

The Impact of Virtual Reality on Cultural Tourism and Heritage Preservation in the United Arab Emirates

Hessa K. ALMARZOOQI

College of Interdisciplinary Studies, Zayed University
Abu Dhabi, United Arab Emirates

Areej ELSAYARY

College of Interdisciplinary Studies, Zayed University
Abu Dhabi, United Arab Emirates

ABSTRACT

This study explores the potential of virtual reality (VR) to enhance cultural tourism and support heritage preservation in the United Arab Emirates (UAE). As the UAE diversifies its economy and modernizes, cultural tourism plays a crucial role in preserving and showcasing its rich heritage. The integration of VR in museums offers immersive experiences that can engage visitors, foster deeper understanding of Emirati culture, and make cultural sites more accessible. The study investigates how VR can transform cultural tourism by assessing its impact on visitor perceptions of Emirati culture and examining the challenges of implementing VR technology in cultural institutions. The findings aim to provide insights into the potential of VR to promote cultural preservation and contribute to the UAE's broader tourism goals.

Keywords: Virtual Reality, Cultural Tourism, Emirati Culture, Heritage Preservation, UAE, Museums, Immersive Experiences, Technology Integration, Tourism Development

1. INTRODUCTION

Cultural tourism, blending travel with heritage exploration, is vital for both national identity and economic development globally [1]. It involves visiting destinations to experience a society's heritage, traditions, and artistic contributions. In the UAE, cultural tourism is central to its broader tourism strategy, emphasizing Emirati heritage and stimulating economic growth [2]. The rise of advanced technology, particularly virtual reality (VR), offers new ways to present cultural heritage, enhancing tourist engagement with history, culture, and customs [3]. VR technology enables museums to create interactive, immersive environments that deepen visitors' understanding of Emirati culture [4]. As a transformative tool, VR has the potential to revolutionize cultural tourism, making it an important area of study. Beyond economic benefits, cultural tourism helps preserve and develop heritage, fostering social cohesion [5]. It connects the UAE's rapid modernization with its historical roots, showcasing its cultural journey from pearl diving to becoming a global innovation hub.

Cultural tourism is driven by the desire to engage with different cultures through activities such as visiting museums, historical

sites, and cultural festivals [1]. This form of tourism includes both tangible (e.g., monuments, artworks) and intangible heritage (e.g., customs, traditions). It is crucial not only for leisure but also for preserving heritage by generating revenue for site restoration [5]. Additionally, cultural tourism strengthens national identity and pride, especially in countries like the UAE, which are undergoing rapid transformation. Economically, it can boost local economies by attracting high-spending visitors who stay longer. For instance, preserving ancient Roman sites in Italy and temples in Kyoto has contributed significantly to their economies. Virtual reality (VR) is revolutionizing how cultural heritage and traditions are shared with tourists [3]. By creating simulated environments, VR enables visitors to experience historical sites, cultural events, and inaccessible artifacts [4]. It allows museums to offer immersive, interactive experiences that help visitors better understand and appreciate Emirati culture. VR also increases accessibility, allowing those with disabilities or limited mobility to participate. Moreover, VR enhances education by providing engaging, interactive learning opportunities for diverse audiences. As VR technology becomes more affordable and user-friendly, its use in cultural tourism is expanding. The growing availability of VR headsets and software tools is accelerating its adoption, allowing cultural institutions to create more engaging, educational experiences. The UAE views cultural tourism as crucial to diversifying its economy, which has traditionally relied on oil revenues [2]. The government is investing in tourism, technology, and renewable energy to reduce reliance on oil. Cultural tourism has been identified as a key area for attracting diverse visitors and generating revenue. Initiatives like the Louvre Abu Dhabi and the development of cultural heritage sites are part of this strategy [6]. However, the rapid pace of modernization presents challenges in preserving traditional values while embracing modernity. VR could be pivotal in preserving cultural heritage while attracting global tourists. This study responds to the growing interest in immersive technologies, particularly VR, in tourism [3]. VR offers a unique opportunity to modernize cultural experiences while preserving Emirati heritage [2]. Given the UAE's focus on technological innovation, exploring VR's potential in cultural tourism is essential [5]. However, the impact of VR on cultural tourism, particularly in the UAE and the broader Middle East, has not been fully explored [3]. This research aims to fill this gap by examining how VR museums can enhance visitor experiences, attract diverse audiences, and contribute to cultural preservation. The primary goal of this study is to

evaluate the potential of VR to enhance cultural tourism in the UAE while balancing modernization and heritage preservation.

The research questions include:

1. How can the integration of virtual reality in museums enhance cultural tourism and influence visitor perceptions of Emirati culture and heritage?
2. What challenges exist in implementing virtual reality technology in cultural institutions in the UAE, and how can it contribute to cultural preservation and promotion.

2. LITERATURE REVIEW

Virtual Reality in Cultural Tourism

Immersive technologies like virtual reality (VR) are increasingly recognized for enhancing the visitor experience in cultural tourism. VR offers cultural institutions new methods to present history and heritage, going beyond traditional displays. Studies, such as González-Rodríguez et al. [7], show that VR increases emotional engagement and sensory involvement, which are vital for creating meaningful cultural experiences. By simulating historical environments realistically, VR is valuable for museums and heritage sites [7]. Other studies, like Sihuang and Ze's [8], also emphasize VR's ability to reconstruct cultural heritage with visual and auditory elements, intensifying immersion. Han et al. [9] highlight that VR, along with augmented reality (AR), allows visitors to interact with cultural sites in unprecedented ways, such as exploring 3D artifacts and experiencing historical reenactments. This technology makes cultural tourism more accessible, engaging, and educational, aligning with Beck et al.'s [3] findings on the importance of user-centered VR design. Survey results support the claim that VR enhances museum visits. A significant 71.4% of respondents enjoyed "Immersion in history/culture," and 57.1% found VR more engaging than traditional exhibits, underlining its ability to create lasting educational experiences.

Museums and Virtual Reality

Museums increasingly adopt VR to enhance visitor interactions. Jung et al. [6] note that VR boosts engagement by making exhibits more interactive, while Lee et al. [10] confirm its role in cultural education. Additionally, Damiano et al. [11] show how virtual museums allow remote access to cultural heritage, which is particularly useful for preserving at-risk artifacts. Despite the growing body of research, there remains a lack of studies focused on VR's impact on cultural tourism in the Middle East, especially the UAE. This gap offers a chance for this study to contribute by examining VR's role in preserving the UAE's cultural heritage while exploring the technological benefits in the region.

While VR's role in cultural tourism has been studied in Europe and North America, few studies have explored its use in preserving and promoting heritage in the UAE and the broader Middle East. Marasco [12] discussed VR in Western museums, but research on VR's long-term impact on cultural preservation remains limited. Shahab et al. [13] examined VR's educational benefits, but did not address its role in sustaining heritage. This study aims to fill that gap by examining VR's contribution to both visitor engagement and long-term cultural preservation in the UAE.

Cultural Tourism in the UAE

The UAE, known for rapid modernization and economic diversification, is an ideal setting for this study. Once reliant on oil, the country now invests heavily in tourism and cultural institutions. World-class museums like the Louvre Abu Dhabi and Sharjah Art Foundation attract global visitors and showcase the UAE's rich history. However, balancing modernization with heritage preservation presents unique challenges, making VR an important tool for engaging younger, tech-savvy generations while fostering cultural awareness. This study examines how VR can provide immersive, interactive cultural experiences that complement the UAE's cultural preservation efforts. The UAE's development of cultural tourism coincides with its broader diversification strategy. Initially focused on natural attractions, the country now emphasizes its cultural heritage, which is reflected in investments in heritage sites. Key sites like Al Ain (a UNESCO World Heritage Site), Dubai's Bastakiya Quarter, and the Sheikh Zayed Grand Mosque showcase the country's rich history and cultural identity [14, 15, 16]. These sites help foster national pride and attract tourists, thereby supporting economic diversification through tourism. As part of its strategy to lead global innovation, the UAE has increasingly integrated technology into its tourism sector. Initiatives like augmented reality (AR) apps and VR experiences are enhancing cultural tourism by offering immersive, educational experiences. These technologies improve visitor engagement and safety, creating an interconnected tourist ecosystem. For instance, VR installations in museums and cultural sites offer interactive storytelling, allowing visitors to explore historical moments in unprecedented ways [5]. UAE museums are adopting VR to enhance visitor experiences. The Louvre Abu Dhabi, for example, offers VR tours and interactive exhibits that provide historical context to artifacts, improving visitor engagement [6]. Similarly, the Sharjah Museum of Islamic Civilization and the Dubai Frame integrate VR to offer unique insights into Islamic history and Dubai's transformation, respectively [17, 18]. These case studies highlight how VR can promote cultural understanding and contribute to the UAE's tourism strategy. While VR presents many opportunities, challenges remain, such as making technology accessible to all audiences and ensuring cultural sensitivity. Despite these challenges, VR has the potential to engage younger, tech-savvy tourists and provide educational experiences that also promote cultural preservation. This study explores how VR can meet these challenges and contribute to the UAE's tourism and cultural preservation goals.

3. METHODOLOGY

This study adopts a mixed-methods approach, combining quantitative surveys and qualitative interviews to explore VR's role in UAE cultural tourism. The survey of 42 museum visitors collected demographic data and insights on VR engagement, preferences, and suggestions for improvement. Interviews with 11 professionals focused on the challenges of VR implementation, including balancing technological innovation with cultural preservation and aligning VR with the UAE's Vision 2021 tourism strategy.

Key findings indicated that younger visitors (18-24) engage more with VR than older participants, and that perceived ease of use and cultural relevance influence VR adoption. Themes from interviews emphasized the potential of VR for enhancing education but also highlighted technical and financial barriers.

Ethical considerations were addressed, including consent and data security, with approval from Zayed University's research committee. However, limitations arose from the six-week data collection period, self-selection bias, and the underrepresentation of Emirati nationals. The reliance on digital tools also excluded less tech-savvy individuals, and the study's cultural context necessitates careful interpretation. Future research should extend the sample size, improve recruitment methods, and ensure more inclusive participation for a more representative analysis of VR's impact on cultural tourism in the UAE.

4. RESULTS AND DISCUSSION

Visitor Engagement with VR in Museums

The survey conducted revealed valuable insights into how museum visitors engage with virtual reality (VR). Of the 42 respondents, 73.8% had never used VR in a museum, while 26.2% had tried it. Those who experienced VR rated it positively, with 54.5% giving it a score of 4 out of 5. The most appreciated features were interactive elements (63.6%) and immersion in history and culture (45.5%), consistent with global trends highlighting VR's ability to offer immersive, educational experiences [19]. Visitors overwhelmingly preferred interactive exhibits (69%) over traditional displays, indicating a clear demand for technology-driven museum experiences. Despite the relatively low percentage of VR users, 63.6% believed VR enhanced learning compared to traditional exhibits, and 54.5% supported its inclusion in all major museums. Motivations for museum visits primarily included learning about history and heritage (78.6%) and entertainment (69%), suggesting that VR's storytelling capabilities could play a significant role in satisfying these expectations [20].

The survey highlighted notable differences in VR perceptions across age, gender, and technology familiarity. Younger participants (18-24) were particularly enthusiastic about VR, favoring interactive exhibits and expressing higher interest in VR's potential to enhance learning experiences [21]. In contrast, older respondents (45+) were less engaged, reflecting lower familiarity or interest in digital technologies. The survey also revealed that female respondents (71.4%) and male respondents (28.6%) shared similar preferences for interactive exhibits, although prior VR exposure was not significantly noted. Emirati nationals were underrepresented in the sample, with only one participant, indicating a need for more inclusive research strategies targeting local populations. Additionally, familiarity with technology played a crucial role, as tech-savvy respondents showed higher engagement levels with VR and greater willingness to recommend it [22].

Key Insights

The survey results revealed several trends, including a clear preference for interactive exhibits, suggesting that museums should accelerate the integration of digital technologies like VR to align with visitor expectations [20]. This preference was especially strong among younger visitors. However, the study identified a gap in Emirati representation, highlighting the need for culturally tailored outreach and inclusive engagement strategies. Furthermore, technology familiarity influenced visitor experiences, with those more comfortable with digital

tools having more positive interactions with VR. Museums should consider creating more accessible, user-friendly interfaces to bridge this digital divide and ensure inclusive experiences for all visitors.

Museum Perspectives on VR

The online responses from those interested in VR museums revealed a strong consensus on the potential of VR to modernize museum experiences by combining education with entertainment. Respondents appreciated the interactive elements (63.6%) and immersion in history and culture (45.5%). These findings echo research by Lee et al. [11], highlighting how VR allows users to experience historical events and locations in ways that traditional exhibits cannot replicate. Additionally, respondents emphasized that VR could attract international tourists, with 63.6% agreeing that it adds a unique attraction for cultural tourism. This aligns with González-Rodríguez et al. [7], who found that immersive technologies enhance tourism by offering unique, memorable experiences.

Despite the positive responses, VR was not a primary draw for most museum-goers. Only 23.8% preferred VR experiences, while 69% favored interactive exhibits and 66.7% preferred traditional artifacts. This suggests that while VR holds promise, it is still emerging as a mainstream attraction in museums, consistent with global research indicating that immersive technologies, although engaging, are not yet dominant in cultural spaces [23].

Visitor Motivations and Expectations

The most common reason for visiting museums was to learn about history and heritage (78.6%), followed by entertainment (69%). Interactive exhibits were cited as a key attraction (54.8%), emphasizing that visitor engagement is essential to satisfaction. Despite growing interest in immersive technologies, only 26.2% had experienced VR in a museum. Those who did found it engaging, with 54.5% rating their experience 4 out of 5. The interactive features (63.6%) and immersion in history (45.5%) were the most appreciated aspects. This finding supports research suggesting that meaningful interaction is more important than hyper-realistic visuals in virtual heritage experiences [24].

VR's Role in Cultural Tourism

A majority (63.6%) of participants believed that VR could attract international tourists to UAE museums by offering a unique cultural experience. Additionally, 63.6% felt VR significantly enhanced learning compared to traditional exhibits. This highlights VR's educational value, aligning with studies that demonstrate its potential to foster deeper engagement and emotional connections with cultural content [7][9]. However, opinions on the widespread adoption of VR varied, with 54.5% supporting its inclusion in all major museums, while others preferred selective implementation. This suggests that museums should consider integrating VR as a supplementary feature rather than a primary attraction, ensuring accessibility while maintaining the educational focus of traditional exhibits [12].

Suggestions for Improving VR Experiences

Respondents provided several recommendations for improving VR experiences, emphasizing the need for accessibility and user-friendly design to cater to all age groups. Suggestions included allowing users to manipulate virtual artifacts, such as rotating or zooming in, to enhance engagement. Some participants cautioned against overusing futuristic elements that might compromise cultural authenticity, preferring VR that remains grounded in historical accuracy [4, 6]. These findings align with literature on digital innovation in cultural heritage, stressing the importance of balancing technological advancements with the preservation of cultural integrity.

Implementation Challenges in VR Adoption

The survey results highlighted strong enthusiasm for virtual reality (VR) in museums but also identified several challenges related to its implementation. Budget constraints were identified as a significant barrier, with many respondents pointing out the substantial investment required for hardware, software, and content development. This is particularly challenging for smaller museums or those with limited funding, a point echoed by Beck et al. [3]. Accessibility concerns were another common issue, with participants stressing the need for VR experiences to be inclusive, catering to all visitors regardless of age or technological familiarity. Suggestions included simplifying VR interfaces for all age groups and ensuring ease of use for those unfamiliar with technology. Another challenge noted was the development of culturally sensitive content, especially in the UAE context, where participants emphasized the importance of creating VR experiences that authentically reflect Emirati heritage rather than relying on Western-centric narratives, a concern supported by Bekele and Champion [23]. Additionally, visitors highlighted adaptation challenges, including discomfort with VR headsets and difficulties navigating virtual environments. Some respondents suggested providing guides or detailed instructions to improve user experience. These challenges underline the complexities of implementing VR in museum settings while maximizing its potential.

Balancing Innovation and Heritage Preservation

A key theme among respondents was the need to balance modernization with heritage preservation when integrating VR into museums. While many expressed excitement about VR's potential, some raised concerns about the overuse of digital tools potentially overshadowing traditional exhibits or physical artifacts. One participant suggested that "VR shouldn't be applied to all kinds of museums," advocating for careful consideration of VR's applicability based on the museum type and its target audience. Another respondent emphasized the importance of maintaining historical authenticity and cautioned against making VR experiences "too futuristic." These concerns align with Ajana's [6] argument that museums must navigate the tension between embracing innovation and preserving their role as custodians of cultural heritage. Museums can strike a balance by using VR to complement traditional exhibits, rather than replacing them entirely. Additionally, ethical considerations surrounding the digital representation of cultural artifacts were raised, with concerns about ownership, accuracy, and potential misrepresentation, highlighting the need to maintain public trust in museum practices [14].

Cultural and Economic Impact of VR

VR has proven to be a transformative tool for enhancing cultural learning and preservation. By immersing visitors in historical or heritage-based environments, VR allows for experiential education that traditional exhibits cannot replicate. For instance, VR can recreate lost artifacts or historical events, allowing users to interact with the past in ways that deepen their understanding of cultural contexts [24]. This immersive approach aligns with previous studies that suggest VR fosters emotional connections to heritage, such as the Musée d'Orsay's "Van Gogh's Palette," where visitors explored the artist's techniques through interactive brushstrokes and colors [25]. Additionally, VR plays a significant role in digital preservation, with initiatives like China's VR-Heritage project using 3D scanning to create detailed digital replicas of cultural sites, safeguarding them from degradation. In the UAE, similar efforts could protect endangered landmarks such as Al Ain's UNESCO-listed oases while making them accessible to global audiences.

Integrating VR into museums offers significant economic potential by attracting tourists and diversifying revenue streams. VR-driven initiatives have proven successful in increasing attendance, such as the Musée d'Orsay's VR experience, which drew 18,000 visitors in five months [24]. Similarly, the VR tour "Horizon of Khufu" attracted over 250,000 attendees in 2024, demonstrating how VR can make museums must-visit destinations for international tourists seeking unique, tech-driven experiences. Moreover, VR creates new revenue opportunities, such as virtual events, exclusive tours, and virtual gift shops offering 3D customizable souvenirs. VR also reduces operational costs by minimizing physical wear on artifacts and enabling virtual exhibitions. For the UAE, which already boasts cutting-edge attractions like the Museum of the Future, VR could further enhance its reputation as a leader in innovative tourism.

Opportunities for UAE Tourism

Integrating VR into UAE museums aligns with the nation's Vision 2021 strategy to diversify tourism and promote cultural heritage. The UAE has already pioneered projects like the National Museum VR Experience, immersing users in Emirati history through panoramic desert landscapes and interactive timelines. These initiatives cater to tech-savvy younger audiences while supporting the UAE's goals of reducing oil dependence and establishing itself as a global cultural hub. Learning from global examples, such as China's VR-Heritage project, UAE museums could partner with universities to document and preserve cultural heritage digitally. Additionally, the success of Horizon of Khufu illustrates the potential for shared VR spaces, which the UAE could adapt to showcase iconic sites like the Sheikh Zayed Grand Mosque or Al Fahidi Historical Neighbourhood. By integrating VR with existing attractions, the UAE can create a dynamic tourism ecosystem that appeals to history enthusiasts and tech-driven travelers.

Challenges in Implementing VR in UAE Museums

Adopting VR in UAE museums faces significant technical challenges, including infrastructure limitations and high maintenance demands. VR requires robust internet connectivity,

advanced hardware, and regular software updates, which can place a strain on institutional budgets. For example, the Louvre Abu Dhabi's "Masterpieces of History" VR exhibit uses cutting-edge HTC Vive hardware, reflecting the high costs involved [25]. Smaller museums, especially in rural areas, may struggle with inconsistent internet access and outdated equipment, hindering their ability to offer seamless VR experiences. Maintenance is another critical challenge, as VR hardware can wear out quickly from frequent use, and software needs regular updates to fix bugs or improve features. For museums without tech partnerships or government support, these costs can be prohibitive.

Ensuring accessibility for a diverse audience remains a key issue. While younger, tech-savvy visitors (18–34) show high engagement with VR, older adults and those less familiar with technology often find VR interfaces intimidating. In the survey, 45+ respondents made up only 4.8% of the participants, reflecting the difficulty older visitors may face when using VR equipment. Other physical side effects, such as motion sickness and eye strain, are also common deterrents [24]. To address these challenges, museums must prioritize inclusive design, with simplified interfaces, multilingual guides, and alternative experiences like 2D previews for VR content. Training staff to assist users and offering pre-VR tutorials could also help ease the adaptation process. The Dubai Frame's AR exhibits, which blend digital and physical elements, serve as a model for gradually introducing visitors to immersive technologies without overwhelming them.

The digital representation of cultural artifacts raises several ethical issues, including misinterpretation or oversimplification of cultural narratives. UNESCO cautions that VR depictions of sensitive sites, like Al Ain's oases, must avoid "over-interpretation" that distorts historical accuracy. In the UAE, where the population is diverse, VR content must resonate with both Emirati nationals and international visitors. Ownership of virtual replicas is another concern; questions arise about who controls the digital representations of cultural artifacts, the museum, the government, or the communities of origin. Collaborative projects, like the National Museum VR Experience, have helped mitigate these concerns by working closely with the UAE Ministry of Culture to ensure authenticity. However, without clear guidelines, VR could commodify heritage and reduce sacred traditions to mere entertainment.

5. CONCLUSION AND RECOMMENDATION

This study highlights the transformative potential of virtual reality (VR) in UAE cultural tourism while also addressing several challenges related to its implementation. This study reveals VR's dual potential: to revolutionize museum experiences and present challenges in its implementation. Visitors show a strong preference for interactive technologies, with 69% favoring digital exhibits, particularly younger visitors (52.4% aged 18-24) who express significant enthusiasm for immersive formats. Despite current VR adoption being modest (26.2%), its high satisfaction rates, 54.5% of users rated their experience 4 out of 5, suggest that VR can be an effective engagement tool when thoughtfully executed. The UAE, with its unique position as both a technological innovator and a country with deep cultural roots, is well-suited to test VR applications that balance innovation and authenticity. To

achieve successful VR integration, museums should focus on creating hybrid experiences that complement physical artifacts rather than replace them. Addressing accessibility issues, especially for less tech-savvy visitors, is also essential. Strategic collaborations with local communities and technology partners can help overcome the financial challenges associated with VR adoption and ensure culturally sensitive implementations. Museums must prioritize engagement and learning over technological spectacle to foster meaningful connections with visitors while respecting cultural authenticity. To strengthen future studies, expanding data collection timelines is essential. Closer collaboration with museums would allow for greater participation rates and a more diverse sample. An extended data collection period would help engage underrepresented groups, such as older adults, and the introduction of incentives, such as free VR trial access, could increase participation in surveys and interviews. Language inclusivity is another critical consideration for future research. Developing bilingual surveys or incorporating Arabic-language facilitators would improve accessibility for non-English speakers and Emirati nationals, promoting cultural representation and enhancing the sensitivity of the research findings. This would ensure that studies reflect the diverse linguistic backgrounds of the UAE's population. Adopting a longitudinal research design would provide deeper insights into the long-term effects of VR on cultural preservation and tourism. Tracking visitor engagement and attitudes over time would help assess VR's impact on learning outcomes, cultural appreciation, and the frequency of repeat visits to museums. These methodological improvements would offer a more nuanced understanding of VR's potential within the UAE's cultural tourism landscape.

6. REFERENCES

- [1] G. Richards, “Cultural tourism: A review of recent research and trends,” *Journal of Hospitality and Tourism Management*, vol. 36, pp. 12–21, Jul. 2018, doi: 10.1016/j.jhtm.2018.03.005. Available: <https://doi.org/10.1016/j.jhtm.2018.03.005>
- [2] D. Boussaa, “Urban heritage and tourism in the Gulf: The case of Dubai in the UAE,” *Journal of Tourism and Hospitality Management*, vol. 2, no. 4, pp. 174–181, 2014.
- [3] H. Wu, X. Lv, M. Cavusoglu, and C. Cobanoglu, “Chinese cruise customers loyalty: the impact of customer participation and service personal values,” *Tourism Review*, vol. 76, no. 1, pp. 255–276, Apr. 2020, doi: 10.1108/tr-03-2019-0085. Available: <https://doi.org/10.1108/tr-03-2019-0085>
- [4] J. Huang and W. Li, “Research on innovative strategies of museum display design to improve user experience,” in *Proc. Int. Conf. on Human-Computer Interaction*, 2024, pp. 343–358. [Online]. Available: https://doi.org/10.1007/978-3-031-60471-2_22
- [5] B. Sančanin, “Historical heritage in the function of developing cultural tourism,” *The Journal of Middle East and North Africa Sciences*, vol. 5, no. 5, pp. 6–12, 2019.
- [6] B. Ajana, “Branding, legitimization and the power of museums: The case of the Louvre Abu Dhabi,” *Museum & Society*, vol. 13, no. 3, pp. 316–335, 2015.
- [7] M. R. González-Rodríguez, M. C. Díaz-Fernández, and M. Á. Pino-Mejías, “The impact of virtual reality technology on tourists’ experience: a textual data analysis,” *Soft Computing*, vol. 24, no. 18, pp. 13879–13892, Mar. 2020, doi: 10.1007/s00500-020-04883-y. Available: <https://doi.org/10.1007/s00500-020-04883-y>
- [8] S. Man and Z. Gao, “(Retracted) Digital immersive interactive experience design of museum cultural heritage based on virtual reality technology,” *Journal of Electronic Imaging*, vol. 32, no. 01, Aug. 2022, doi: 10.1117/1.jei.32.1.011208. Available: <https://doi.org/10.1117/1.jei.32.1.011208>
- [9] D.-I. D. Han, J. Weber, M. Bastiaansen, O. Mitas, and X. Lub, “Virtual and augmented reality technologies to enhance the visitor experience in cultural tourism,” in *Progress in IS*, 2019, pp. 113–128. doi: 10.1007/978-3-030-06246-0_9. Available: https://doi.org/10.1007/978-3-030-06246-0_9
- [10] H. Lee, T. H. Jung, M. C. tom Dieck, and N. Chung, “Experiencing immersive virtual reality in museums,” *Information & Management*, vol. 57, no. 5, p. 103229, 2020. [Online]. Available: <https://doi.org/10.1016/j.im.2020.103229>
- [11] A. Damiano, A. Aiello, S. Fai, and C. Santagati, “Virtual museums as a means for promotion and enhancement of cultural heritage,” *ISPRS Archives*, vol. 42, no. 2/W15, pp. 33–40, 2019. [Online]. Available: <https://doi.org/10.5194/isprs-archives-XLII-2-W15-33-2019>
- [12] A. Marasco, “Beyond virtual cultural tourism: history-living experiences with cinematic virtual reality,” *Tourism & Heritage Journal*, vol. 2, pp. 1–16, May 2020, doi: 10.1344/thj.2020.2.1. Available: <https://doi.org/10.1344/thj.2020.2.1>
- [13] H. Shahab, M. Mohtar, E. Ghazali, P. A. Rauschnabel, and A. Geipel, “Virtual reality in museums: Does it promote visitor enjoyment and learning?,” *International Journal of Human-Computer Interaction*, vol. 39, no. 18, pp. 3586–3603, Sep. 2022, doi: 10.1080/10447318.2022.2099399. Available: <https://doi.org/10.1080/10447318.2022.2099399>
- [14] UNESCO World Heritage Centre, “Cultural sites of Al Ain (Hafit, Hili, Bidaa Bint Saud and Oases Areas),” [Online]. Available: <https://whc.unesco.org/en/list/1343/>
- [15] Dubai Culture, “Al Fahidi Historical Neighbourhood,” [Online]. Available: <https://dubaiculture.gov.ae/en/attractions/heritage-sites/al-fahidi-historical-neighbourhood>
- [16] B. O’Kane, *Sheikh Zayed Grand Mosque (Abu Dhabi)*, unpublished manuscript.
- [17] A. Isaacson, “New research reveals demand for VR access to museum collections,” *The VR Collective*, Jan. 30, 2025. [Online]. Available: <https://thevrcollective.com/new-research-reveals-demand-for-vr-access-to-museum-collections/>
- [18] A. Hardaker, “Report suggests ‘clear public appetite’ for collections in VR,” *Museums + Heritage*, Jan. 9, 2025. [Online]. Available: <https://museumsandheritage.com/advisor/posts/report-suggests-clear-public-appetite-for-collections-in-vr/>
- [19] M. Lorenz, J. Brade, P. Klimant, C.-E. Heyde, and N. Hammer, “Age and gender effects on presence, user experience and usability in virtual environments—first insights,” *PLoS ONE*, vol. 18, no. 3, p. e0283565, Mar. 2023, doi: 10.1371/journal.pone.0283565. Available: <https://doi.org/10.1371/journal.pone.0283565>
- [20] M. Trunfio, M. D. Lucia, S. Campana, and A. Magnelli, “Innovating the cultural heritage museum service model through virtual reality and augmented reality: The effects on the overall visitor experience and satisfaction,” *Journal of Heritage Tourism*, vol. 17, no. 1, pp. 1–19, 2022. [Online]. Available: <https://doi.org/10.1080/1743873X.2021.1877185>
- [21] “Virtual reality in museums: How virtual reality enhances art, history, and culture,” *ArborXR*, Jul. 6, 2023. [Online]. Available: <https://arborxr.com/blog/virtual-reality-in-museums-how-virtual-reality-enhances-art-history-and-culture>
- [22] N. Makarevych, “Using virtual reality to transform museum exhibits,” *Onix*, Apr. 2, 2025. [Online]. Available: <https://onix-systems.com/blog/using-virtual-reality-for-museums>
- [23] bigDreamTeam, “Immersive technologies: UAE museums,” Big Dream Lab Dubai, Feb. 16, 2024. [Online]. Available: <https://bigdreamlab.ae/blog/immersive-technologies-uae-museums/>
- [24] M. Sun and A. N. B. Othman, “The impact of virtual reality technology on museum audience engagement,” *International Journal of Academic Research in Progressive Education and Development*, vol. 14, no. 1, Mar. 2025, doi: 10.6007/ijarped/v14-i1/24867. Available: <https://doi.org/10.6007/ijarped/v14-i1/24867>
- [25] J. Richardson, “The disadvantages of using virtual reality in museums,” *MuseumNext*, Dec. 13, 2024. [Online]. Available: <https://www.museumnext.com/article/the-disadvantages-of-using-virtual-reality-in-museums/>