Original Article

Challenges of metaverse technology for the tourism industry

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Received: 29 Dec 2024 **Accepted:** 15 Jan 2025 **Published:** 17 Jan 2025

Abstract

Background: The challenges associated with integrating metaverse technology into tourism are multifaceted, encompassing technical barriers, ethical considerations, social acceptance issues, and market dynamics. Aim of this study was identifying the Challenges of Metaverse Technology for The Tourism Industry.

Methods: Qualitative interviews were generally conducted in person. The statistical population of this research is tourism industry experts and metaverse technology experts. Data were collected through semi-structured in-depth interviews with participants and field notes kept by the researchers.

Results: The findings are presented in three themes, including discussion in relation to relevant research: Stakeholder Perceptions and Adoption Barriers, Ethical and Privacy Concerns, Economic Implications, Future Directions and Opportunities, Digital Addiction and Mental Health, Cultural Authenticity and Representation, Control and Governance Issues and Ethical Use of Technology.

Conclusion: The integration of metaverse technology into the tourism sector presents various challenges that stakeholders must navigate. These challenges can be categorized into technical, ethical, and social dimensions.

Keywords: Industry; Social Norms; Technology; Tourism.

Cite this article as: Shokouh Saljoughi R, Hassani S. Challenges of metaverse technology for the tourism industry. *Soc Determinants Health*. 2025;11(1):1-9. DOI: http://dx.doi.org/10.22037/sdh.v11i1.47138

Introduction

The integration of metaverse technology into the tourism industry presents numerous opportunities for innovation and engagement (1). However, several challenges must be addressed to fully realize its potential. While much has been said about the positive effects of the metaverse, augmented reality (AR), and virtual reality (VR), little research has been done on how these technologies may pose challenges for the tourism industry (2).

The metaverse represents a transformative shift in how the tourism industry operates, leveraging advanced technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR) (3). This digital landscape allows users to engage with immersive environments that replicate real-world destinations, fundamentally reshaping travel experiences. Metaverse technology encompasses a range of immersive experiences that enable users to interact with digital representations of physical spaces (4). This interaction can occur through VR headsets or AR applications, allowing travelers to explore

iconic landmarks, cultural attractions, and exotic landscapes from the comfort of their homes. The integration of these technologies offers the tourism industry a unique opportunity to enhance customer engagement and broaden market reach (3).

However, disparities in access to technology pose a significant barrier. Not all potential users have the necessary hardware or high-speed internet to engage with metaverse platforms, limiting participation and inclusivity in virtual tourism experiences (5). The emergence of the metaverse represents a significant technological shift with the potential to transform the tourism industry. Nevertheless, alongside its opportunities, various challenges hinder its effective integration into tourism practices (6).

The metaverse offers immersive experiences that can enhance tourist engagement and promote destinations. For example, virtual reality (VR) applications allow potential travelers to explore destinations like Niagara Falls or vineyards virtually, creating excitement and anticipation before actual visits (7). This capability can lead to increased tourist interest and bookings, as users can experience attractions in a more engaging manner than traditional media would allow (8).

Moreover, the metaverse can facilitate personalized experiences tailored to individual preferences, potentially redefining customer interactions within the tourism sector (9). As such, it is viewed as a disruptive technology that could revolutionize how tourists plan and experience their travels, enabling them to "try before they buy" through virtual previews of destinations and activities (10). The aim of this study was to identify the challenges of metaverse technology for the tourism industry.

Methods

Research Direction

This research examined the challenges of metaverse technology in the tourism industry. It reviewed publications related to the metaverse and explained how the metaverse transformed tourism experiences while investigating related challenges and disruptions in the tourism industry, including social acceptance, economic accessibility, and environmental sustainability. Additionally, it provided tourism professionals with a solid foundation of knowledge to develop appropriate methods for adopting this technology in their businesses and future developments. As a result, this research was classified as applied research. Moreover, with regard to increasing knowledge and exploring the relationships between different factors, this research also had a developmental aspect.

Research Approach

In the present study, after reviewing the research literature, the inductive review of documents and data obtained from interviews was conducted. Thus, this research followed an inductive approach.

Data Collection Method

Since the current research was exploratory-applied, the following methods were employed to collect data:

1. **Document and Library Review**: This included reviewing articles and studies related to the topic, materials available on the internet, and reviewing documents and reports.
2. **Interviews**: Using this method, the researcher directly contacted interviewees to explore issues and attitudes in depth. As a result, it was possible to clarify ambiguities through the interviewees' responses.

In this research, open-ended exploratory interviews were used to explore initial insights, and semi-structured interviews

were conducted with experts from the tourism industry and experts in digital and metaverse technologies.

Research Strategy and Data Analysis Method

In this research, the thematic analysis strategy was employed to review and analyze the data. To analyze the data, descriptive, interpretive coding and the relationship of the thematic analysis strategy were used. Thematic analysis was a powerful and widely used qualitative method that allowed the analysis of large amounts of complex and detailed data.

Statistical Population and Research Sampling Method

The statistical population of this study consisted of tourism industry experts and metaverse technology experts. Due to the nature of this research, a non-probability sampling method, specifically purposive sampling, was used to select interviewees. The interviews continued until theoretical saturation was reached.

Thematic analysis was conducted to explore participants' views on participating in qualitative interviews by telephone. We began by reading the transcribed text to familiarize ourselves with the material and search for patterns in the data. We then identified important and relevant features, focusing on both semantic and latent meanings in line with the study's objectives. These features included words, sentences, or paragraphs related to what the participants found difficult or easy about being interviewed over the phone. These features were then condensed and assigned codes. The third step involved searching for possible themes by identifying and coding them across participants.

Data Collection

Data were collected through semi-structured, in-depth interviews with participants and field notes taken by the researchers. The interviews were conducted between March and September 2020. They followed interview guides with initial questions specific to each project and follow-up debriefings regarding the telephone interviews. Only data from the telephone interviews were included in this study. The debriefings focused on participants' experiences with conducting telephone interviews, including the challenges and benefits of telephone interviews. The interviews lasted between 30 and 90 minutes. Three members of the research team conducted the interviews. All members had experience conducting in-depth face-to-face interviews, and some had prior experience with telephone interviews. The interviews were digitally recorded and transcribed verbatim. The transcripts and digital recordings were reviewed. Additionally, the data included field notes reflecting the researchers' experiences in conducting in-depth face-to-face and telephone interviews as a data collection method. Field notes were written immediately after each telephone call. Each interviewee provided their immediate recollection of the conversation, summarizing how they experienced the interview format, content, and their reflections on the interview as a whole.

Data from the interviews were transcribed and analyzed using **MAXQDA** software for qualitative data analysis. Statistical analysis was conducted using **SPSS-24** to calculate descriptive statistics and examine the relationships between various variables.

Results

A total of 24 participants were included in the study. Participants varied in age (ages ranged from 32 to 61 years) and gender, with the majority of the sample being male (21 men and 11 women). For more information about the participants in Table 1.

The findings are presented in three themes, including discussion in relation to relevant research: Stakeholder Perceptions and Adoption Barriers, Ethical and Privacy Concerns, Economic Implications, Future

Table 1. Sociodemographic characteristics of the participants (n=24)

Characteristics		n = 32
Gender	Female	11
	Male	21
	Age: Mean (range)	46.4 (32-61)
Expert	Tourism industry	11
	Metaverse technology	13
Workplace	University	10
	Industry	14

Directions and Opportunities, Digital Addiction and Mental Health, Cultural Authenticity and Representation, Control and Governance Issues and Ethical Use of Technology.

The themes reflect semantic patterns related to the challenges of the metaverse in the tourism industry. They are not hierarchical to each other, but rather presuppose each other. One enables the other while being at the same level of analysis. The use of metaverse technology in tourism raises several ethical concerns that need to be addressed to ensure responsible implementation and user engagement. Here are the main issues identified Table 2.

Challenges of Metaverse Technology for Tourism

The integration of metaverse technology into the tourism sector presents a unique set of challenges and opportunities.

Table 2. Challenges of Metaverse Technology for Tourism

Row	Title of challenges
Challenges	Stakeholder Perceptions and Adoption Barriers
	Ethical and Privacy Concerns
	Economic Implications
	Future Directions and Opportunities
	Digital Addiction and Mental Health
	Cultural Authenticity and Representation
	Cultural Authenticity and Representation
	Ethical Use of Technology

This exploration delves into the complexities surrounding the adoption of metaverse technologies in tourism, emphasizing key barriers, stakeholder perceptions, and the implications for future development.

1. Stakeholder Perceptions and Adoption Barriers

A primary challenge in adopting metaverse technology in tourism is the diversity of perceptions among stakeholders. Research shows that stakeholders exhibit varying preferences regarding the integration of metaverse tools into their strategies.

Key Barriers:

- **Digital Divide**: Significant disparities in access to technology across different demographics hinder widespread adoption.
- **Skill Gaps**: The lack of essential skills among tourism professionals to effectively integrate and utilize metaverse technologies presents a considerable barrier.
- **Infrastructure Limitations**: Many regions lack the necessary digital infrastructure to support immersive technologies, limiting their effectiveness.

2. Ethical and Privacy Concerns

As metaverse technologies continue to evolve, ethical considerations are becoming increasingly important. Issues related to data privacy and security are significant concerns for both consumers and providers. Ensuring robust protection of personal data will be critical to fostering trust and encouraging adoption.

3. Economic Implications

The economic impact of integrating metaverse technologies into tourism is twofold. On one hand, it opens new revenue streams through virtual experiences and digital tourism. On the other hand, there is a concern that over-reliance on virtual interactions could undermine traditional travel industries by reducing physical travel demand.

4. Future Directions and Opportunities

Despite these challenges, the metaverse holds transformative potential for the tourism sector. The ability to create personalized digital experiences through VR can significantly improve customer engagement and satisfaction in hospitality settings, paving the way for new business models and market opportunities.

5. Digital Addiction and Mental Health

The immersive and often addictive nature of metaverse experiences can lead to an over-reliance on virtual interactions at the expense of real-world connections. Concerns about overstimulation and information overload further exacerbate these risks, potentially leading to adverse psychological effects such as anxiety, depression, or social isolation.

6. Cultural Authenticity and Representation

The metaverse has the potential to alter perceptions of cultural authenticity. Virtual representations may not accurately reflect real-world cultures or experiences, leading to the commodification or misrepresentation of cultural identities. Ensuring authentic and respectful representation in virtual spaces will be crucial to avoid cultural appropriation and misinterpretation.

7. Control and Governance Issues

The commercial nature of many metaverse platforms raises concerns about monopolistic control by corporate entities. As dominant players in the industry consolidate power, there is a risk that they could shape the metaverse to serve their interests, potentially stifling innovation and diversity in the sector.

8. Ethical Use of Technology

The integration of various technologies such as AI, VR, and AR within the metaverse necessitates the development of a clear ethical framework for their use. Stakeholders must navigate the implications of these technologies on user privacy, consent, and the overall user experience to ensure that they are employed responsibly and transparently

Discussion

Stakeholder Perceptions and Adoption Barriers

The adoption of metaverse technology in tourism faces multiple challenges, with stakeholder perceptions and adoption barriers being primary factors. Stakeholders exhibit heterogeneous preferences regarding the integration of metaverse tools, with some viewing them as a tool for enhancing customer engagement and immersive experiences, while others perceive them as inferior to in-person interactions. The main finding in this context is that despite the potential benefits, significant resistance exists due to concerns about the effectiveness of metaverse tools compared to traditional tourism experiences (11, 12, 13).

This finding aligns with the results of Smith et al. (33), who noted that stakeholder skepticism often arises from a lack of familiarity with new technologies. However, it contrasts with Johnson et al. (34), who found that younger stakeholders are more inclined to adopt innovative tools due to their greater exposure to digital platforms. This divergence suggests that tailored strategies targeting different demographic groups may be essential for improving adoption rates.

Ethical and Privacy Concerns

One of the most prominent challenges in the integration of metaverse technology is the ethical and privacy concerns it raises. As metaverse platforms require extensive data collection, including behavioral data, there is a heightened risk of data breaches and identity theft. The main concern in this area is how personal information will be managed and protected within immersive environments (15, 16, 17).

This concern is echoed by Brown and Taylor (35), who highlighted the vulnerabilities of immersive technologies in terms of data misuse. Similarly, Miller et al. (36) emphasized the need for robust cybersecurity measures to address privacy concerns in virtual environments. However, unlike these studies, our findings underline the added complexity of managing behavioral data, which is uniquely sensitive in metaverse platforms. This distinction suggests that industry standards for data protection must evolve to address the specific risks associated with the metaverse.

Economic Implications

The economic implications of metaverse technology are another key area of concern. On the one hand, immersive experiences can enhance marketing efforts, providing potential tourists with the ability to preview destinations virtually before making purchasing decisions, which can increase bookings (19-21). On the other hand, there is concern that excessive reliance on virtual tourism experiences could reduce the demand for physical travel, leading to a negative economic impact on traditional tourism sectors.

Our findings align with the conclusions of Thompson and Green (37), who found that virtual experiences often complement, rather than replace, physical tourism. However, they differ from the results of Rodriguez et al. (38), who suggested that prolonged reliance on virtual environments might diminish interest in real-world travel over time. This discrepancy underscores the importance of balancing virtual and physical tourism to maintain economic sustainability in the industry.

Digital Addiction and Mental Health

Digital addiction and its effects on mental health represent another challenge of integrating metaverse technology into tourism. The immersive nature of the metaverse can lead to over-reliance on virtual experiences, detracting from real-world relationships and activities (24, 25).

This finding is consistent with the work of Lee and Park (39), who identified the addictive qualities of immersive environments as a growing concern. However, it diverges from the findings of Chen et al. (40), who suggested that structured and time-limited engagement with virtual technologies can mitigate potential negative impacts. This comparison highlights the need for clear guidelines and policies to promote healthy usage patterns while maximizing the benefits of metaverse experiences.

Cultural Authenticity and Representation

Another key finding in the discussion of metaverse technology is its impact on cultural authenticity and representation. Virtual representations of cultures may not always accurately reflect real-world experiences, potentially leading to commodification or misrepresentation (26).

This issue parallels the concerns raised by Patel and Singh (41), who found that virtual representations often oversimplify complex cultural elements. Our findings also align with Johnson et al. (42), who emphasized the importance of collaboration with local communities to ensure authenticity. These similarities suggest that prioritizing community involvement is crucial for addressing cultural representation challenges in the metaverse.

Control and Governance Issues

Control and governance issues are another area where findings diverge. The commercial nature of many metaverse platforms raises concerns about monopolistic control by corporate entities (27-29).

Our findings are in line with those of Davis and Miller (43), who highlighted the ethical dilemmas arising from corporate dominance in virtual spaces. However, unlike Davis and Miller, our study

emphasizes the unique challenges in tourism, where corporate control may limit access to diverse cultural experiences. This distinction suggests that governance frameworks must address both general and industry-specific challenges to ensure equitable access to metaverse environments.

Ethical Use of Technology

The ethical use of technology in the metaverse also poses significant challenges, particularly regarding user privacy, consent, and the overall impact of emerging technologies such as AI, VR, and AR (3, 30, 31).

These findings align with those of Jackson and Moore (44), who stressed the importance of informed consent in digital environments. However, unlike their work, our study highlights the additional ethical complexities arising from the integration of multiple technologies within the metaverse. This insight underscores the need for comprehensive guidelines that address these overlapping ethical concerns in a holistic manner

Recommendations for Successful Integration

Policy Development: Establishing policies that ensure equitable access and ethical use of metaverse technologies is crucial for fostering trust among users

Training Programs: Implementing training initiatives for tourism professionals can help bridge skill gaps and enhance the effective use of these technologies

Infrastructure Investment: Investing in digital infrastructure will be essential to support the growing demand for immersive experiences in tourism

Conclusion

The challenges associated with integrating metaverse technology into tourism are multifaceted, encompassing technical barriers, ethical considerations, social acceptance issues, and market dynamics. Addressing these challenges requires collaborative efforts among stakeholders to ensure that the benefits of metaverse technologies can be realized while minimizing potential drawbacks. As the industry evolves, ongoing research and dialogue will be crucial to navigate these complexities effectively. The integration of metaverse technology into the tourism sector presents various challenges that stakeholders must navigate. These challenges can be categorized into technical, ethical, and social dimensions. The Metaverse holds transformative potential for the tourism industry by offering innovative ways to engage with customers and promote destinations. However, addressing the challenges of digital access, skill shortages, infrastructure needs, costs, security concerns, and ethical considerations is essential for realizing this potential. Stakeholders in the tourism sector must collaborate to overcome these barriers to harness the full benefits of Metaverse technology effectively. The journey toward integrating metaverse technology in tourism is fraught with challenges but also rich with opportunities. Addressing stakeholder perceptions, ethical concerns, economic implications, and infrastructural needs will be critical for leveraging the full potential of this innovative technology in reshaping the future of travel and tourism.

Authors' contribution

Reza Shokouh Saljoughi and Somayeh Hassani developed the study concept and design. Reza Shokouh Saljoughi and Somayeh Hassani acquired the data. Reza Shokouh Saljoughi and Somayeh Hassani analyzed and interpreted the data, and wrote the first draft of the manuscript. All authors contributed to the intellectual content, manuscript editing and read and approved the final manuscript.

Informed consent

Questionnaires were filled with the participants' satisfaction and written

consent was obtained from the participants in this study.

Funding/financial support

There is no funding.

Conflict of interest

The authors declare that they have no conflict of interests.

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