependant Variable(s)	Data Collection	Data Analysis	Key Finding(s)
Chung et al. (2015)	Heritage site	AR mobile application	Technology acceptance model, technology readiness and acceptance model	Technology readiness, visual appeal, facilitating condition, perceived usefulness, perceived ease of use			AR attitude, AR usage intention, destination visit intention	Survey	PLS	Technology readiness predicts usefulness, visual appeal predicts ease of use and usefulness, and facilitating condition predicts ease of use. Ease of use and usefulness predict user attitude, usage, and intention to visit.
Jung et al. (2015)	Theme parks	on-site computerized book using marker-based AR	Process theory	Content quality, system quality, personalized service quality		Personal innovativeness	Satisfaction, intention to recommend	Survey	PLS	content, personalized service, and system quality have a significant impact on users' satisfaction and intention to recommend.
Kourouthanassis et al. (2015)	Tourism, travel guide app	Mobile AR app	SOR[1] model	Performance expectancy, effort expectancy, pleasure, arousal, dominance, personal innovativeness price value			Behavioral intention	Survey	PLS	functional aspects of a mobile AR travel guide stimulate feelings of pleasure and arousal and impact users' adoption intention.
Javornik (2016)	Shopping	Mobile AR app	theory of interactive media effects	Perceived augmentation, flow			Affective response, cognitive response, behavioral intention	Experiment, Survey	PLS	perceived augmentation influences affective responses and behavioral intentions through flow. AR features do not show an increase in perceived interactivity.
Jung et al. (2016)	Museum	Mobile AR app, VR headset	Social presence theory, Experience economy theory	Social presence, esthetic, education, entertainment, and escapism experience			Visitor experience, intention to revisit	Experiment	PLS	Social presence in mixed reality environments predicts 4 realms of the experience economy. All aspects of the experience economy, except for aesthetic, influence visitor experience.
Kim and Hyun (2016)	location-based information and navigation	AR	TAM[2]	System quality, service quality, information quality, telepresence			Reuse intention	Survey	PLS	The use of AR is influenced by system/ information/ service quality. These factors contribute to the sense of telepresence, which influences the intention to continue use.

Author(s) (Yeas)	Context / Data Collection Site	Type of XR	Theory	Independent Variable(s)	Mediating Variable(s)	Moderating Variable(s)	Dependant Variable(s)	Data Collection	Data Analysis	Key Finding(s)
Chung et al. (2018)	Cultural heritage sites	AR mobile app	post-acceptance model of IS continuance, balance theory, TRA[3], experience economy	Expectation confirmation, perceived advantage, perceived enjoyment, AR satisfaction, esthetic expectation,			Attitude toward a destination through AR, behavioral intention toward a destination	Survey	PLS	AR satisfaction and Positive attitude towards the destination influence intentions to visit. Design components in mobile apps and aesthetic experiences are crucial for shaping positive perceptions of AR.
Han et al. (2018)	urban cultural heritage tourism-Mobile AR app	AR	Hassenzahl's (2003) model	Product features, product characteristics, situation			Pleasure, satisfaction	Experiment, focused group study	Thematic analysis	Information quality and public transportation access drive app selection and reuse.
He et al. (2018)	Museum/ Art museum (one of Van Gogh's paintings)	AR	Mental imagery theory, attention control theory, experiential value	Information type, level of virtual presence, imagery vividness	Information type	Virtual Presence	Visitor's experience, willingness to pay more	Experiment	ANOVA	when verbal cues are used and the virtual presence is high, visitors are intended to pay more.
Jung et al. (2018)	Cultural heritage sites	AR	Experience economy theory (esthetic), motivational theory (hedonic and utilitarian), TAM, Hofstede's cultural dimensions	Aesthetics of AR, social influence, perceived usefulness, ease of use, and enjoyment		Cultural differences	Behavioral intention to use AR	Experiment	PLS	AR aesthetics had a greater impact on user experience. Cultural differences influenced AR effectiveness.
Paulo et al. (2018)	Tourism, mobile AR app.	AR	UTAUT2[4], TTF[5]	Task and technology characteristics, task-technology fit, performance and effort expectancy, social		Age and Gender	Behavioral intention, use behavior	Survey	PLS	Performance, facilitation, enjoyment, and habit influence mobile AR usage intention, while effort, social influence, and price do not.

Author(s) (Yeas)	Context / Data Collection Site	Type of XR	Theory	Independent Variable(s)	Mediating Variable(s)	Moderating Variable(s)	Dependant Variable(s)	Data Collection	Data Analysis	Key Finding(s)
				influence, facilitating condition, hedonic motivation, price value, habit						
Tom Dieck et al. (2018)	Urban tourism	Mobile AR app	Experience economy theory	4E, satisfaction, memory,			Visitor engagement	Survey	SEM	Esthetic affects the other realms of experience. Both Education and Entertainment had significant impacts on satisfaction, while Education, Entertainment, and Escapism affected memory. Satisfaction and memory are linked to increased public engagement.
Tussyadiah et al. (2018)	Art Gallery	AR glasses (Google Glass Screen)	Mediation of tourism experience, technology embodiment	Ownership, location, agency, embodiment,			Enjoyment, Experience	Experiment, Survey	CFA and CB-SEM	Technology embodiment enhances enjoyment and overall experiences.
Boboc et al. (2019)	Cultural heritage	AR mobile app		Mobile AR app use			perceived comprehensibility, perceived manipulability, perceived enjoyment, and perceived usefulness	Experiment, survey		perceived enjoyment garnering the highest attention from participants.
Lee et al., (2020)	Museum	VR	Experience economy	4E, Experience			Intention to visit	Survey	SEM	Absorptive experiences influence immersive experiences. Overall experience affects the intention to visit.
Park and Stangl (2020)	Tourism – destination seeking	AR mobile app	Sensation seeking concept, TAM, Flow concept	TAM (Ease of use, usefulness, enjoyment), flow (control, attention, curiosity), perceived benefits (functional, symbolic, and experiential benefits), information			levels of sensation-seeking	Survey	PLS	Sensation-seeking travellers' AR experiences and preferences vary by cluster. High Sensation-Seekers had the most positive experiences, followed by Ambivalent Sensation-Seekers.

Author(s) (Yeas)	Context / Data Collection Site	Type of XR	Theory	Independent Variable(s)	Mediating Variable(s)	Moderating Variable(s)	Dependant Variable(s)	Data Collection	Data Analysis	Key Finding(s)
				quality, interactivity, and attitude toward AR						
Wu et al. (2020)	AR in theatrical performances within theme parks Tourism-related exhibition (Avengers station)	AR	TAM	Technology readiness, visual appeal, facilitating condition, ease of use, usefulness			Behavioral intention, attitude toward AR, experiential value	Survey	SEM	Technology readiness affects visitors' attitudes and behavior through both ease of use and usefulness. But, visual appeal only affects them through usefulness.
Batat (2021)	Food Service / Le Petit Chef Restaurant	AR		Use of AR during a dining experience			The dining experience, food well-being, post-consumption behavior	Qualitative mixed method – Secondary data and interview	Qualitative Thematic Analysis	AR enhances the restaurant experience and promotes overall food well-being and positive post-consumption behaviors.
Hu et al. (2021)	Theatrical performances within theme parks	AR	transcendent experience perspective, experience economy	AR experiential quality (esthetic, enjoyment, educational curiosity, escapism, focused immersion), visitors' emotional responses (nostalgia, and emotional arousal)			Feeling of belonging	Survey	SEM-PLS	Emotional arousal and nostalgia enhanced by AR technology led to a feeling of belonging among theme park visitors.
Huang (2021)	Shopping tourism-related products	AR	Attention restoration theory, empowerment paradigms	AR empowerment (environmental embedding, simulated physical control), restorative experience	Restorative experience		Immersion, willing to pay a price premium	Experiment	SEM	AR environment and sensory manipulation enhance restorative experiences, driving immersion and increased willingness to pay.
Huang and Liu (2021)	Green destination / Online	AR	Humanizing experience theory	Dynamic levels of 360-degree panorama,		Technology readiness	Destination brand love (place identity,	Experiment - Survey	SEM	360◦ AR panorama enhances personalized, contactless tourism,

Author(s) (Yeas)	Context / Data Collection Site	Type of XR	Theory	Independent Variable(s)	Mediating Variable(s)	Moderating Variable(s)	Dependant Variable(s)	Data Collection	Data Analysis	Key Finding(s)
	forum platform			anthropomorphism, self-representation, intimacy			affective attachment, compatibility)			and fosters love for green destination brands.
Leopardi et al. (2021)	Compares the performance of 5 different XR technologies in a museum.	XR	Concept of presence, experience economy theory	Presence, experience	Experience		Attitude towards experience, Likelihood of repeating and recommending the experience.	Experiment -survey	ANOVA	HMDs provide the best performance in terms of ATE, followed by AR.
Orús et al. (2021)	Tourism, hotels	360-degree video (AR)	EPI[6] Cube	Content, presence, ease of imagination, visual appeal		Technological embodiment	Intention to book a hotel	Experiment	multivariate analysis of covariance	Real content increased presence, imagination ease, visual appeal, and booking intentions more than digital content. Effects were stronger with high embodied devices
Panduputri and Novani (2021)	Virtual tour	VR	Experience economy	4E, satisfaction			Intention to visit	Survey	PLS-SEM	Entertainment, esthetics, and escapism positively relate to satisfaction, which leads to the intention to visit.
Shin and Jeong (2021)	Tourism Destination	AR	Cognitive evaluation theory + self-presentation theory	Hedonic, utilitarian, and self-presentation motivations,		Innovativeness	Attitude toward AR, intention to use AR	Survey	PLS	All 3 motivations positively influence traveller attitudes toward AR, with utilitarian motivation having the strongest impact. Self-representation has a positive impact only when travellers are highly innovative.
Ali (2022)	Food services-restaurant	AR		Utilitarian, hedonic, social			Behavioral intention (usage, intention to reuse, recommendation)	Interview, survey	CFA, Content analysis	a measurement scale to assess consumer's AR-enhanced experiences was developed and validated
Bird et al. (2022)	museum	Head-mounted AR device	SOR model	AR display, experience (4Es), cognitive (presence, visual attention), x		Individual differences	Positive (visitor engagement), negative (cognitive overload)	Focus group, survey		Users' responses aligned well with intentions at the stimulus level but showed discrepancies at the organism and response levels.

Author(s) (Yeas)	Context / Data Collection Site	Type of XR	Theory	Independent Variable(s)	Mediating Variable(s)	Moderating Variable(s)	Dependant Variable(s)	Data Collection	Data Analysis	Key Finding(s)
				and fosters love for green destination brands.						Also, Emotional responses strongly influenced engagement.
Do et al. (2022)	Tourism apps (travel products)	AR	TAM, SOR framework, flow theory	Perceived usefulness, ease of use, interactivity	Enjoyment factor		Perceived enjoyment, satisfaction, impulse buying	Survey	PLS	Mobile AR apps (apps' ease of use, interactivity, and usefulness) influence tourist impulse buying tendencies.
Jiang et al. (2022)	museum exhibitions	Handheld AR device		Interaction quality, information quality, information richness, satisfaction, perceived playfulness			Continuance intention	Survey	SEM	Satisfaction, playfulness, and info quality drive AR museum use intent, while info richness minimally affects playfulness. Interaction quality bolsters info attributes.
Pinto et al. (2022)	Mobile AR	AR	UTAUT	Performance, and effort expectancy, behavioral, and social influence, facilitating condition, hedonic motivation, price value, habit, personal innovativeness		Age, Gender	Adoption and actual use	Survey	SEM-PLS	Habit, hedonic, motivation, and facilitating conditions are the determinants of the use of mobile AR in tourism.
Yang et al. (2022)	scenic spots	720-degree,3-dimensional panoramic technology	SOR model, theory of technology readiness, TAM	Flow experience, technical optimism, and discomfort, perceived usefulness, and ease of use,	Technology acceptance, technology readiness		Adoption intention, consumption intention	Survey	SEM	Flow enhances perceptions of virtual tourism tech, reduces discomfort, and boosts usefulness and ease of use. Tourists' intention to use technology affects their intention to travel to a destination.
Huang et al. (2023)	Tourism – Travel destination	AR	Mood maintenance theory	AR perceived intelligence, anticipated relaxation, mood maintenance activities (selfie sharing, self-representation)		Technology adoption readiness	Destination visit intention	Experiment -survey	CFA - SEM	AR body representation and AR selfie-sharing activities play a significant role in inducing visit intention to tourism destination

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Jiang et al. (2023)	Heritage sites – national heritage park in China	AR	MTE[7] concept	AR Intervention, attitude toward AR intervention	Attitude toward AR intervention		MTE, Behavioral intention, satisfaction	Experiment	ANOVA	AR improves MTE, which boosts visitor satisfaction and mediates the link between AR attitude and behavioral intention.

1- Stimulus–Organism–Response model,
2- Technology Acceptance Model,
3- Theory of Reasoned Action,
4- Unified Theory of Acceptance and Use of Technology
5- Task Technology Fit
6- Embodiment- Presence- Interactivity Cube
7- Memorable Tourism Experience

Extended Reality (XR) brings a multitude of benefits to the tourism industry across various domains. One of its primary advantages is immersing visitors, providing them with more compelling and memorable experiences. XR offers innovative ways for tourists to explore cultural heritage (Wei, 2019) and enhances the overall enjoyment of the tourism experience (Fan et al., 2022; Guo et al., 2022). It plays a crucial role in conserving disappearing destinations, artifacts, and attractions by offering virtual access to these resources, ensuring their preservation and accessibility for future generations (Bec et al., 2021). XR serves as a potent tool for enticing visitors to tourist attractions, elevating their desire to visit physical destinations, attracting a larger influx of tourists, and ultimately enhancing revenue generation (Althewaynee et al., 2022). Additionally, XR facilitates a deeper understanding of specific events, facts, and locations through interactive and realistic experiences, enhancing users' comprehension and motivation (Althewaynee et al., 2022). It also extends accessibility to remote and otherwise inaccessible heritage sites.

XR significantly impacts various stages of visitors' experiences, spanning the pre-travel, on-site, and post-travel phases (Santoso et al., 2022). During the pre-travel phase, where tourists gather information and build expectations, XR services play a pivotal role in destination marketing activities, promoting destinations, and assisting travelers in planning their journeys. For instance, mobile apps, such as ARLoopa, can offer AR experiences that allow potential visitors to remotely explore artifacts and historical sites. Transitioning to the on-site experience, XR enriches visitors’ interaction and provides educational opportunities about historical heritages. For instance, the Louvre Museum offers a VR experience that immerses visitors in the world of the Mona Lisa painting, enhancing their understanding of art and culture. In the post-travel stage, which involves reflecting on and preserving the experience, XR continues to be valuable. VR photo albums, for example, enable travellers to create immersive and enduring mementos of their journeys.

In this study, when I refer to XR, I am specifically focusing on the utilization of a mobile app during the pre-travel experience. This app is designed for remotely exploring a museum artifact, in this case, a painting. The mobile app offers a virtual environment where visitors can immerse themselves within the painting's setting, creating the sensation

of standing within the artwork itself. This immersion is achieved by overlaying the painting onto the visitor's physical surroundings, seamlessly blending the virtual and real worlds.

On the other hand, 2D-tour are 2-dimensional (2D) and represent a non-immersive form of VR that provides a digital exploration experience accessible through a museum's website or dedicated platform. These tours allow users to remotely navigate a museum's physical spaces and exhibitions, relying on a range of media, including 360-degree images, panoramic photographs, and 2D images. This simulation of experience enables users to scroll or swipe through these images using their computers or mobile devices (Li et al., 2022). In the context of this study, a 2D-tour specifically refers to the 2D presentation of zoomable artifact images available on a museum's website.

2.2 The concept of storytelling and narrative transportation in museums

Storytelling and Narratives have long been integral to human communication and entertainment, and their potential for enhancing museum experiences has been increasingly recognized in recent years (Bedford, 2001; Van Laer et al., 2019). Storytelling is a natural way that humans learn and make sense of the world around them (Bedford, 2001). Nielsen (2017) defines narratives as a diverse set of forms that serve various purposes, including conveying emotions, facilitating learning, promoting interaction, addressing individual or social issues, and stimulating imagination. Narratives can be fictional or non-fictional, digital or non-digital, and subjective or objective (Nielsen, 2017). According to Nielsen, the power of a narrative lies in its ability to capture the audience's attention and evoke their feelings, memories, and curiosity. Nielsen defines storytelling as "a narrative that creates engagement" (p. 445) and highlights the power of storytelling to convey meaning, understanding, and emotions (Nielsen, 2017), impacting the human mind, attitudes, fears, hopes, and values (Derbaix, 2017).

In today's competitive environment, museums are looking for ways to distinguish themselves, and storytelling is a valuable tool to achieve this goal (Bedford, 2001). Museums play the role of storytellers by sharing stories and experiences with their

visitors, which creates a dynamic atmosphere that allows visitors to engage actively in playful learning, education, and entertainment experiences (Alinam et al., 2020). Hooper-Greenhill (2000) explains that museums are spaces for interaction and communication, and storytelling is the essence of what museums strive to preserve and communicate. The very reason museums exist is because someone deemed a story worth telling and believed it should be passed down from generation to generation. As a result, museums are the storytellers, and their mission is to identify, preserve and share these stories, which are the hallmark of their authenticity (Bedford, 2001).

In terms of visitor experience, it is important to understand the effect of storytelling on visitors. Moscardo (2010) found that stories play a crucial role in shaping positive tourist experiences. Moreover, storytelling has been shown to increase visitor engagement and emotional investment, leading to a more profound and memorable experience (Van Laer et al., 2019). As such, visitors tend to develop empathy for the story's characters and have a sense of entering a world created by the narrative, resulting in their immersion into the story's plot (Moscardo, 2010). Therefore, museums should aim to use storytelling and narratives to immerse visitors in their exhibits and create a memorable experience.

Narrative transportation theory, introduced by Green and Brock (2000), provides a framework for understanding how individuals become absorbed in a narrative, which in turn affects their attitudes, beliefs, and behaviors (Van Laer et al., 2019). The theory suggests that when individuals become deeply immersed in a story or narrative, they may experience a mental process known as “transportation”, whereby attention, imagery, and feelings converge to create a distinct experience that can affect their real-world beliefs (Green & Brock, 2000). This process can result in parts of the real world becoming inaccessible to the transported individual and may lead to a subjective distancing from reality (Jarrier et al., 2017; Irimias et al., 2021). Green and Brock (2000) note that transportation is not limited to the reading of written material, and that narrative worlds are broadly defined for modality (Green & Brock, 2000). Therefore, the theory can be applied to various forms of narrative, including those experienced through XR and 2D-tour technologies. Jarrier et al. (2017) defined the dimensions of narrative transportation as the development of *mental imagery, loss of reality and time, and projection in the narrative universe*.

The development of *mental imagery* suggests that when visitors are transported into a compelling narrative, they actively engage their imagination (Jarrier et al., 2017). They create mental images and scenarios related to the narrative, making it feel more real and vivid. In the context of a museum visit, this means that when visitors are deeply transported into a narrative about the artifacts or exhibits, they start to mentally picture and engage with the content in a more immersive way. *Loss of Reality and Time* indicates the state when visitors become so engrossed in the narrative that they temporarily disconnect from their everyday reality and lose track of time (Jarrier et al., 2017). In a museum setting, this can mean that visitors may feel like they have entered a different world or time. The concept of "projection in the narrative universe" implies that visitors mentally project themselves into the story or narrative being presented (Jarrier et al., 2017). In a museum context, this means that visitors start to see themselves as part of the narrative, actively engaging with the content rather than passively observing.

Recent studies at the intersection of technology and museum storytelling provide valuable insights into enhancing visitor engagement and understanding. While various methodologies and best practices have been explored, it is essential to highlight the pivotal role of technology, especially XR, in museum storytelling. Van Laer et al. (2021) found that digital narratives, utilizing innovations like XR, possess a remarkable potential to significantly enhance narrative transportation. This technology enables a deeper level of immersion and connection, amplifying the impact of storytelling in museums.

2.3. Literature Review on Museum Visitors' Experience

The experience economy theory, introduced by Pine and Gilmore in 1998, emphasizes the importance of businesses providing memorable experiences to consumers instead of just offering standardized products or services (Song et al., 2015). The concept of the experience economy has relevance in the tourism industry, which inherently focuses on creating memorable experiences for visitors (Radder and Han, 2015). In the context of tourism, this shift towards experiential tourism aims to offer visitors unique and personalized experiences that leave a lasting impact (Oh et al., 2007). According to Pine and Gilmore (1998), experiences are defined as events that engage individuals on a

personal level. Vesci et al. (2020) characterize museum experiences as distinct and personal events that engage visitors emotionally, physically, intellectually, and/or spiritually, highlighting the inherently experiential nature of museums and the cultural artifacts they preserve.

Pine and Gilmore (1998) proposed a framework for analyzing experiences based on two dimensions: consumer participation and connectedness. Consumer participation can be either active or passive, depending on whether consumers actively shape the experience (Oh et al., 2007). Connectedness refers to the degree of absorption and immersion in the experience (Oh et al., 2007). Pine and Gilmore (1998) identified four realms of experience: *educational, entertainment, esthetic, and escapism*, and they are characterized by different combinations of consumer participation and connectedness (see Figure 2) (Quadri-Felitti and Fiore, 2013).

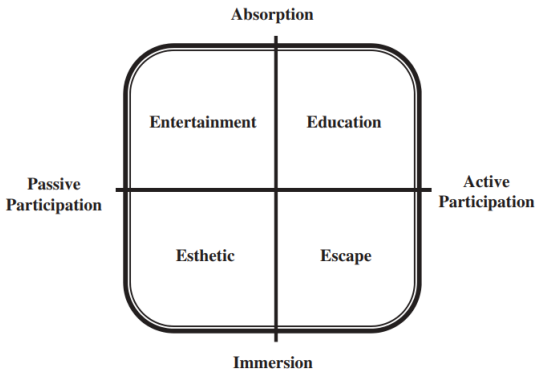

Figure 2: Four realms of experience economy (Pine and Gilmore, 1998)

In the context of museum visitors, the educational experience refers to users' active participation in events aimed at acquiring knowledge or skills, often through intellectual or physical engagement. The entertainment experience, on the other hand, involves activities or performances designed to provide amusement and pleasure to visitors, often through passive observation, capturing and holding their attention. As for the esthetic experience, it pertains to individuals passively appreciating the museum's environment, deriving enjoyment from the sensory appeal it offers. Lastly, the escapism experience represents the desire of visitors to break away from the routines of daily life and immerse themselves in the extraordinary. In this realm, tourists actively participate in activities that allow them to temporarily suspend the norms and values governing their ordinary lives.

Numerous studies have delved into the significance of Pine and Gilmore's (1998) experience economy framework, which emphasizes memorable tourist experiences. Vesci et al. (2022) conducted an exploration of Italian art museums, uncovering dimensions such as aesthetics, escapism, and "edumotion" that positively impacted visitor satisfaction and word-of-mouth intentions. In the context of South African heritage museums, Radder and Han (2015) identified three experience realms—edutainment, escapism, and esthetics—where edutainment notably influenced overall satisfaction and behavioral intentions. Mahdzar et al. (2017) examined the 4Es (education, entertainment, esthetics, escapism) and found their positive and significant impact on museum visitors' satisfaction and intention to recommend, except for escapism's influence on the intention to recommend. Lee et al. (2020) demonstrated the link between absorptive experiences (education and entertainment), immersive experiences (escapism and esthetics), the overall museum VR tour experience, and the intention to visit a museum. Jung et al. (2016) explored social presence's influence on visitor experiences in mixed (VR & AR) environments, highlighting its predictive power on the four experience economy realms and their impact on visitor experiences and intentions to revisit museums. These findings underscore the role of multisensory engagement and various experience dimensions in shaping visitor experiences and behavioral intentions in the museum context.

In the context of this research, I have purposefully excluded the educational aspect from the potential visitor's experience. This decision is rooted in the specific nature of our treatment, which involves presenting participants with a recorded video showcasing the use of an AR mobile app to view a museum artifact. Unlike traditional museum experiences that often incorporate educational elements through textual information, audio guides, or interpretive displays, this study focuses solely on the visual and immersive aspects of AR technology. As a result, I do not anticipate any provision of educational content or informational cues within the treatment in my research context. In sum, I intend to examine the impact of AR technology on the experiential and sensory dimensions of a museum artifact, independent of educational elements, to gain insights into the effect of technology-driven immersive encounters on their intention to physically visit the museum among those potential visitors, who have not seen the museum artifact in person.

2.4. Literature review on the concept of memorable tourism experience

Tourists' experiences can form tourists' memories of the visit (Hosseini et al, 2023). The connection between memory and experiences is a well-established idea, with roots in early environmental psychology studies (Hosany et al, 2022). In tourism, memory is crucial for people to remember their personally significant travel experiences (Kim et al., 2012). These experiences and memories are fundamental considerations in examining tourists after their visits or travels. More importantly, many different behavioral responses are shaped based on memories. Such as revisiting intention (Marschall, 2012; Kim and Ritchie, 2014), word-of-mouth recommendation, developing attachment toward a destination (Vada et al., 2019), and making future visit decisions (Barnes et al., 2016). Therefore, understanding and measuring memorable tourism experiences can provide valuable insights into tourists' intentions to visit again. Zhang et al. (2018) explain that "tourism experiences and memorable tourism experiences (MTE) are interrelated but have distinct meanings and scopes". In simple terms, not all tourism experiences are unforgettable. Kim et al. (2012) defined a positive MTE as "a tourism experience positively remembered and recalled after the event has occurred" (P.13).

MTE has gained increasing attention from both practitioners and academia. Numerous studies have delved into various facets of MTEs. Tung and Ritchie (2011) focused on cognitive processes related to attention, memory formation, and retention. They identified four essential dimensions crucial to understanding MTEs: affect, expectations, consequentiality, and recollection. Kim et al. (2012) introduced a comprehensive scale for measuring MTE, encompassing seven dimensions: *hedonism, refreshment, local culture, meaningfulness, knowledge, involvement, and novelty*. Sthapit et al. (2019) revealed that satisfaction and specific MTE dimensions, namely novelty, refreshment, involvement, and knowledge, significantly contribute to shaping the overall memorability of a trip. Yang and Zhang (2022) found that smart tourism technologies (STTs) positively impact the creation of MTEs among museum visitors, subsequently influencing their intentions to revisit and make favorable recommendations. In alignment with this perspective, Zhang et al. (2018)

suggested that both country image and destination image influence revisit intention through the mediating role of MTEs.

Scholars have been exploring the dimensions of MTE, originally proposed by Kim et al. (2012). However, there has not been a consensus among researchers about a firm list of these dimensions but different studies suggest different dimensions, based on specific contexts (Hosseini et al., 2023). This lack of agreement reflects the subjective and complex nature of MTEs. Therefore, in this study, I decided to adopt four dimensions introduced by Kim et al. (2012), which include *hedonism, novelty, refreshment, and meaningfulness*. I found that the other three dimensions from Kim et al. (2102) were irrelevant to the context of this research. Additionally, in accordance with the recommendation by Hosany et al. (2022) to incorporate not only the generic (original) dimensions of Memorable Tourism Experiences (MTE) but also context-specific dimensions, I decided to introduce 'exciting-ness' as a vital dimension in my research. The concept of 'exciting-ness' aligns with the idea that experiencing something new or utilizing innovative technology to enhance an experience can evoke a sense of excitement. As suggested by Jiang et al. (2023), this addition serves to provide a more concise scale for measuring MTE. To achieve this, 'exciting-ness' was separated from the original scale by Kim et al. (2012) to make it more manageable and context-specific, ensuring that it aligns with the unique focus of my research. In sum, *hedonism, novelty, refreshment, meaningfulness, and exciting-ness* are included as the dimensions for memorability in this study and their definitions are presented in Table 3 in section 4.2.

CHAPTER 3 THEORETICAL BACKGROUND AND HYPOTHESIS

In this chapter, I explore the theoretical foundations that guide my investigation into the relationship between presentation modes using two different technologies (i.e., XR vs. 2D), NT, experience, MTE, and potential visitors' behavioral responses. Based upon the Narrative Transportation Theory, Experience Economy Theory, and the literature reviewed in Chapter 2, this research proposes a theoretical model, I formulate a series of hypotheses and the research model is depicted in Figure 3.

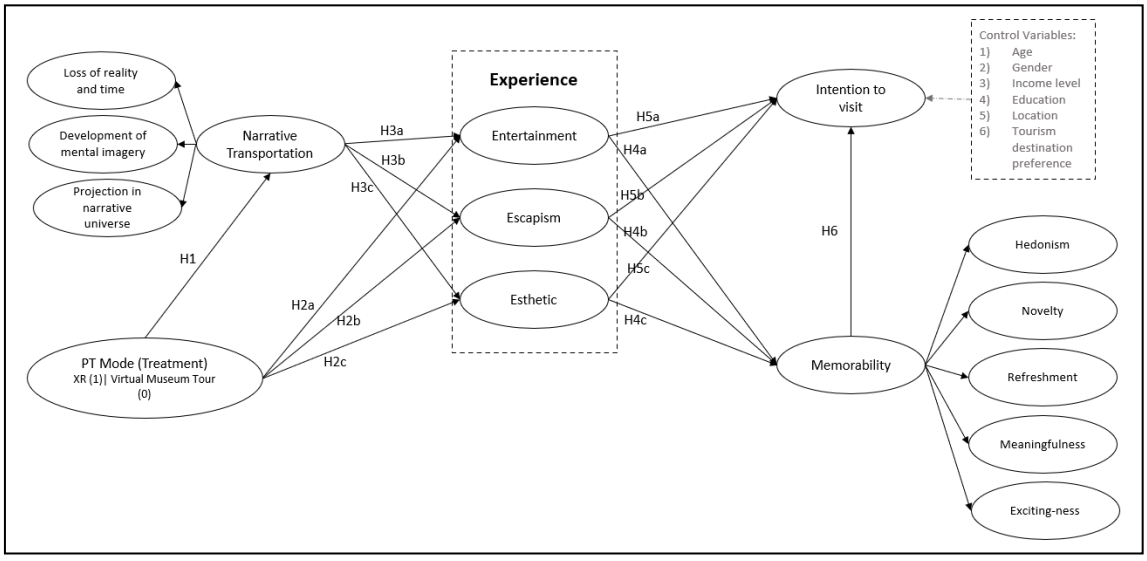

Figure 3: Proposed Research Model

XR offers visitors opportunities for deep immersion in virtual or augmented environments, enabling them to perceive themselves as present within these constructed worlds (Cipresso et al., 2018; Eda, 2021). These technologies excel in creating sensory-rich and interactive experiences that effectively blur the boundaries between physical and virtual realms. AR, for example, enhances perceptions and interactions with the real world (Cranmer et al., 2020), while Virtual Reality (VR) immerses individuals fully into a digitally created narrative space.

Narrative transportation, as defined earlier, represents the immersive state in which individuals become mentally engaged and absorbed in a narrative, leading to heightened emotional and cognitive involvement (Green & Brock, 2000). It can be understood as the degree to which visitors become immersed in a story, making their narrative experience

feel akin to a genuine, lived experience (Green & Brock, 2000). In essence, transportation equates to immersion or absorption into the narrative world.

Drawing from extant research, Van Laer et al. (2019) confirm that digital stories, particularly those leveraging XR technologies, have the potential to heighten the narrative transportation effect. This suggests that XR's immersive qualities enhance narrative transportation. Therefore, this study posits that potential visitors who engage with museum artifacts through XR will experience a higher degree of narrative transportation compared to those who utilize the 2D-tour. XR's immersive qualities position it as a powerful catalyst for enhancing narrative transportation. In contrast, the 2D-tour, while informative, may lack the immersive qualities necessary to induce the same level of narrative transportation, given its inherent limitations in sensory engagement and presence.

H1: Those visitors who are virtually exposed to the artifact through XR will have higher narrative transportation than those who are virtually exposed to it through 2D-tour.

Recent studies have highlighted the potential of XR technologies in enhancing various dimensions of the visitor experience (Cranmer et al., 2020; He et al., 2018; Jung et al., 2016; Tom Dieck et al., 2018; Trunfio et al., 2022). XR offers visitors opportunities for deep immersion in virtual or augmented environments, enabling them to perceive themselves as present within these constructed worlds (Cipresso et al., 2018; Eda, 2021).

In the realm of potential visitors' experience, three specific dimensions are considered in this study: *entertainment, escapism, and esthetic experiences*. These dimensions are crucial in creating memorable and immersive encounters (Pine & Gilmore, 1999; Trunfio et al., 2022). First, potential visitors can engage in *entertainment* activities within the destination, adding pleasure and enjoyment to their overall experience. XR technologies are known for their ability to create sensory-rich and interactive experiences, making them an ideal platform for entertainment (Jung et al., 2016). Second, *escapism* is characterized by a sense of immersion, allowing potential tourists to temporarily escape their routine lives and become part of a different world (Chuah, 2018). XR technologies

excel in providing this immersive experience, enabling potential visitors to escape into the virtual or augmented environments they offer. Finally, XR technologies expand the possibilities for creating and appreciating *esthetic* experiences by offering immersive, interactive, and visually captivating environments that go beyond the limitations of traditional displays. XR technologies have been shown to facilitate immersive encounters, enriching the esthetic dimension of the potential visitor experience (Trunfio et al., 2022). The impact of esthetic experience is even emphasized by Tom Dieck et al. (2018) as influencing entertainment, escapism, and education. Therefore, I argue that the immersive qualities of XR, its sensory richness, and its capacity to blur the boundaries between physical and virtual realms position it as a powerful tool for elevating the potential visitor experience in entertainment, escapism, and esthetic dimensions. Therefore, Potential visitors' level of experience will be higher in the XR environment than in the 2D environment.

H2a: Potential visitors' level of entertainment experience will be higher in the XR environment than in the 2D environment.

H2b: Potential visitor's level of escapism experience will be higher in the XR environment than in the 2D environment.

H2c: Potential visitors' level of esthetic experience will be higher in the XR environment than in the 2D environment.

Narrative transportation, the immersive state of mental engagement in a narrative, is a vital concept in the study of narratives (Cao et al., 2021). This sense of immersion significantly influences various dimensions of the visitor experience within a museum setting.

Narrative transportation has the potential to enhance the entertainment experience, even for potential museum visitors engaging with artifacts remotely. When individuals are deeply transported into a narrative, whether through physical presence or virtual technology, they are likely to find the experience enjoyable, akin to engaging storytelling or entertainment (Green and Brock, 2000; Escalas, 2004). This immersive engagement

can make the exploration of museum artifacts more pleasurable, even when accessed remotely.

H3a: Narrative transportation positively affects the entertainment experience.

Narrative transportation allows potential museum visitors to momentarily detach from their everyday lives and become immersed in a different world (Chuah, 2018). This concept, closely linked to the idea of transportation, involves individuals feeling detached from their routines and fully immersed in a narrative (Green and Brock, 2000). When individuals engage with a narrative through narrative transportation, whether in a physical museum visit or virtually, they experience a sense of escape from their regular routines. This temporary detachment from reality and immersion in the narrative world can significantly contribute to the escapism dimension of their museum experience, enriching their overall encounter with museum artifacts.

H3b: Narrative transportation positively affects the escapism experience.

Narrative transportation creates a deeper emotional connection with museum artifacts, whether experienced on-site or virtually through technology. When potential visitors become emotionally engaged and immersed in the narrative behind the artifacts, they tend to develop a stronger appreciation for their aesthetic qualities (Tom Dieck et al., 2018). This emotional connection can lead to a more profound sense of authenticity and esthetic enjoyment. The immersive nature of narrative transportation, as described by Green and Brock (2000), contributes significantly to the esthetic appreciation experience. Individuals who are deeply transported into a narrative, even through virtual technology, are more likely to perceive museum artifacts as authentic and engage in a visually captivating environment.

H3c: Narrative transportation positively affects the esthetic appreciation experience.

As the roles of narrative transportation in enhancing several aspects of potential visitors' experiences with museums have been established, it becomes evident that the lasting impact of these experiences goes beyond the immediate encounter. Memories are integral to the holistic nature of the potential visitor's experience, shaping the way individuals perceive and recall their visits (Çoban and Yetis, 2019). The connection between experience and memory is dynamic and multifaceted. It extends beyond the immediate encounter with a museum exhibit, encompassing both the anticipation before and the recollection after the visit (Kastenholz et al., 2018). These memories not only serve as sources of pleasant recollection but also play a pivotal role in shaping potential visitors' future expectations and evaluations (Hosseini et al., 2023). As I delve deeper into the dimensions of potential visitors' experience – entertainment, escapism, and esthetic appreciation – I will explore how each facet contributes to the creation of vivid, lasting memories.

Engaging and enjoyable experiences have been consistently shown to be more memorable (Kastenholz et al., 2018). Manthiou et al. (2014) have indicated that entertainment experiences can contribute to the vividness of memory, which is one of the primary components of memory (Tung and Ritchie, 2011). Kim's (2012) study on memorable experiences in tourism suggested that certain experiential dimensions, including refreshment and involvement (as often found in entertaining experiences), significantly influence the ability to recollect past travel experiences or retrieve vivid information about them. Su et al. (2016) further support that the enjoyment factor, closely related to entertainment experiences, contributes to memorable experiences. Therefore, it is reasonable to posit that the pleasure derived from entertainment experiences enhances potential visitors' memorability without physically visiting the museum.

H4a: Entertainment experience has a positive impact on potential visitors' memorability.

Escapism, characterized by emotional involvement and immersion, has been identified as a significant contributor to memorability (Kastenholz et al., 2018). These experiences enable potential museum visitors to temporarily escape from their routine lives. For example, Manthiou et al. (2014) shed light on the escapism experience in the context of festivals and its influence on the vividness of memory. Their findings suggest that

festivals offer attendees ample opportunities to escape from their routine lives, relieving boredom, and allowing them to enjoy a change of pace. Such encounters, associated with escapism at museums, are more likely to be remembered due to their distinctiveness and the deep emotional connections they create, even when these encounters are virtual. Thus, I hypothesize that:

H4b: Escapism experience has a positive impact on potential visitors' memorability.

Esthetic experiences, characterized by their visual appeal and esthetic richness, play a significant role in enhancing memorability (Kastenholz et al., 2018). Kim et al.'s (2012) research emphasizes the influence of esthetics as a key dimension that affects the recollection of past travel experiences. Furthermore, studies such as Oh et al. (2007), Su et al. (2016), and Quadri-Felitti and Fiore (2013) underscore the importance of aesthetics, particularly in terms of visual appeal, in contributing to memorability. Experiences that offer visual beauty and esthetic enrichment tend to forge deep emotional connections, rendering them more memorable, even when such experiences are indirect and tech-enabled. In light of these findings, it is reasonable to propose that:

H4c: Esthetic experience has a positive impact on potential visitors' memorability.

Beyond its influence on memorability, visitors' experiences can also yield various behavioral responses, such as their intention to visit/revisit the museum. The existing literature strongly links visitors' experiences with their intentions to revisit museums and cultural heritage sites, primarily focusing on on-site exposure, where visitors are physically present at the museum (Keng et al., 2007). These studies emphasize the significant role of well-staged experiences in driving visitor satisfaction and their likelihood to return, particularly vital in the intangible tourism industry (Hosany and Witham, 2010). Furthermore, the experience economy framework underscores how positive experiences foster intentions to visit places in the future, as supported by Chang and Lin (2015) and Pine and Gilmore (1998). In the museum context, Jung et al. (2016) found that favorable technology-driven escapism and entertainment experiences during on-site museum visits were associated with an increased intention to revisit. Additionally,

digital platforms like websites and augmented reality have been effective in drawing more visitors to museums, demonstrating the influential role of technology-enhanced experiences (Pallud and Straub, 2014; Chung et al., 2015).

However, it is important to note a distinctive feature of this study. While the extant literature predominantly measures intentions to revisit based on on-site exposure, this study breaks new ground by investigating the impact of exposing potential visitors to museum artifacts through XR technology, thereby conducting off-site exposure assessments. The unique nature of this approach is aligned with the work of Lee et al. (2020) and Jung et al. (2016), as these studies also inquire about visitors' opinions regarding their off-site museum experiences. In light of this unique approach that considers off-site exposure XR technology, I now examine how distinct experience realms directly influence potential visitors' intentions to physically visit the museum.

H5a: Entertainment experience has a positive impact on potential visitors' intention to visit.

H5b: Escapism experience has a positive impact on potential visitors' intention to visit.

H5c: Esthetic experience has a positive impact on potential visitors' intention to visit.

Memorability, as a crucial aspect of visitors' experiences, plays a pivotal role in shaping visitors' intentions to visit/revisit a destination. This connection between memorability and intention to visit is well-supported by previous research. Tourism literature has consistently demonstrated the significance of memorable experiences in predicting an individual's desire to revisit a particular destination in the future (Yang and Zhang, 2022). Individuals often rely on their recalled past experiences when making decisions related to travel and destination selection (Kim et al., 2012). Positive memories associated with a destination can lead to nostalgia-driven return visits, highlighting the profound impact of memory on destination choices (Coudounaris and Sthapit, 2017; Marschall, 2012). Furthermore, it is worth noting that memories are important in forming intentions to visit, whether these memories are derived from a physical visit or a virtual visit facilitated by technology.

Moreover, Scholars have highlighted that memory serves as a mediating factor in the relationship between visitor experiences and behavioral intentions (Kim et al., 2012). It not only directly influences visitors' intentions to visit but can also serve as a mediating factor between each realm of experience (esthetic, escapism, and entertainment) and visitors' intention to physically visit the museum. These memorable experiences breed future intentions and have a lasting impact on potential visitors' decisions (Coudounaris and Sthapit, 2017). Therefore, it is reasonable to hypothesize that:

H6: Memorability has a positive impact on potential visitors' intention to visit the museum.

H7: Memorability mediates the relationship between the distinct realms of experience and potential visitors' intention to physically visit the museum.

H7a: Memorability mediates the relationship between entertainment experience and potential visitors' intention to physically visit the museum.

H7b: Memorability mediates the relationship between escapism experience and potential visitors' intention to physically visit the museum.

H7c: Memorability mediates the relationship between esthetic experience and potential visitors' intention to physically visit the museum.

CHAPTER 4 RESEARCH METHODOLOGY

To examine these hypotheses, I conducted a field experiment followed by an online survey designed to gather insights into the potential museum visitors' experiences after being exposed to a museum artifact through XR and 2D-tour. The data collection process was facilitated using the Prolific platform, and Qualtrics was utilized for the experimental treatment and survey administration.

4.1. Samples and Data Collection

Participant recruitment was conducted using the Prolific platform, a trusted online tool for connecting researchers with diverse participants worldwide (Palan and Schitter, 2018). Prolific offers a streamlined process for data collection, enabling researchers to efficiently target specific respondents, gather responses promptly, and provide compensation for participants. The target population consisted of individuals from diverse geographical locations around the world. The research aimed to investigate the experiences of individuals who had not physically visited Van Gogh's Bedroom painting at the Van Gogh Museum. Thus, specific screening criteria were established, including the following: Prolific workers who had not previously viewed Van Gogh's Bedroom painting in person and who were proficient in the English language. The screening question asked whether they had ever physically seen the painting. Only those who responded "No" to this screening question were eligible to proceed with the survey. As an incentive, each participant received compensation of USD 1.00$. While this research focuses on Van Gogh's Bedroom painting and XR (vs. 2D) technology, its findings can have broader applicability, due to the popularity of the artist and the museum artifact so that the study's insights can be extended to various cultural tourism and geographic contexts.

Participants who met the screening criteria were randomly assigned to one of two experience scenarios involving Van Gogh's Bedroom painting. In the XR scenario, participants viewed a brief video presenting the painting from an XR perspective. The video featured an individual exploring the painting using a mobile XR application, providing participants with an observational XR experience. Conversely, in the 2D-tour

scenario, participants watched a short video showcasing the painting on the Van Gogh Museum's website. This video depicted someone exploring the painting online using a laptop or computer, offering participants an observational 2D-tour experience. The length of the XR and 2D scenarios are 160 seconds and 173 seconds respectively, so the lengths of the experimental videos are approximately the same. Two screenshots of the video clips that show the differences between XR and 2D-tour experience environment and the URL to both videos are presented in Appendix B. Subsequently, participants were required to answer questions in the survey, but only if they had successfully watched the video in its entirety. In Qualtrics, where the questionnaire is published, measures were implemented to ensure that participants watched the videos completely. A timer was set for the videos, and the next button for questionnaire progression would only appear if participants had initiated the video and the timer duration matched the specified length (the length of the video). This approach ensured that only participants who had watched the entire video could proceed to answer the subsequent questions. This step was implemented to ensure that participants engaged fully with the provided content.

The study collected a total of 344 completed survey responses from a diverse pool of participants. The respondent group comprised 48.54% male, 48.54% female, and 2.9% non-binary individuals. The majority of participants, accounting for 56%, fell within the age group of 20s. Geographically, 63.37% of respondents hailed from Europe, with the remaining participants representing various continents. Further demographic details are available in Table 3.

Table 2 Descriptive statistics: participant characteristics (N=344)

Variable	Category	Frequency	Ratio (%)
Gender	Male	167	48.54
	Female	167	48.54
	Non-binary	10	2.90
Age	18-29	193	56.10
	30-39	85	24.71
	40-49	36	10.47
	50-59	14	4.07

Variable	Category	Frequency	Ratio (%)
	>60	16	4.65
Education	No formal education	7	2.03
	High school diploma	91	26.45
	College degree	34	9.88
	Vocational training	28	8.14
	Bachelor's degree	134	38.95
	Master's degree	44	12.79
	Professional degree	4	1.16
	PhD	2	0.58
Household income level	Under 20,000 USD	132	38.37
	20,001 USD– 40,000 USD	125	36.34
	40,001 USD– 60,000 USD	41	11.92
	60,001 USD– 80,000 USD	19	5.52
	80,001 USD– 100,000 USD	17	4.94
	100,001 USD– 100,500 USD	8	2.33
	100,501 USD or over	2	0.58
Continent	Africa	103	29.94
	Asia	3	0.87
	Europe	218	63.37
	North America (including the Caribbean)	8	2.33
	Pacific Islands (Oceania)	6	1.74
	South America	1	0.29
	Central America	2	0.58
	Middle East	2	0.58
Tourism Destination Preference	Museum and exhibition among five first preferences	175	50.85
	Museum and exhibition not among the five first preferences	169	49.13

In line with recommendations for statistical analysis using Partial Least Squares (PLS) as suggested by Hair et al. (2011), the study adhered to the '10-times rule'. This rule stipulates that the minimum number of survey responses required should equal ten times the number of relationships, denoted by arrows in Figure 3, between the variables of interest. Excluding control variables, the study identified twenty-two such relationships. Consequently, the minimum sample size required was determined to be 220 (22*10). Having collected a total of 344 usable survey responses, significantly exceeding the minimum requirement of 220, the study is well-equipped with robust statistical power for analysis.

In this study, manipulation checks served as a critical component of experimental research, adhering to established principles within the field. Many researchers highlighted the importance of verifying the effectiveness of experimental manipulations to ensure research validity (Hauser et al., 2018). To assess the success of the presentation mode manipulation, “virtual presence” was used as a manipulation check variable in this study. The concept of "virtual presence", as defined by Viglia and Dolnicar (2020), encompasses the psychological sense of "being present" within a virtual environment, encompassing perceptions of physical presence and the ability to interact as if in the real world. To validate the adequacy of my manipulation, participants were asked with three items related to virtual presence, modified from (He et al., 2018), after engaging with either the XR scenario or the 2D-tour scenario (see Appendix A). These three items are “the environment the painting described became a place, rather than just images.”, “I felt “being there” in the environment the painting described.”, and “The environment the painting described seemed realistic.”.

Following data collection, I applied Partial Least Squares (PLS) analysis to examine the relationship between presentation mode and virtual presence variable. The analysis revealed a highly significant connection between these two variables (beta = 0.866, t-value = 10.464, $p < 0.001$). This finding provides strong evidence that the manipulation (XR presentation mode vs. 2D-tour mode) effectively induced the variance in the sense of virtual presence in participants, confirming that the experimental design remained unaffected by potential threats related to manipulation. Consequently, I can confidently proceed with the analysis and interpretation of the study's findings.

4.2. Measurement

All constructs, including control variables, were assessed through a reflective measurement approach using multiple items. The detailed definitions of these constructs are provided in Table 4. For this study, measurement items for all constructs were drawn from existing research and adapted to align with the specific context of the technology modes applied and museum experiences. The list of all these measurement items can be found in Appendix A. A closed-end survey format was employed, predominantly utilizing a seven-point Likert scale, ranging from 'strongly disagree (1)' to 'strongly agree (7)' and incorporating a midpoint of 'Neither Agree nor Disagree (4)' for item responses. Some questions employed alternative scales, such as multiple-choice, and rank-order formats. Additionally, the survey collected demographic information, encompassing age, gender, educational background, income level, continent (a binary measure of Europe or non-Europe), and tourism destination preference (a binary measure of having museums in first 5 destination preferences or not having museums in first 5 destination preferences) which were subsequently treated as control variables.

Table 3 Conceptual Definition of Constructs

Construct	Definition	Reference
XR vs. 2D-tour (Experimental treatment)	XR: "An umbrella term for a variety of distinct concepts – most prominently AR and VR." (P.4) vs. 2D-tour: An online platform that extends the traditional museum experience, by enabling users to engage autonomously with museum collections and spaces using a phone or computer interface.	Li et al. (2022); Rauschnabel et al. (2022)
Narrative Transportation (NT)	The state of being fully absorbed and mentally engaged in a story, characterized by intense focus on the narrative's events, which can influence real-world beliefs and emotions.	Green and Brock (2000)
Loss of Reality and Time	The phenomenon wherein an individual's immersion in a recreational environment causes them to lose their	Jarrier et al. (2017)

Construct	Definition	Reference
(2nd-Order for NT)	sense of reality and time, often resulting in observable physiological reactions.	
Development of Mental Imagery (2nd-Order for NT)	The phenomenon is where individuals create clear and detailed mental images depicting the events and elements within the narrative.	Jarrier et al. (2017)
Projection in Narrative Universe (2nd-Order for NT)	The process by which individuals effortlessly immerse themselves in the narrative universe, experiencing a sense of attraction or even becoming absorbed within it.	Jarrier et al. (2017)
Entertainment experience	An entertainment experience refers to a situation in which individuals engage in activities or observe performances conducted by others for the purpose of enjoyment, amusement, or leisure, often characterized by a sense of passive involvement and entertainment value.	Radder and Han (2015)
Escapism Experience	Visitors' motivation to escape their everyday lives and immerse themselves in an alternate time or place offered by the museum's resources and interpretive elements. It involves engaging the senses and altering perspectives for a temporary sense of detachment from daily routines.	Radder and Han (2015)
Esthetic Experience	This experience is characterized by a passive appreciation of the destination environment, where tourists enjoy the way the destination appeals to their senses.	Radder and Han (2015)
Memorability (Mem)	In this study, the term "memorability" is used interchangeably with "memorable tourism experience", which is defined as “A tourism experience positively remembered and recalled after the event has occurred.” (P.13)	Kim et al. (2012)

Construct	Definition	Reference
Hedonism (2^{nd}-Order for Mem)	The experience of enjoyable sensations or pleasurable feelings that elicit excitement within an individual.	Kim et al. (2012)
Novelty (2^{nd}-Order for Mem)	A psychological sensation of freshness and newness that arises from engaging in a previously unexperienced activity or experience.	Kim et al. (2012)
Refreshment (2^{nd}-Order for Mem)	The state of feeling revitalized and invigorated.	Kim et al. (2012)
Meaningfulness (2^{nd}-Order for Mem)	A profound sense of importance or significance.	Kim et al. (2012)
Exciting-ness (2^{nd}-Order for Mem)	A feeling of exhilaration and enthusiasm resulting from the anticipation or experience of a new and thrilling encounter.	Jiang et al. (2023)
Intention to visit	The intention to physically visit the museum following a virtual visit experienced through technology.	Lee et al. (2020)

4.3. Measurement Properties

PLS analysis is applied to validate the research findings using SmartPLS 4.0. PLS analysis is designed to maximize the explained variance of the dependent variables while assessing the measurement quality (Loureiro, 2014). It is a well-established method commonly applied in the fields of marketing, information systems, and business research. Given that PLS is adept at handling non-normal data and intricate models, it aligns with the research's complexity, involving seven hypotheses with some non-normal data distribution. This choice of analysis method is well-suited to address the study's primary objectives, which encompass assessing the significance of the relationships outlined in Figure 3 and ensuring the quality of the measurement properties derived from survey data collection.

Table 4 Measurement of internal reliability and convergent validity

Construct	Loading	Cronbach's α	Rho_a	Composite Reliability	Average Variance Extracted
Intention to Visit (IntV)	IntV01: 0.917	0.928	0.929	0.949	0.823
	IntV02: 0.920				
	IntV03: 0.886				
	IntV04: 0.905				
Hedonism (MemHedo)	MemHedo01: 0.877	0.920	0.923	0.944	0.807
	MemHedo02: 0.868				
	MemHedo03: 0.916				
	MemHedo04: 0.932				
Novelty (MemNov)	MemNov01: 0.876	0.905	0.906	0.934	0.780
	MemNov02: 0.918				
	MemNov03: 0.925				
	MemNov04: 0.808				
Refreshment (MemRef)	MemRef01: 0.909	0.929	0.931	0.949	0.824
	MemRef02: 0.913				
	MemRef03: 0.898				
	MemRef04: 0.912				
Meaningfulness (Memmea)	MemMea01: 0.860	0.837	0.839	0.902	0.754
	MemMea02: 0.897				
	MemMea03: 0.849				
Exciting-ness (MemExc)	MemExc01: 0.953	0.947	0.947	0.966	0.904
	MemExc02: 0.962				
	MemExc03: 0.938				
Projection in Narrative Universe (NTProj)	NTProj01: 0.802	0.874	0.879	0.914	0.726
	NTProj02: 0.870				
	NTProj03: 0.890				
	NTProj04: 0.843				
Development of Mental Imagery	NTDev01: 0.815	0.833	0.841	0.890	0.669
	NTDev02: 0.845				

Construct	Loading	Cronbach's α	Rho_a	Composite Reliability	Average Variance Extracted
(NTDev)	NTDev03: 0.741				
	NTDev04: 0.865				
Loss of Reality and Time (NTLos)	NTLos01: 0.849	0.870	0.875	0.911	0.718
	NTLos02: 0.869				
	NTLos03: 0.849				
	NTLos04: 0.822				
Entertainment (ExEnt)	ExEnt01: 0.873	0.780	0.792	0.872	0.694
	ExEnt02: 0.814				
	ExEnt03: 0.811				
Escapism (ExEsc)	ExEsc01: 0.701	0.835	0.876	0.884	0.609
	ExEsc02: 0.828				
	ExEsc03: 0.591				
	ExEsc04: 0.889				
	ExEsc05: 0.855				
Esthetic (ExEst)	ExEst01: 0.897	0.912	0.915	0.938	0.793
	ExEst02: 0.901				
	ExEst03: 0.927				
	ExEst04: 0.833				

Internal Reliability: To evaluate internal reliability, I employed multiple methods, including composite reliability (CR), Cronbach's Alpha (CA), and reliability (RhoA). The results, as depicted in Table 5, consistently exceeded the 0.70 cutoff value for all dimensions under study, in line with the criteria suggested by prior research (Monika et al., 2022; Hair et al., 2010). Additionally, I calculated Cronbach's alpha for the variables. confirming that the data met rigorous standards for internal reliability, thereby bolstering the validity of my research.

Convergent Validity: Convergent validity ensures that my survey effectively measures the intended constructs. I utilized several criteria, including factor loadings, composite reliability (CR), and average variance extracted (AVE) values, to gauge convergent

validity for each variable. As illustrated in Table 5, factor loadings exceeded or are very close (for one item for 'Escapism') to the preferred threshold of 0.60, indicating acceptable correlations between the original variables and the survey items, aligning with established standards (Hair et al., 2010). Additionally, all CR values surpassed the recommended threshold of 0.70, signifying robust internal consistency within my variables (Aguirre-Urreta et al., 2013). Furthermore, AVE values consistently exceeded 0.5, denoting a substantial proportion of variance captured by my variables compared to measurement errors, in accordance with Fornell and Larcker (1981).

Discriminant Validity: I then tested for discriminant validity to ensure that each dimension's variance shared with its items was greater than the variance shared with other dimensions, following Fornell and Larcker's (1981) guidelines. The results, found in Tables 6 and 7, clearly show that the square root of AVE values for all constructs (on the diagonal) exceeded their correlations with other constructs (off the diagonal). I also applied the Heterotrait–Monotrait (HTMT) correlation ratio. To confirm discriminant validity, HTMT values should not surpass 0.90 (Monika et al., 2022). As seen in Table 7, all HTMT values remained below 0.90, solidifying the presence of discriminant validity. However, it is noteworthy that the HTMT value between the 'entertainment' and 'esthetic' constructs slightly exceeded the threshold, measured at 0.927. This exception suggests some shared variance between these two constructs but I believe that this value does not significantly undermine the overall discriminant validity of my measures, as these two constructs are the two parts of a broad concept of 'experience'. Also, removing one of these conceptually different variables could negatively affect the theoretical contribution of this paper. I, therefore, decided to keep both variables with a limitation of a possible discriminant validity issue between these two 'experience' variables.

Table 5 Fornell-Larcker Criterion: Construct inter-correlation matrix and the square roots of AVE with reflective measures

	ExEnt	ExEsc	ExEst	IntV	MemExc	MemHedo	MemMea	MemNov	MemRef	NTDev	NTLos	NTProj
ExEnt	0.833											
ExEsc	0.668	0.781										
ExEst	0.785	0.643	0.89									
IntV	0.62	0.561	0.659	0.907								
MemExc	0.765	0.649	0.723	0.668	0.951							
MemHeo	0.75	0.635	0.805	0.785	0.791	0.898						
MemMa	0.7	0.622	0.676	0.69	0.749	0.760	0.869					
MemNov	0.626	0.517	0.547	0.445	0.655	0.599	0.588	0.883				
MemRef	0.753	0.676	0.722	0.665	0.844	0.808	0.759	0.689	0.908			
NTDev	0.557	0.5	0.637	0.611	0.527	0.64	0.584	0.383	0.511	0.818		
NTLos	0.654	0.667	0.583	0.533	0.656	0.599	0.601	0.522	0.676	0.454	0.847	
NTProj	0.732	0.702	0.673	0.700	0.743	0.779	0.740	0.56	0.741	0.669	0.64	0.852

Table 6 Discriminant Validity, Heterotrait-monotrait ration (HTMT) matrix

	ExEnt	ExEsc	ExEst	IntV	MemExc	MemHedo	MemMea	MemNov	MemRef	NTDev	NTLos	NTProj	XR/Web
ExEnt													
ExEsc	0.803												
ExEst	0.927	0.724											
IntV	0.721	0.620	0.715										
MemExc	0.881	0.714	0.778	0.711									
MemHeo	0.879	0.709	0.878	0.847	0.845								
MemMa	0.854	0.729	0.772	0.878	0.839	0.864							
MemNov	0.751	0.589	0.603	0.483	0.708	0.656	0.674						
MemRef	0.873	0.751	0.784	0.712	0.898	0.870	0.854	0.749					
NTDev	0.685	0.581	0.730	0.695	0.594	0.730	0.702	0.439	0.580				
NTLos	0.783	0.774	0.653	0.587	0.722	0.664	0.701	0.588	0.750	0.526			
NTProj	0.877	0.804	0.856	0.774	0.813	0.865	0.861	0.628	0.818	0.789	0.729		
XR/Web	0.305	0.160	0.296	0.182	0.278	0.307	0.144	0.296	0.262	0.045	0.069	0.277	

Common Method Bias (CMB) Test: CMB refers to a potential issue in research where the variance in responses can be attributed to the common method of data collection rather than the constructs being measured. It can lead to inflated associations between variables or biased results. To address this concern in this study, I applied the CMB testing suggested by Liang et al. (2007). I employed the CMB test by utilizing latent method factor (LMF) modeling in PLS. To perform the CMB test, I transformed an individual indicator into a single-indicator construct. Subsequently, I constructed a second-order theoretical construct incorporating an LMF. This LMF was interconnected with all first-order single-indicator constructs. Following this, I conducted PLS analysis to compute and assess the ratio of substantive variance to method variance.

The resulting CMB test outcomes, as presented in Table 7, revealed that the mean proportion of variance explained by substantive factors was 0.768, while the mean proportion attributed to method-based factors was 0.020. The ratio of substantive variance to method variance was approximately 38:1, indicating that the identified method variance had negligible impact. To summarize, the findings indicate that common method bias does not pose a significant concern within our variable dataset.

4.4. Structural Model Test

Path analysis was performed on the structural model to evaluate the relationships between all variables. To assess the significance of the hypothesized connections, various statistical measures are employed, including the explained variance (R^2), path coefficients (β), and their corresponding levels of significance as determined by t-values. I utilize a bootstrapping method with 5000 resampling iterations and the PLS algorithm to estimate these parameters.

Path coefficients, represented by β, offer insights into the sensitivity of relationships between independent and dependent variables. A higher path coefficient indicates that changes in the independent variable have a more pronounced impact on the variation in the dependent variable. T-statistics are used to evaluate the significance of each estimated path coefficient.

Figure 4 shows a comprehensive view of the results, which presents the explained variances (R^2), path coefficients (β), and their associated significance levels (t-values) for the variables under investigation. The analysis supports all hypotheses, except for H2b, H5a, and H5b. Furthermore, the potential influences of control variables on the dependent variable (intention to visit) were examined. Notably, none of the control variables demonstrated a significant relationship with intention to visit, except for Gender.

The coefficient of determination (R^2) serves as a valuable metric to assess the degree to which exogenous variables explain the variability present in endogenous variables, providing insights into the model's predictive capacity (Mahdzar et al., 2017). Overall, 57.4% of the variance for 'intention to visit' was accounted for by the research model.

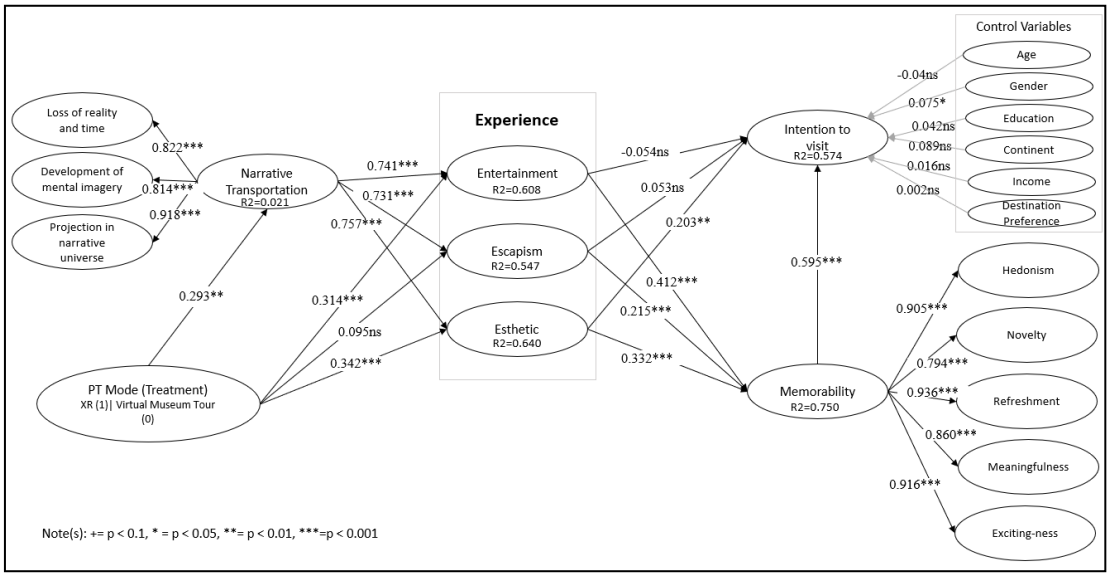

Figure 4: Structural Test Results (N=344)

Table 7 Common Method Bias Test using the modeling of the latent method factor (LMF)

Construct	Indicator	Substantive Factor Loading (R1)	$R1^2$	Method Factor Loading (R2)	$R2^2$
Intention to Visit (IntV)	IntV01	1.020***	1.040	-0.123**	0.015
	IntV02	0.937***	0.878	0.019	0.000
	IntV03	0.926***	0.857	-0.048	0.002
	IntV04	0.742***	0.551	0.194***	0.038
Memorability Hedonism	MemHedo01	0.833***	0.694	0.045	0.002
	MemHedo02	0.948***	0.899	-0.086	0.007

Construct	Indicator	Substantive Factor Loading (R1)	$R1^2$	Method Factor Loading (R2)	$R2^2$
(MemHedo)	MemHedo03	0.952***	0.906	-0.038	0.001
	MemHedo04	0.862***	0.743	0.075	0.006
Memorability, Novelty (MemNov)	MemNov01	0.888***	0.789	-0.016	0.000
	MemNov02	0.911***	0.830	0.009	0.000
	MemNov03	0.921***	0.848	0.006	0.000
	MemNov04	0.809**	0.654	-0.000	0.000
Memorability, Refreshment (MemRef)	MemRef01	1.012***	1.024	-0.111*	0.012
	MemRef02	1.163***	1.353	-0.274***	0.075
	MemRef03	0.680***	0.462	0.238***	0.057
	MemRef04	0.770***	0.593	0.154**	0.024
Memorability, Meaningfulness (MemMea)	MemMea01	0.682***	0.465	0.196**	0.038
	MemMea02	0.968***	0.937	-0.080	0.006
	MemMea03	0.951***	0.904	-0.109^{+}	0.012
Memorability, Exciting-ness (MemExc)	MemExc01	1.043***	1.088	-0.101*	0.010
	MemExc02	1.025***	1.051	-0.070*	0.005
	MemExc03	0.781***	0.610	0.175***	0.031
Experience, Entertainment (ExpEnt)	ExpEnt01	0.666***	0.444	0.224***	0.050
	ExpEnt02	1.043***	1.088	-0.247***	0.075
	ExpEnt03	0.798***	0.637	0.016	0.000
Experience, Escapism (ExpEsc)	ExpEsc01	0.707***	0.500	-0.010	0.000
	ExpEsc02	0.695***	0.483	0.152*	0.023
	ExpEsc03	0.842***	0.709	-0.276***	0.076
	ExpEsc04	0.858***	0.736	0.035	0.001
	ExpEsc05	0.829***	0.687	0.029	0.001
Experience, Esthetic (ExpEst)	ExpEst01	0.974***	0.949	-0.086^{+}	0.007
	ExpEst02	1.059***	1.121	-0.175***	0.031
	ExpEst03	0.970***	0.941	-0.047	0.002
	ExpEst04	0.525***	0.276	0.341***	0.116
NT, Projection in the narrative universe (NTProj)	NTProj01	0.832***	0.692	-0.037	0.001
	NTProj02	1.007***	1.014	-0.151*	0.023
	NTProj03	0.945***	0.893	-0.059	0.003
	NTProj04	0.614***	0.377	0.255***	0.065
NT, Development of	NTDev01	0.778***	0.605	0.052	0.003
	NTDev02	0.970***	0.941	-0.157***	0.025

Construct	Indicator	Substantive Factor Loading (R1)	$R1^2$	Method Factor Loading (R2)	$R2^2$
mental imagery (NTDev)	NTDev03	0.621***	0.386	0.141*	0.020
	NTDev04	0.878***	0.771	-0.010	0.000
NT, Loss of the notion of reality and time (NTLoss)	NTLoss01	0.818***	0.669	0.024	0.001
	NTLoss02	0.747**	0.558	0.143**	0.020
	NTLoss03	0.910***	0.828	-0.065	0.004
	NTLoss04	0.916***	0.839	-0.104*	0.011
Average (by absolute value)		0.866	0.768	0.109	0.020

Note(s): $^{+}$ = p < 0.1, * = p < 0.05, ** = p < 0.01, *** = p < 0.001

CHAPTER 5 DISCUSSION

5.1. Findings

The analysis reveals a significant association between the type of presentation (XR vs. 2D-tour) and narrative transportation ($\beta = 0.293$, $p < 0.01$), supporting H1. This finding indicates that individuals who engaged with museum artifacts through XR experienced substantially higher levels of narrative transportation compared to their counterparts who utilized the 2D-tour. In essence, XR's immersive qualities significantly enhance the narrative transportation effect in this study, compared to 2D-tour.

The examination of the relationship between the type of presentation and potential museum visitors' experiences yielded insightful results. Firstly, the type of presentation significantly and strongly influenced both entertainment and esthetic experiences ($\beta = 0.314$, $p < 0.001$ and $\beta = 0.342$, $p < 0.001$, respectively), providing support for H2a and H2c. This suggests that individuals who engaged with museum artifacts virtually through XR reported significantly higher levels of entertainment and greater esthetic appreciation compared to their counterparts who experienced the 2D-tour. However, the association between the type of presentation and escapism experience was not supported ($\beta = 0.095$), indicating that H2b was not supported. This finding underscores the notion that while XR technology can heighten the entertainment and aesthetic dimensions of the potential visitor experience, it may not necessarily induce a sense of escapism when visitors are passively observing XR content through a video format. The lack of direct interaction with XR technology may contribute to this result, as escapism often entails a more immersive and participatory engagement.

The investigation into the connections between narrative transportation and potential visitors' experiences yielded noteworthy results. Firstly, narrative transportation exhibited a highly significant and positive association with all three aspects of the potential visitor experience: entertainment, escapism, and esthetic appreciation ($\beta = 0.741$, $p < 0.001$; $\beta = 0.731$, $p < 0.001$; $\beta = 0.757$, $p < 0.001$, respectively). These findings provide support for H3a, H3b, and H3c. These results imply that when potential visitors are immersed in a narrative within the museum context, their overall museum experience is substantially

enriched. Specifically, the narrative transportation effect positively influences entertainment by making the virtual exhibition or artifact viewing through technology more enjoyable and pleasurable. Additionally, it enhances escapism by allowing potential visitors to escape from their daily routines and become part of a captivating narrative world. Furthermore, it elevates esthetic appreciation by creating a deeper emotional connection with artifacts, enriching the perception of authenticity and visual captivation.

One noteworthy aspect of these findings is the significant association between narrative transportation and escapism (H3b supported), even though the type of presentation alone did not have a significant impact on escapism (H2b not supported). This highlights the mediating role of narrative transportation, suggesting that while the type of presentation may not directly induce escapism in potential visitors, it can influence the degree of narrative transportation, which, in turn, positively affects the visitors' sense of escapism during their visit.

These results collectively underscore the importance of narrative transportation in shaping potential visitors' experiences within the museum context and emphasize its potential to enhance multiple dimensions of the potential visitors' experience through XR or 2D-tour technologies. It suggests that crafting narratives that transport potential visitors can be a powerful strategy for museums looking to create more enjoyable, immersive, and aesthetically rewarding encounters.

The analysis of the relationships between visitor experience dimensions and memorability yields significant findings. The results demonstrate that potential visitor experiences have a substantial impact on their memorability, as indicated by the significant associations observed ($\beta = 0.412$ for entertainment, $\beta = 0.215$ for escapism, and $\beta = 0.332$ for esthetic, all at a significance level of 0.001), supporting H4a, H4b, and H4c. These results emphasize the pivotal role of potential visitor experiences in shaping their memories of the museum visit. Greater levels of entertainment, escapism, and esthetic appreciation during the artifact, exhibition, or museum visit are linked to more memorable overall experiences. This underscores the significance of enhancing potential visitor experiences to foster lasting and impactful memories.

Furthermore, studying the relationships between experience dimensions and intention to physically visit the museum reveals noteworthy findings. Among these dimensions, only the association between esthetic experience and the intention to visit is statistically significant ($\beta = 0.203$, $p < 0.01$), supporting H5c, while the relationships between entertainment experience and the intention to visit and between escapism experience and the intention to visit were not significant, not supporting H5a and H5b. These results suggest that when potential visitors perceive their experience of viewing a museum artifact through technology as rich in esthetic qualities, they are more inclined to express a stronger intention to physically visit the museum in the future. However, the results indicate that no significant relationships exist between the levels of entertainment and escapism experienced and the intention to visit the museum physically.

The lack of a significant association between entertainment/escapism experiences and the intention to visit the museum may be attributed to a specific visitor behavior pattern. It is plausible that when potential visitors perceive their virtual exhibition/artifact viewing experience through technology as rich, entertaining, and immersive, they may be inclined to continue seeking entertainment and escapism through the same virtual technology rather than making a physical visit to the museum. In essence, virtual technology itself may become a preferred medium for experiencing entertainment and escapism. These dimensions of experience, while contributing positively to the XR encounter, may not, on their own, serve as convincing incentives for potential visitors to commit to a physical museum visit.

The association between memorability and intention to visit the museum is indeed significant, with a substantial beta coefficient of 0.595 (significant at the 0.001 level). This result strongly supports the hypothesis H6. It suggests that the extent to which potential visitors remember the virtual exhibition/artifact viewed, one facilitated through technology, has a profound influence on their intentions to visit the museum in a physical, on-site capacity. In essence, if potential visitors have a memorable and enriching experience during their virtual exhibition/artifact viewing, they are significantly more inclined to express an intention to visit the museum in the future.

The PLS analysis revealed significant indirect effects of memorability on the relationship between each distinct realm of experience (entertainment, escapism, and esthetic) and potential visitors' intention to physically visit the museum. The t-values for these indirect effects, as shown in Table 8, were found to be 5.629 for entertainment, 4.511 for escapism, and 4.392 for esthetic, all significant at a highly meaningful level ($P<0.001$). As a result, all hypotheses H7a, H7b, and H7c are strongly supported, indicating that memorability effectively mediates the relationship between these experiential dimensions and potential visitors' intentions to physically visit the museum.

This result suggests a nuanced relationship between the dimensions of experience and potential visitors' intention to visit. While the direct relationships between entertainment/ escapism experiences and the intention to visit were not found to be significant, the mediating role of memorability significantly influenced potential visitors' intentions. In essence, if potential visitors can form memorable experiences when they are viewing exhibitions/artifacts virtually through technology, these memories act as a powerful mediator, converting their entertaining, escaping, and esthetic experiences into a heightened intention to physically revisit the museum in the future. This finding underscores the pivotal role that memorable experiences play in driving future museum attendance and highlights the importance of creating engaging, memorable encounters for potential museum visitors, using technologies.

Table 8 Results of Hypotheses Testing

	Path Coefficients	T-value	P-value	Supported?
H1: XR/2D-tour →NT2ndO	0.293	2.722 **	0.007	Yes
H2a: XR/2D-tour → ExpEnt	0.314	4.681 ***	0.000	Yes
H2b: XR/2D-tour → ExpEsc	0.095	1.32 ns	0.187	No
H2c: XR/2D-tour → ExpEst	0.342	5.576 ***	0.000	Yes
H3a: NT2ndO → ExpEnt	0.741	26.887 ***	0.000	Yes
H3b: NT2ndO → ExpEsc	0.731	27.503 ***	0.000	Yes
H3c: NT2ndO → ExpEst	0.757	33.297 ***	0.000	Yes
H4a: ExpEnt → Mem2ndO	0.412	7.848 ***	0.000	Yes

	Path Coefficients	T-value	P-value	Supported?
H4b: ExpEsc → Mem2ndO	0.215	5.237 ***	0.000	Yes
H4c: ExpEst → Mem2ndO	0.332	6.06 ***	0.000	Yes
H5a: ExpEnt → IntV	-0.054	0.69 ns	0.490	No
H5b: ExpEsc → IntV	0.053	1.093 ns	0.274	No
H5c: ExpEst → IntV	0.203	2.624 **	0.009	Yes
H6: Mem2ndO → IntV	0.595	7.392 ***	0.000	Yes
Control Variables:				
Gender → IntV	0.075	2.143 *	0.032	Yes
Age → IntV	-0.04	1.075 ns	0.282	No
TourismDesPref → IntV	0.002	0.027 ns	0.979	No
Income → IntV	0.016	0.471 ns	0.638	No
Edu → IntV	0.042	1.118 ns	0.264	No
Continent → IntV	0.089	1.162 ns	0.245	No
mediating effect of memorability (indirect effect)				
H7a: ExpEnt → Mem2ndO → IntV		5.629***	0.000	Yes
H7b: ExpEsc → Mem2ndO → IntV		4.511***	0.000	Yes
H7c: ExpEst → Mem2ndO → IntV		4.392***	0.000	Partial Mediation

Note(s): += p < 0.1, * = p < 0.05, **= p < 0.01, ***=p < 0.001

5.2. Theoretical Contribution

First, this study significantly enriches the emerging field of XR applications in cultural tourism by investigating how XR technology enhances potential visitors' experiences within cultural heritage settings. It offers profound insights into the theoretical foundations of technology-mediated museum experiences, illuminating the complex interplay between XR technology and the cultural heritage domain. Furthermore, this research extends its impact to the broader literature on technology in the tourism industry, highlighting the potential of XR to transform potential visitor engagement in cultural contexts. Its implications also resonate with the smart tourism field (Gretzel et al., 2015),

because this study explores XR's capacity to create captivating and interactive museum experiences.

Second, this study extends the theoretical framework of narrative transportation theory by examining its impact in the context of XR and 2D-tour. It sheds light on how individuals become immersed in narratives within virtual environments, expanding the understanding of the psychological processes underlying virtual engagement. Additionally, this research introduces innovative approaches to storytelling in museums through technology, enhancing potential visitors' connections with cultural artifacts. Notably, it pioneers the application of narrative transportation in a museum context where XR technologies are employed, highlighting that narrative transportation can thrive even when potential visitors explore museum artifacts through technology without physical presence, further enriching the comprehension of immersive experiences.

Third, this study advances the theoretical understanding of potential visitor behavior in cultural heritage contexts by delving into the relationship between different dimensions of visitor experiences and their intentions to physically visit the museum. In doing so, it not only contributes valuable insights to the theoretical framework of visitor motivations and decision-making processes but also bridges a significant gap in the existing literature. The prevailing research predominantly focuses on measuring visitors' behavioral and cognitive responses based on their physical exposure to artifacts, overlooking the potential impact of exposing potential visitors to artifacts through extended reality technology (virtually). This study pioneers an exploration into whether such virtual exposure can indeed yield meaningful experiences.

Fourth, building upon the established body of literature on the role of memorability in shaping visitors' intentions to physically visit museums, this study delves deeper by examining the mediating role of memorability. This perspective enriches the theoretical understanding of how different dimensions of potential visitor experiences (e.g., entertainment, escapism, esthetic) influence intentions to visit the museum. By highlighting the mediating effect of memorability, this research offers fresh insights into the mechanisms through which experiences exert their influence on future visitor behavior.

Fifth, while this study did not directly investigate the indirect effect of narrative transportation on potential visitors' experiences, the findings collectively underscore the theoretical significance of narrative transportation within the museum context. They highlight its potential to enhance multiple dimensions of the potential visitor experience, encompassing entertainment, escapism, and esthetic engagement. These outcomes deepen the theoretical understanding of how narrative transportation operates as an underlying mechanism shaping potential visitors' holistic museum experiences, contributing to the theoretical framework of visitor engagement within cultural heritage settings.

5.3. Practical Contribution

First, In the context of cultural heritage, this study's findings offer valuable practical implications focused on the transformative power of XR technology in enhancing potential visitors' experiences. This insight holds great potential for real-world applications, especially in museums and cultural heritage settings. Museums can use this knowledge to refresh their exhibitions, filling them with immersive, interactive, and unforgettable encounters with cultural artifacts. Furthermore, since this study shows that technology can improve off-site visits, it extends its relevance to museums, art galleries, and cultural heritage sites looking to enhance their virtual offerings. These organizations can enhance their websites, mobile apps, and various platforms to improve the potential visitors' experience, offering entertainment, escape, and exposure to the artistic aspects of their exhibits. The use of immersive technologies in museums' virtual offerings not only enhances potential visitors' experiences but also provides a strategic advantage for marketing professionals aiming to attract museum visitors to make physical visits. As a result, this research empowers museums to consider investments in XR technology.

Second, the study's findings underscore the paramount importance of NT in enhancing potential visitors' museum experiences. It becomes clear that museums should prioritize the cultivation of NT among their visitors. To achieve this, museums can curate exhibitions and displays designed to immerse visitors in compelling narratives that trigger the three key variables of NT: the loss of time and reality, the development of mental imagery, and projection into the narrative universe. By strategically integrating these

elements into their exhibits, museums can facilitate profound and engaging experiences that captivate visitors' imaginations and emotions, likely leading to positive word-of-mouth advertising and attracting additional visitors. Moreover, the study highlights the potential for museums to amplify the impact of NT by harnessing XR technologies. By intertwining narratives with immersive XR experiences, museums can elevate NT to new heights. These technologies can transport visitors deeper into the narrative universe, providing them with an even more enriched and captivating museum journey. Ultimately, the practical implication is clear: museums should embrace NT as a cornerstone of their visitor engagement strategy and leverage XR technologies to create narratives that resonate deeply with their audiences, thereby fostering memorable and transformative experiences.

Third, the study's findings have unveiled a significant practical implication for museums, highlighting the pivotal role of memorability in shaping potential visitors' intentions to physically visit the museum. It becomes evident that the visitor experience is not limited to the moment of the visit itself but extends to the lasting memories it generates. Furthermore, visitors' memory of an exhibition/artifact showed to be pre-formed with the help of virtual technologies such as XR or 2D-tour even before they visit the exhibition/artifact in the real world. Museums should recognize the importance of curating exhibits and experiences that not only captivate the senses but also leave a lasting impression on potential visitors. Key factors such as hedonism, refreshment, novelty, excitement, and meaningfulness should be incorporated into museum offerings. By prioritizing these values, museums can craft more memorable experiences that resonate with visitors long after they have concluded their virtual visit. These memories, filled with positive emotions and personal connections, can act as powerful motivators, driving individuals to physically visit and explore the museum.

Fourth, the implications of this study encompass the vital realm of cultural heritage preservation. XR technology not only engages off-site museum visitors but also contributes significantly to safeguarding the rich cultural heritage. The findings indicate that XR can have a profound impact on individuals, even when they explore heritage sites remotely. This has several implications for cultural heritage preservation. Firstly, when people have more enriching experiences during off-site visits, they are more likely to

develop a genuine appreciation for these heritage sites. They may feel a stronger connection to these cultural treasures, making them more committed to their preservation. Secondly, through XR, individuals can delve deeper into the history and significance of these heritage sites, fostering greater awareness and knowledge about the shared cultural legacy. This heightened understanding can play a pivotal role in the ongoing protection and conservation of these sites. Thirdly, the immersive experiences offered through XR can serve as compelling incentives for individuals to physically visit museums and heritage sites. These in-person visits not only amplify the impact of XR experiences but also contribute directly to heritage conservation efforts through ticket sales and donations. Lastly, as many cultural heritage sites face the threat of deterioration or destruction, XR provides a lifeline. By enabling off-site visits and engagement, XR can extend the lifespan of these sites, providing a means of experiencing and preserving them even in the face of adverse conditions. In this way, XR technology emerges as a powerful tool not just for enhancing (potential) visitor engagement but also for the critical task of preserving our invaluable cultural heritage for generations to come.

5.4. Limitations

Despite several theoretical and practical contributions, this study has several limitations.

First, a notable limitation of this study is the method used to expose participants to XR/2D-tour technologies. While the study employed videos to simulate XR/2D-tour experiences, the authenticity and realism of participants' responses may have been compromised. Ideally, providing participants with actual XR/2D-tour technology exposure, such as using head-mounted displays or interactive online virtual tours, would have yielded more genuine insights into their experiences and opinions. Unfortunately, due to limited resources, it was not feasible to expose participants to real XR technologies in this study.

However, the results of this study offer valuable insights into the effectiveness of short videos for attracting visitors to museums. Although this is concurrently a limitation of the study, it also presents a highly practical implication for heritage sites to consider. Creating

engaging video content and disseminating it through platforms like YouTube or other social media channels could prove to be an effective strategy for attracting visitors, all with a significantly lower financial burden compared to investing in expensive XR technologies.

Future research endeavors should aim to overcome this limitation by conducting experiments that involve real-world exposure to technologies, allowing participants to interact with cultural artifacts and virtual museum tours firsthand. This approach would likely provide more accurate and reliable data, enhancing the validity of findings in subsequent studies.

Second, a significant limitation of this study pertains to its potential lack of generalizability. The research focused exclusively on a single painting in a specific museum, which may restrict the applicability of the findings to broader contexts within the cultural heritage sector. Various factors, such as the quality of the XR experience and the nature of the cultural artifacts or museums, could introduce variations in (potential) visitor experiences. Future studies should aim to address this limitation by conducting experiments that encompass a more diverse range of XR technologies, cultural artifacts, and museum types. Additionally, it is important to consider that the study investigated the impact of XR on individual artifacts, and the experience of visiting an entire museum, where visitors navigate through multiple exhibits, could differ significantly. Subsequent research should explore the variations in XR effects between single artifact experiences and complete museum visits. Furthermore, recognizing that different museums offer distinct virtual museum tours with varying features and content, future investigations can delve into the differences between these virtual experiences to provide a more comprehensive understanding of the impact of virtual museum tours on visitor engagement and intentions.

Third, while this study provides valuable insights into the relationship between presentation mode, narrative transportation, and experience within the museum context, it is crucial to acknowledge certain limitations. Notably, the proposed mediating role of narrative transportation was not empirically tested in this research, and no specific hypothesis was formulated to examine its impact on the relationship between presentation

mode and visitors' experiences. This represents a potential avenue for future research, where empirical investigations could be conducted to validate and quantify the mediating effect of narrative transportation.

CHAPTER 6 CONCLUSION

The primary objective of this study is to investigate the impact of technologies on potential museum visitors' experiences, the level of narrative transportation they undergo when viewing an exhibition/artifact virtually through XR or 2D-tour technologies, and the subsequent effects on memorability and their intentions to physically visit the museum. The central research question sought to determine if XR exhibits distinct effects compared to traditional 2D-tour. This study proposed a comprehensive model grounded in Narrative Transportation Theory and the Experience Economy Theory, aiming to uncover the relationships among presentation mode (XR versus 2D-tour), narrative transportation, three realms of experience (entertainment, escapism, esthetic), memorability, and visitors' intentions to visit the museum in person.

The findings of this study revealed several insights. Presentation mode exhibited a significant association with narrative transportation, as well as with entertainment and esthetic experiences. However, the link between presentation mode and escapism did not yield statistical significance. It became evident that narrative transportation played a central role, demonstrating strong associations with all three realms of experience. The results uncovered significant connections between esthetic experiences and potential visitors' intentions to visit the museum. However, this was not the case for entertainment and escapism, where the correlations with intention to visit remained non-significant. It is important to highlight that all three realms of experience exhibited strong associations with memorability. Moreover, this study illuminated the mediating role of memorability in shaping the relationship between potential visitors' experiences and their intentions to visit the museum. Memorability emerged as a critical intermediary factor, facilitating the influence of potential visitor experiences on their future intentions.

This research contributes substantially to the literature surrounding the application of XR technologies in smart tourism, with a particular focus on cultural heritage sites, notably museums. As a practical implication, cultural heritage institutions should consider the adoption of XR technologies within their virtual offerings. XR technology has the capacity to enhance potential visitor experiences, create lasting memories, and stimulate interest in physical museum visits. By leveraging the most effective technologies, cultural

heritage sites can engage a broader audience, providing memorable, immersive, and meaningful encounters with their artifacts.

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APPENDIX A. Measurement Items

Construct	Measurement Items	Source
Virtual Presence	• The environment the painting described became a place, rather than just images. • I felt "being there" in the environment the painting described. • The environment the painting described seemed realistic.	He et al., (2018)
Experience, Entertainment	• The experience of seeing Van Gogh's painting in the video clip emotionally stimulated me. • The experience of seeing Van Gogh's painting in the video clip provided an unusual experience. • I felt physically relaxed when I was watching the video clip.	Vesci et al. (2020)
Experience, Escapism	• I felt like someone else while watching the video clip. • I imagined being in a different time and place while watching the video clip. • I preferred to avoid interaction with others while watching the video clip. • The experience of watching the video clip helped me escape from reality. • It allowed me to get away from a stressful social environment while watching the video clip.	Vesci et al. (2020)
Experience, Esthetic	• The experience was attractive. • The experience was pleasant. • The experience was appreciable. • The experience allowed me to harmonize myself with the environment.	Song et al. (2015)
NT, Projection in the narrative universe	• I went easily into the Painting narrative while watching the video clip. • I projected myself into another universe while watching the video clip. • I was captivated by the painting in the video clip.	Jarrier et al. (2017)

Construct	Measurement Items	Source
	• I felt sucked into another world while watching the video clip.	
NT, Development of mental imagery	• I could easily imagine the elements and details portrayed in the painting. • I am able to maintain a vivid mental image of the depicted scene and elements in the painting. • I found myself speculating and trying to interpret the intended message or meaning conveyed by the painting. • The images and elements depicted in the painting stayed clear and memorable in my mind.	Jarrier et al. (2017)
NT, Loss of the notion of reality and time	• I lost track of time while watching the video clip. • I didn't realize how much time was passing while watching the video clip. • For a moment I didn't know where I was while watching the video clip. • For a moment I was not myself anymore while watching the video clip.	Jarrier et al. (2017)
Intention to Visit	• I would consider visiting the Van Gogh Museum after experiencing the painting in the video clip. • After experiencing the painting in the video clip, I would have a greater inclination to visit the Van Gogh Museum in Amsterdam in the future. • I would prioritize visiting the Van Gogh Museum in Amsterdam after seeing it in the video clip if given the opportunity. • After seeing Van Gogh's Bedroom painting in the video clip, I would be more likely to recommend visiting the Van Gogh Museum in Amsterdam to others.	Huang et al. (2023)
Memorability, Hedonism	• I am thrilled about having a new experience after I saw the video. • I was indulged in the activity depicted in the video clip.	Kim et al. (2012)

Construct	Measurement Items	Source
	• I really enjoyed the video clip and its content. • The video clip and its content were exciting for me.	
Memorability, Novelty	• It was a once-in-a-lifetime video and I have not seen such an experience before. • The video was unique. • It was different from other experiences I have previously seen. • I watched something new in the video.	Kim et al. (2012)
Memorability, Refreshment	• Engaging with the Painting in the video provided me with a sense of liberation. • I enjoyed a sense of freedom while somebody was exploring the painting in the video. • The experience was refreshing for me. • Seeing the video and realizing how a person engages with the painting revitalized my energy and enthusiasm.	Kim et al. (2012)
Memorability, Meaningfulness	• I think the ability to engage with the Painting (as in the video) is a meaningful experience for me. • This experience helped me gain a deeper understanding or appreciation of the artwork. • The Painting made me think about bigger ideas or themes in life or art.	Jiang et al. (2023)
Memorability, Exciting-ness	• I felt a thrill from watching the video. • I felt a rush of excitement while engaging with the video. • The video content sparked a feeling of enthusiasm and anticipation in me.	Jiang et al. (2023)

APPENDIX B. Video Screenshots

Figure 5. Screenshot of the 2D-tour scenario video.

The URL to the 2D-tour scenario video is:

https://youtu.be/xcTiTWeFrQY

Figure 6. Screenshot of the extended reality scenario video.

The URL to the XR scenario video is:

https://www.youtube.com/watch?v=FlAO_p4kEm8