

From Virtual to Reality: Enhancing Cultural Tourism Through AI, VR, and the Metaverse

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Abstract: This paper examines the transformative role of Artificial Intelligence (AI) in cultural tourism, highlighting its integration with advanced digital platforms such as the Metaverse, Virtual Reality (VR), and Augmented Reality (AR). Traditionally, cultural tourism centers on immersive engagement with the tangible and intangible heritage of destinations. However, the adoption of AI and related digital technologies is revolutionizing how visitors interact with cultural artifacts and practices, creating personalized and deeply engaging experiences that were previously unattainable. AI enhances the tourist experience by offering adaptive and intelligent platforms that personalize interactions based on real-time data analysis of visitor preferences and behaviors. This capability significantly enriches educational outcomes and visitor satisfaction by providing culturally relevant, context-aware content in multiple languages, thereby increasing accessibility and inclusivity. In virtual settings, such as the Metaverse, AI-driven interfaces allow for the creation of deeply immersive environments where users can interact with cultural heritage in ways that respect and preserve the authenticity of the original sites, thus supporting sustainable tourism practices. Moreover, the use of VR and AR technologies, powered by AI, introduces unprecedented levels of interaction and immersion, making cultural tourism more vibrant and engaging. These technologies allow tourists to explore historical reconstructions or deeply engage with cultural narratives without the physical intrusion that can lead to site degradation. However, this digital transformation presents significant challenges, notably in the commodification of culture and the potential loss of authenticity in cultural representations. This paper advocates for a balanced approach to integrating AI, VR, and AR technologies, such as the Metaverse, in cultural tourism. It emphasizes that technological advancements should enhance the visitor experience while preserving the intrinsic cultural value of heritage sites. By outlining a roadmap for responsible and sustainable implementation, this study seeks to contribute to the ongoing discourse on leveraging technology to enrich cultural tourism while upholding ethical standards and preserving cultural integrity.

Keywords: Artificial intelligence, Cultural tourism, Digital innovation, Metaverse, Sustainable tourism, Augmented reality, Virtual reality, Heritage preservation, Immersive technology

1. Introduction

Cultural tourism has traditionally provided immersive experiences that connect visitors with the tangible and intangible heritage of destinations. However, the rapid advancement of digital technologies—such as Artificial Intelligence (AI), Virtual Reality (VR), Augmented Reality (AR), and the Metaverse—is fundamentally reshaping how tourists interact with cultural sites and narratives (Buhalis et al., 2023; Correia, P., 2025). These technologies are not merely innovative tools but serve as transformative enablers, offering more personalized, immersive, and accessible cultural tourism experiences.

The Metaverse, a digital environment that merges physical and virtual worlds, enables users to engage with cultural heritage in unprecedented ways (Liu & Park, 2024). Through AI-powered interfaces, tourists can dynamically interact with historical sites and cultural narratives, introducing new levels of immersion and interaction. This integration facilitates the exploration of historical reconstructions and meaningful engagement with cultural artifacts without requiring physical site visits (Zhang & Wang, 2023). Additionally, AI-driven personalization enhances visitor satisfaction and fosters deeper cultural engagement by tailoring experiences to individual preferences.

Despite its transformative potential, this digital evolution is not without challenges. Critical issues include the commodification of culture, risks to the authenticity of cultural representations, and ethical concerns related to data privacy and sustainability (Chen et al., 2023). As cultural tourism increasingly relies on digital platforms, it becomes imperative to balance technological innovation with the preservation of cultural integrity and the authenticity of visitor experiences.

This paper examines the transformative impact of AI and the Metaverse on cultural tourism, focusing on how these technologies enhance visitor engagement while safeguarding cultural heritage. By analyzing the benefits, challenges, and ethical considerations, the study offers a roadmap for the responsible and sustainable integration of these technologies into cultural tourism. This research contributes to the broader discourse on leveraging AI and immersive technologies to enrich cultural tourism, emphasizing the importance of ethical practices and the preservation of cultural value.

Guiding Research Questions

To investigate the opportunities and challenges associated with the integration of AI and the Metaverse in cultural tourism, this paper is structured around the following key research questions:

1. How can AI and the Metaverse enhance visitor engagement and interaction in cultural tourism?

This question examines the ways in which AI-driven platforms and immersive technologies facilitate deeper, more personalized interactions between tourists and cultural heritage sites. By focusing on adaptive, real-time content delivery, multisensory engagement, and dynamic cultural narratives, the analysis seeks to understand how these technologies enrich the visitor experience.

2. What are the potential challenges and ethical concerns related to the integration of these technologies in cultural tourism?

This question addresses critical issues such as the commodification of culture, the authenticity of virtual representations, and the privacy and security of visitor data. The exploration also considers the sustainability implications of AI and immersive technologies, including the energy demands of VR and AR platforms. These challenges underscore the need for careful implementation strategies to avoid compromising cultural value and ethical principles.

3. How can AI and immersive technologies be integrated into cultural tourism to preserve cultural integrity and promote sustainable practices?

This question seeks to outline a framework for the responsible and sustainable adoption of AI, VR, and Metaverse technologies in cultural tourism. The emphasis is on balancing technological innovation with cultural preservation and ethical considerations, ensuring these technologies enhance rather than detract from the cultural value of heritage sites.

By addressing these questions, this paper aims to provide a comprehensive understanding of how AI and the Metaverse can transform cultural tourism while upholding ethical standards, sustainability goals, and the preservation of cultural integrity. The findings will contribute to the broader discourse on integrating advanced technologies into tourism in a manner that enriches visitor experiences and supports heritage conservation.

2. Methodology

This study adopts a systematic review to analyze the role of AI and the Metaverse in enhancing cultural tourism. By synthesizing existing literature, the review explores how these technologies improve visitor engagement, preserve cultural heritage, and promote sustainable tourism practices. The methodology follows established guidelines from Liberati et al. (2009) and Moher et al. (2009) to ensure rigor and transparency.

A literature search was conducted in the Web of Science (WoS) database, focusing on publications from 2012 to 2024. Using keywords such as "Metaverse," "Tourism," and "Cultural," the search identified studies addressing the Metaverse's impact on cultural preservation, visitor experiences, and sustainability. Inclusion criteria ensured only English-language, peer-reviewed articles engaging with tourism or business applications were selected, excluding studies that lacked contextual relevance. From an initial 193 articles, 42 met these criteria for detailed analysis.

Key themes identified included visitor engagement, cultural preservation, sustainability, and ethical concerns such as data privacy and cultural commodification. The analysis emphasized how AI, VR, and the Metaverse contribute to these areas while promoting authenticity and sustainable practices. Only articles published in journals listed by the Chartered Association of Business Schools (ABS) were included to ensure quality and reliability.

Limitations include the exclusion of non-English publications and grey literature, which may have introduced a publication bias. Nonetheless, the systematic review provides a robust foundation for understanding the integration of the Metaverse in cultural tourism, offering valuable insights for future research and practical applications.

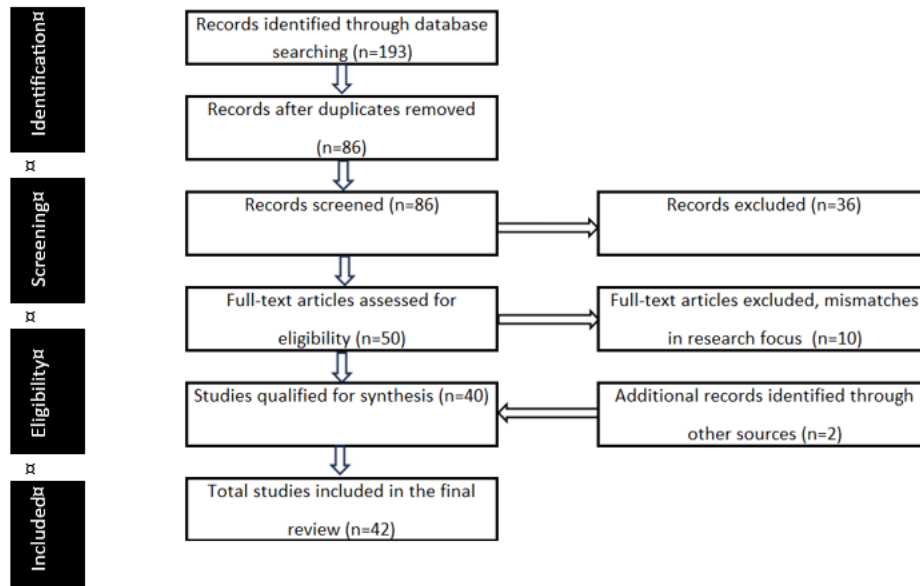


Figure 1: The PRISMA Flowchart details the identification, screening, eligibility, and inclusion phases of the systematic review process. It provides a visual representation of how the initial 193 records were narrowed down to the final 42 studies included in this review (Source: Adapted from Moher et al., 2009 and Yang et al., 2017)

3. Results and Discussion

3.1 Overview of Literature and Trends

The systematic review revealed a growing body of research focused on integrating AI, VR, and the Metaverse within cultural tourism. The literature highlights these technologies' transformative potential in enhancing visitor engagement and accessibility. Studies emphasize that AI-powered platforms create highly personalized experiences by analyzing visitor data in real-time, tailoring content to individual preferences, behaviors, and cultural backgrounds (Buhalis et al. 2023; Zhang & Wang 2023; Correia, P., 2025). This personalization is crucial in offering engaging and meaningful interactions with cultural heritage.

A significant emphasis is placed on VR and AR technologies, recognized for offering virtual access to cultural sites that may be geographically distant or physically restricted (Liu & Park 2024). VR and AR enable detailed reconstructions of historical environments, offering educational and entertaining experiences. In terms of cultural preservation, these technologies can replicate vulnerable or endangered heritage sites, allowing tourists to engage without contributing to physical degradation.

The integration of AI, VR, and the Metaverse is associated with a shift towards more sustainable tourism practices. As destinations face overtourism and environmental concerns, these technologies mitigate the ecological impact of physical travel (Jung et al. 2024). Virtual tourism allows engagement with cultural heritage without physical visitation, reducing carbon footprints and lessening wear on fragile sites.

However, substantial concerns exist regarding potential commodification of culture in virtual spaces. Scholars argue that while digital platforms democratize access to cultural experiences, they risk oversimplifying or misrepresenting complex cultural narratives (Chen et al. 2023). The tension between technological innovation and cultural authenticity is a recurring theme, stressing the importance of maintaining cultural heritage integrity in digital environments.

Ethical concerns, particularly data privacy and security, are growing. AI-driven platforms collecting and analyzing visitor data raise questions about data use, storage, and protection. These concerns extend beyond individual privacy to digital sovereignty, especially in regions with sensitive cultural heritage (Zhang & Wang 2023).

To provide a clearer understanding of how this literature is distributed across different academic fields and time periods, **Table 1** shows the distribution of reviewed articles by journal, highlighting the leading sources of published work on metaverse in tourism. **Table 2** categorizes these studies by discipline and year of publication, offering insight into the progression and interdisciplinary nature of research in this field.

Table 1: Distribution by Journal

Journal Name	No. of studies	%
Information Technology & Tourism	12	29%
International Journal of Contemporary Hospitality Management	4	10%
Tourism Review	4	10%
Current Issues in Tourism	2	5%
Journal of Hospitality and Tourism Insights	2	5%
Journal of Hospitality Marketing & Management	2	5%
Journal of Retailing and Consumer Services	2	5%
Journal of Travel & Tourism Marketing	2	5%
Computers in Human Behavior	1	2%
International Journal of Information Management	1	2%
International Journal of Tourism Research	1	2%
Journal of Computer Information Systems	1	2%
Journal of Destination Marketing & Management	1	2%
Journal of Hospitality & Tourism Research	1	2%
Journal of Vacation Marketing	1	2%
Psychology & Marketing	1	2%
The Service Industries Journal	1	2%
Tourism Economics	1	2%
Tourism Recreation Research	1	2%
Tourism Management	1	2%
TOTAL	42	100%

Table 2: Literature Profiles by Disciplines and Publication Years

Disciplines (No. of Journals)	No. of studies	2022	2023	2024
Hospitality and tourism (12)	22	1	19	2
Digital technology in tourism and hospitality (1)	12		12	
Marketing (3)	3		1	2
information technology (2)	2		1	1
hospitality marketing and management (1)	1	1		
information management (1)	1	1		
Services sector (1)	1		1	
Total	42	3	34	5

3.2 Research Contexts and Key Findings

The reviewed literature highlights the diverse research contexts exploring the Metaverse's application in tourism, particularly in enhancing cultural tourism through AI, VR, and AR. These studies collectively emphasize the transformative potential of immersive technologies in creating more engaging, accessible, and personalized tourism experiences. A predominant focus on overarching management and marketing strategies reveals the growing interest in leveraging the Metaverse to optimize operational efficiencies and enhance customer engagement within the tourism sector.

Specifically, the research encompasses several thematic areas, including the adoption of immersive technologies for heritage preservation, the use of AI to personalize visitor experiences, and the integration of the Metaverse

into sustainable tourism practices. Table 3 summarizes these contexts, categorizing them based on their thematic focus, methodologies, and key findings.

Table 3: Research Contexts and Key Findings

Research Focus	Description	Key Findings	Relevance to Cultural Tourism
Heritage Preservation and Accessibility	Studies explore VR/AR and the Metaverse as tools for digitally preserving cultural heritage and improving access to fragile or remote sites.	Immersive technologies enable virtual tours of endangered sites and digital replication of artifacts, enhancing visitor accessibility and educational value.	Provides sustainable solutions for preserving cultural integrity while allowing wider audience engagement with heritage.
Visitor Personalization via AI	Research examines AI-driven platforms that tailor cultural tourism experiences based on visitor preferences, behavior, and language.	AI enhances visitor satisfaction through real-time data analysis and adaptive content delivery, making experiences contextually relevant and inclusive.	Enables culturally rich, personalized experiences that attract diverse tourist demographics.
Immersive Storytelling and Engagement	Studies analyze how VR, AR, and the Metaverse create interactive, narrative-driven experiences for tourists.	Immersive storytelling deepens visitor engagement by combining visual, auditory, and interactive elements to bring cultural narratives to life.	Reinforces emotional connections to cultural heritage, fostering deeper appreciation and understanding of historical narratives.
Sustainable Tourism Practices	Research investigates virtual tourism's potential to reduce environmental impacts and alleviate pressures on overcrowded physical sites.	Virtual tourism through the Metaverse offers eco-friendly alternatives, reducing travel-related carbon emissions and minimizing physical degradation of heritage sites.	Aligns with global sustainability goals while ensuring cultural sites remain accessible and protected for future generations.
Operational Efficiencies in Tourism	Studies focus on the use of Metaverse technologies to streamline operations, such as staff training, event management, and virtual customer service.	Immersive platforms improve efficiency by simulating real-world scenarios for training and optimizing customer interaction through virtual channels.	Supports cost-effective and innovative approaches to managing cultural tourism businesses.
Users' Continuance Intentions and Behavior	Research examines factors influencing tourists' sustained use of Metaverse platforms and their perceptions of virtual cultural experiences.	Positive user experiences in the Metaverse significantly impact revisit intentions and long-term engagement with cultural tourism platforms.	Highlights the importance of creating meaningful, memorable virtual experiences to maintain tourist interest and loyalty.

3.3 Visitor Engagement and Immersion

AI, VR, and the Metaverse significantly impact enhancing visitor engagement and immersion. AI-driven platforms provide personalized experiences by adapting content to visitor preferences and behaviors (Buhalis et al. 2023). VR and AR transport visitors into reconstructed historical environments or allow visualization of cultural artifacts in original contexts, creating emotionally engaging experiences (Liu & Park 2024). The Metaverse introduces new interaction dimensions by creating persistent, shared virtual spaces for real-time exploration (Zhang & Wang 2023; Correia, P., 2025).

Challenges include potential over-commercialization, where cultural heritage is reduced to digital entertainment, risking loss of deeper meaning (Chen et al. 2023). Ensuring virtual experiences maintain cultural authenticity is critical for preserving cultural tourism integrity in the digital age.

3.4 Cultural Preservation and Authenticity

These technologies contribute to cultural preservation by providing alternative access to heritage sites. VR and AR create digital replicas of fragile or endangered sites, enabling virtual access without physical degradation

(Jung et al. 2024). Digital archiving and reconstruction ensure future generations access to cultural treasures, even if physical counterparts deteriorate (Liu & Park 2024).

However, digital replication risks diminishing experience authenticity. Virtual representations may oversimplify cultural narratives or fail to capture nuanced meanings (Chen et al. 2023). Balancing immersive technology use with maintaining site authenticity requires collaboration between technologists, cultural experts, and local communities.

3.5 Sustainability and Ethical Concerns

Virtual tourism mitigates environmental impacts like carbon emissions and site degradation from overtourism (Jung et al. 2024). AI-powered platforms enhance social sustainability by making cultural tourism more accessible to diverse groups, including those with disabilities or financial constraints.

Ethical concerns include data privacy and culture commodification. AI platforms collecting visitor data raise questions about data handling and consent, especially with sensitive cultural heritage (Zhang & Wang 2023). Commercializing cultural heritage in virtual environments risks trivializing its significance.

Responsible development practices, ethical data management, and commitment to cultural integrity are essential to ensure these technologies positively impact tourism.

3.6 Strategic Implications for Future Research and Practice

Future research should explore balancing technological innovation with cultural authenticity, developing guidelines for ethical virtual tourism, and involving local communities in digital representation decisions. Practitioners must implement technologies promoting sustainability and inclusivity while addressing data privacy and cultural commodification risks.

4. Discussion and Future Directions

The integration of AI, VR, and the metaverse into cultural tourism presents a significant opportunity to revolutionize the way tourists engage with cultural heritage. However, the current body of literature points to both the potential and limitations of these technologies in balancing innovation with cultural authenticity and sustainability. In this section, we discuss the implications of the findings from the systematic review and suggest future research directions to address existing gaps in knowledge.

4.1 Current State of Knowledge Regarding the Intersection of the Metaverse and Tourism

The current literature underscores the transformative potential of the metaverse in tourism, particularly in enhancing visitor engagement and accessibility. The metaverse, as a digital environment where virtual and physical realities converge, allows for immersive experiences that can bridge the gap between tourists and geographically distant cultural heritage sites. As highlighted in the reviewed studies, AI, VR, and AR technologies have begun to make significant inroads into the tourism sector, with applications ranging from virtual tours of historical sites to the creation of interactive cultural narratives (Buhalis et al. 2023; Liu & Park 2024, Correia, P., 2025).

At present, the metaverse is primarily utilized as a tool for creating immersive, multisensory experiences that augment or replace physical travel. The literature emphasizes that these technologies offer unique advantages in terms of visitor engagement. AI-driven platforms allow for the personalization of tourism experiences, adapting to individual preferences and behaviors in real-time, thus providing tourists with culturally relevant content (Zhang & Wang 2023). This capacity for personalization is one of the key strengths of the metaverse, making it a valuable tool for enhancing the educational and emotional impact of cultural tourism.

In addition to engagement, the metaverse has shown promise in promoting sustainability within tourism. Virtual tourism enables engagement with cultural heritage without the need for physical travel, thereby reducing the environmental footprint associated with tourism (Jung et al. 2024; Correia, P., 2025). This is particularly important for destinations that face pressures from overtourism or those that require the preservation of fragile or endangered cultural sites. By providing tourists with the opportunity to explore these locations virtually, the metaverse helps alleviate some of the ecological and conservation challenges associated with traditional tourism practices.

However, the literature also reveals that the adoption of metaverse technologies in tourism is still in its early stages. Many studies focus on the technical aspects of AI, VR, and AR without fully addressing the broader cultural, social, and ethical implications of their use in tourism. For example, while virtual experiences can

enhance accessibility and engagement, they may also risk commodifying culture or distorting the authenticity of cultural heritage (Chen et al. 2023). The metaverse's capacity to replicate cultural sites raises questions about the integrity of these digital representations and the potential oversimplification of complex cultural narratives.

Moreover, the review suggests that more research is needed on the long-term impact of metaverse adoption in tourism, particularly in understanding how virtual experiences influence tourist behavior and attitudes toward physical travel. Although the metaverse can provide an alternative to physical visitation, it remains unclear whether virtual tourism complements or competes with traditional tourism. Some studies suggest that virtual experiences may encourage future physical visits by providing tourists with a preview of destinations, while others indicate that virtual tourism could reduce the demand for actual travel (Liu & Park 2024; Correia, P., 2025). This uncertainty presents an important area for further exploration.

4.2 Answering the Research Questions

This study sets out to investigate the role of AI, VR, and the metaverse in enhancing cultural tourism, guided by three key research questions. Based on the findings from the systematic review, each of these questions can be addressed as follows:

How can AI, VR, and the metaverse enhance visitor engagement and interaction in cultural tourism?

The literature consistently highlights that AI-driven personalization, alongside the immersive capabilities of VR and AR, significantly enhances visitor engagement. AI's ability to analyze real-time data on visitor preferences and behaviors allows for personalized experiences that can adapt to the cultural, linguistic, and informational needs of individual tourists (Buhalis et al. 2023; Correia, P., 2025). VR and AR technologies offer tourists the opportunity to experience cultural heritage in ways that would not be possible through physical visitation alone, enabling virtual reconstructions of historical sites and interactive cultural narratives that deepen engagement (Liu & Park 2024). The metaverse, by merging virtual and real-world experiences, further enhances interaction by allowing tourists to explore cultural environments collaboratively and in real-time.

What are the potential challenges and ethical concerns related to the integration of these technologies in cultural tourism?

The review revealed several challenges associated with the use of AI, VR, and the metaverse in cultural tourism. Chief among these is the risk of commodifying cultural heritage, reducing complex cultural narratives to simplified digital experiences for entertainment purposes (Chen et al. 2023). There are also concerns regarding the authenticity of virtual representations of cultural sites, as digital recreations may fail to capture the nuanced significance of these heritage locations. Ethical concerns around data privacy were also prevalent, with AI-driven platforms raising questions about how visitor data is collected, stored, and used (Zhang & Wang 2023; Correia, P., 2025). These challenges underscore the need for careful consideration of how these technologies are implemented, ensuring that cultural integrity and ethical standards are upheld.

How can AI and immersive technologies be integrated into cultural tourism in a way that preserves cultural integrity and promotes sustainable practices?

The literature suggests that AI, VR, and the metaverse can indeed be integrated into cultural tourism in ways that support both cultural preservation and sustainability, but only with responsible development. Sustainable virtual tourism practices can help mitigate the environmental impact of physical travel, especially to fragile or endangered sites (Jung et al. 2024; Correia, P., 2025). To preserve cultural integrity, however, close collaboration between technologists, cultural heritage experts, and local communities is crucial. This ensures that digital platforms represent cultural heritage accurately and respectfully. Furthermore, AI-driven personalization should aim to educate and inform tourists about the significance of the cultural heritage they are experiencing, rather than just providing entertainment.

4.3 Future Research for Metaverse in Business Services

As AI, VR, and the Metaverse become increasingly integrated into cultural tourism, there is a growing need for research exploring their wider implications within the business services sector. The potential applications of the Metaverse extend well beyond tourism, and its future development as a business tool is likely to have significant impacts across industries.

Future research should focus on how the Metaverse can create new service models within business contexts, particularly in sectors such as education, healthcare, and retail. In these areas, the Metaverse can provide immersive, interactive experiences bridging the gap between virtual and physical environments, offering

personalized services catering to individual users' needs. For example, in education, AI-driven virtual classrooms could provide highly tailored learning experiences, while in healthcare, VR-based therapies could offer personalized treatment options (Jung et al. 2024; Correia, P., 2025). Additionally, further empirical studies are needed to assess how virtual experiences translate into actual tourist behavior, including visit intentions and long-term engagement with cultural destinations (Zhang & Wang 2023; Correia, P., 2025). Understanding how these technologies can improve customer experience and service delivery across various industries will be critical for future business innovation.

Moreover, research should explore the economic implications of the Metaverse, particularly how businesses can monetize virtual experiences and digital assets. Virtual environments in the Metaverse can serve as platforms for the creative arts, immersive storytelling, and digital cultural exhibitions (Dwivedi et al. 2023). This combination of culture and creativity has the potential to generate revenue through digital experiences, exclusive virtual events, and the sale of virtual goods and non-fungible tokens (NFTs), creating a novel economic ecosystem (Koo et al. 2023). However, as with cultural tourism, businesses must carefully balance commercial interests with ethical considerations, ensuring that digital products and services do not exploit consumers or undermine cultural or societal values (Chen 2023).

Another critical area for future research is the regulatory framework surrounding the use of AI, VR, and the Metaverse in business services. As these technologies become more widespread, there is an increasing need for regulations that protect consumer data, ensure transparency in AI-driven decision-making, and safeguard against the commodification of cultural and social experiences. Policymakers and business leaders must work together to develop guidelines that promote innovation while protecting the rights and interests of consumers.

5. Conclusion

This paper has examined the transformative potential of Artificial Intelligence (AI), Virtual Reality (VR), and the Metaverse in cultural tourism through a systematic review of current knowledge and emerging trends. The findings demonstrate that these technologies have the capacity to significantly enhance visitor engagement, preserve cultural heritage, and support sustainable tourism practices.

AI's ability to personalize visitor experiences through real-time data analysis has revolutionized interactions with cultural heritage. By tailoring content to individual preferences, AI ensures cultural experiences are relevant, accessible, and deeply engaging. Similarly, VR and AR technologies create immersive environments that allow tourists to explore cultural heritage in innovative ways, such as virtual reconstructions of historical sites. These technologies open new opportunities for connecting tourists with cultural narratives that might otherwise remain inaccessible due to geographical or physical constraints. The Metaverse, as a convergence of AI, VR, and AR, provides unprecedented possibilities for interaction, education, and entertainment in cultural tourism.

Despite these advancements, integrating these technologies also presents challenges. The commodification of culture and the potential loss of authenticity in virtual experiences are recurring concerns in the literature. Moreover, data privacy and ethical considerations regarding the use of AI-driven platforms must be addressed to ensure that digital transformation does not compromise the integrity of cultural heritage. Navigating the balance between technological innovation and cultural authenticity is critical to preserving the intrinsic value of cultural heritage.

The study also highlights the role of these technologies in promoting sustainability within tourism. Virtual tourism can reduce the environmental impacts associated with physical travel, particularly to fragile or endangered heritage sites. By offering eco-friendly alternatives, these technologies mitigate the negative effects of overtourism. However, for their benefits to be fully realized, it is essential to adopt responsible development practices that prioritize the long-term preservation of cultural heritage.

The review identifies several avenues for future research. There is a pressing need for empirical studies that explore the long-term effects of virtual tourism on visitor behavior, as well as investigations into how AI, VR, and the Metaverse can be integrated into tourism to support both cultural preservation and economic sustainability. Moreover, future studies should examine the broader implications of these technologies beyond cultural tourism, particularly in other business services, where they have the potential to create innovative service models and reshape customer experiences.

In conclusion, AI, VR, and the Metaverse offer exciting opportunities to enrich cultural tourism and advance sustainability goals. However, their implementation requires thoughtful consideration to preserve cultural authenticity and address ethical concerns. As these technologies evolve, they are poised to reshape not only the

tourism industry but also the wider landscape of business services, offering innovative solutions that seamlessly bridge virtual and physical worlds.

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References

- Ampountolas, A., Menconi, G., & Shaw, G. (2023) 'Metaverse research propositions: Online intermediaries', *Tourism Economics*. <https://doi.org/10.1177/13548166231159520>
- Buhalis, D. (2023) 'Smart hospitality: From smart cities and smart tourism towards agile business ecosystems in networked destinations', *International Journal of Contemporary Hospitality Management*, 35(1), pp. 369-393. <https://doi.org/10.1108/IJCHM-05-2022-0631>
- Buhalis, D., Lin, M. S., & Leung, D. (2023) 'Metaverse as a driver for customer experience and value co-creation: Implications for hospitality and tourism management and marketing', *International Journal of Contemporary Hospitality Management*, 35(2), pp. 701-716. <https://doi.org/10.1108/IJCHM-05-2022-0631>
- Chen, S., Chan, I. C. C., Xu, S., Law, R., & Zhang, M. (2023) 'Metaverse in tourism: Drivers and hindrances from stakeholders' perspective', *Journal of Travel & Tourism Marketing*, 40(2), pp. 169-184. <https://doi.org/10.1080/10548408.2023.2227872>
- Correia, P., (2025). Metaverse in Tourism: A Pathway to Sustainability and Regeneration. *International Journal of Technology Management & Sustainable Development*. ISSN: 1474-2748
- Dwivedi, Y. K., Hughes, L., Wang, Y., Alalwan, A. A., Ahn, S. J. G., Balakrishnan, J., Barta, S., Belk, R., Buhalis, D., Dutot, V., Felix, R., Filieri, R., Gustafsson, A., Hinsch, C., Hollensen, S., Jain, V., Kim, J., Krishen, A. S., Lartey, J. O., ... Wirtz, J. (2023). Metaverse marketing: How the metaverse will shape the future of consumer research and practice. *Psychology & Marketing*, 40(4), 750-776. <https://doi.org/10.1002/mar.21767>
- Jung, T., Cho, J., Han, D. I. D., Ahn, S. J. G., Gupta, M., Das, G., et al. (2024) 'Metaverse for service industries: Future applications, opportunities, challenges and research directions', *Computers in Human Behavior*, 151, 108039. <https://doi.org/10.1016/j.chb.2023.108039>
- Koo, C., Kwon, J., Chung, N., & Kim, J. (2023). Metaverse tourism: Conceptual framework and research propositions. *Current Issues in Tourism*, 26(20), 3268-3274. <https://doi.org/10.1080/13683500.2022.2122781>
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Annals of Internal Medicine*, 151, W-65. <https://doi.org/10.7326/0003-4819-151-4-200908180-00136>
- Liu, H., & Park, K.-S. (2024) 'Exploring the impact of metaverse tourism experiences on actual visit intentions: An integrated model of presence, the Technology Acceptance Model, and the Theory of Planned Behavior', *International Journal of Tourism Research*, 26(1), e2616. <https://doi.org/10.1002/itr.2616>
- Mikki, S. (2009). Google Scholar compared to Web of Science. A literature review. *Nordic Journal of Information Literacy in Higher Education*, 1(1). <https://doi.org/10.15845/noril.v1i1.10>
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine*, 151(4), 264-269. <https://doi.org/10.7326/0003-4819-151-4-200908180-00135>
- Yang, E. C. L., Khoo-Lattimore, C., & Arcodia, C. (2017). A systematic literature review of risk and gender research in tourism. *Tourism Management*, 58, 89–100. <https://doi.org/10.1016/j.tourman.2016.10.014>
- Zhang, W., & Wang, Y. (2023) 'An empirical study of the impact of metaverse storytelling on intentions to visit', *Information Technology & Tourism*, 25(3), pp. 411–432. <https://doi.org/10.1007/s40558-023-00261-0>