BEYOND BORDERS: ASSESSING THE EDUCATIONAL VALUE OF THE METAVERSE IN TOURISM

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Abstract

This pilot study explores the educational value of the metaverse in tourism through the lens of Constructivist Learning Theory. A survey-based methodology was used to examine the influence of four key constructs – Active Learning (AL), Knowledge Construction, Reflection and Adaptation (KC), Personalized Learning (PL), and Learning by Social Interaction (LSI)—on the learning efficiency of the metaverse in tourism. Thirty participants, 43.33% male and 56.67% female, from Generations X, Y, and Z, completed the questionnaire. The survey demonstrated good reliability and validity, providing insights into the metaverse's role in tourism education. The findings highlight the importance of knowledge construction, reflection and adaptation, and learning by social interaction in improving learning efficiency through collaborative and reflective processes. In contrast, active learning and personalized learning did not show statistically significant effects on learning efficiency, suggesting that factors such as instructional design, learner motivation, or digital literacy in the metaverse may mediate their effectiveness. This research enhances the understanding of the metaverse not merely as a platform for entertainment or simulation, but as a revolutionary medium for experiential learning and the development of knowledge about touristic destinations.

Keywords: metaverse, constructivism, learning, tourism, digital experiences

JEL Classification: I24, O33

DOI: 10.24818/CTS/7/2025/2.09

1. Introduction

The metaverse, an immersive and interactive virtual environment, has marked a transformative shift in how individuals interact, communicate, and learn across digital platforms (Chowdhury and Frank, 2021). The metaverse employs technologies such as blockchain, augmented reality, virtual reality, and artificial intelligence, with applications in various industries, including tourism (Sánchez-Amboage et al., 2024). In tourism, the metaverse offers new opportunities for engaging potential tourists beyond traditional marketing or information dissemination. Digital tourism experiences, such as virtual concerts, virtual tours, immersive festivals, and cultural exhibitions, provide environments where users can actively explore and learn about destinations, history, culture, and heritage, often before physically visiting a place or, in some cases, instead of physical travel (Wang et al., 2022). Additionally, metaverse tourism is gaining recognition as a sustainable alternative to traditional travel, with the potential to reduce the ecological and environmental burdens commonly associated with physical tourism (Go & Kang, 2023). Importantly, it also creates new opportunities for inclusive tourism, particularly benefiting individuals with disabilities or mobility limitations, who may find virtual travel more accessible and accommodating. Collectively, these developments position the metaverse as a transformative force within the tourism industry, enabling novel, immersive, and boundary-free tourism experiences (Gursoy, Malodia & Dhir, 2022).

Despite growing enthusiasm, academic research on metaverse tourism remains relatively underdeveloped. The existing literature primarily focuses on conceptual explorations and theoretical frameworks (Buhalis et al., 2022; Go & Kang, 2022; Gursoy et al., 2022; Akyürek et al., 2024). However, recent empirical studies have begun to address this gap by examining tourists' immersive experiences (Inmor et al., 2025), the role of telepresence and avatar identification in shaping travel

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intentions (Shin & Kang, 2024), SMEs' motivations and satisfaction in adopting metaverse tools (Ledesma-Chaves et al., 2024), and how users engage with or intend to adopt metaverse technologies in tourism settings (Mandal et al., 2024; Petrica, 2024), offering a more nuanced understanding of user behaviour and adoption patterns within virtual tourism environments. Moreover, there are limited studies on the educational value of the metaverse in tourism settings. This signals a clear gap and an opportunity for deeper research into how these immersive environments can facilitate educational, experiential, and inclusive forms of tourism (Akyürek et al., 2024; Petr & Caudan, 2024).

The aim of this paper is to evaluate the educational value of the metaverse in tourism contexts, particularly in terms of how it shapes user engagement and facilitates meaningful learning outcomes about tourist destinations. The assessment of the educational potential of the metaverse in tourism is grounded in Constructivist Learning Theory (CLT). Constructivist pedagogy emphasises that learners construct knowledge through experience, reflection, and social interaction, which aligns well with the immersive and interactive nature of metaverse platforms. Using a framework based on key constructs from CLT, including active learning, knowledge construction, knowledge reflection and adaptation, personalised learning, and learning through social interaction, this study investigates how these elements influence user engagement and learning outcomes in virtual tourism environments.

This research will contribute to a deeper understanding of the metaverse not only as a tool for entertainment or simulation, but as a transformative medium for experiential learning and destination knowledge construction. The findings can inform the design of educational tourism experiences and support strategic planning for tourism stakeholders leveraging immersive technologies.

2. Literature Review

2.1 Educational value of Metaverse

The term "metaverse" was first introduced in Neal Stephenson's 1992 novel Snow Crash (Chua & Yu, 2023; Kaddoura & Al Husseiny, 2023). In the novel, the "Metaverse" is depicted as a three-dimensional virtual world. The word itself combines "meta," meaning virtual, and "verse," referring to the universe (Stephenson, 1992; Lee, 2021). Some interpretations also define "metaverse" as originating from the Greek word for "beyond the universe" (Chua & Yu, 2023). The concept describes a new digital realm formed through technologies such as smartphones and the internet (Kye et al., 2021). It is an immersive, three-dimensional virtual environment that exists parallel to the physical world (Stephenson, 1992; Chen et al., 2023; Zhou, Chen & Jin, 2024). According to Gursoy et al. (2022), the metaverse is a digital space where users engage in social interactions, create value, and co-develop experiences using digital avatars. Activities within this virtual world are facilitated through 3D digital interactions, incorporating augmented and virtual reality services (Damar, 2021). In the metaverse, users represented by avatars can connect, interact, and engage with user-generated content in a synchronised and persistent digital environment (Weinberger, 2022).

The metaverse offers significant educational value by providing immersive, interactive, and engaging learning experiences that extend beyond traditional classroom settings (Kaddoura & Al Husseiny, 2023). Recognising this potential, Facebook rebranded as "Meta" and allocated $150 million in 2021 to develop an educational ecosystem within the metaverse (Park & Kim, 2022). Currently, technologies such as augmented reality, mirror worlds, and virtual reality are attracting attention in metaverse-based learning (Kye et al., 2021). Although the integration of the metaverse in education can be traced back to the launch of the virtual reality platform Second Life in 2008, research in this field peaked in 2022 (Chua & Yu, 2023). One prominent metaverse application in education is Extended Reality (XR), which enables remote learning through virtual classrooms created with XR technology. These environments incorporate interactive and collaborative tools, significantly reducing the need for physical travel (Jagatheesaperumal et al., 2022). Another widely used technology in education is virtual reality (VR), which captures students' attention and enhances their learning experience by making it more engaging and immersive. Additionally, metaverse-based education facilitates a deeper understanding of information (Hui et al., 2022). Mirror worlds, which digitally replicate the real world and transfer its environments and functions into software models, are also extensively used in education and other fields (Gurrin, Smeaton, & Doherty, 2014). The metaverse-based learning approach creates virtual identities for teachers, students, and other stakeholders, establishing both formal and informal learning spaces within a digital environment. It also facilitates collaboration between students and academics in a shared virtual space (Chen, 2022; Maghaydah et al., 2024).

In the tourism sector, the metaverse is a transformative tool that offers immersive learning, enhances destination perception, and fosters digital engagement among modern travellers. It bridges the gap between virtual and real-world tourism, influencing travellers' behaviours and supporting sustainable tourism development. Engaging with metaverse tourism platforms also affects how travellers perceive a destination or tourism product. Travellers can explore destinations virtually before a trip, improving their pre-travel knowledge and expectations (Go & Kang, 2023). Another study found that metaverse tourism experiences impact both virtual and real-world travel intentions. Factors such as telepresence and avatar identification play a crucial role in making virtual tourism experiences more engaging and realistic, encouraging users to visit destinations in person (Shin and Kang, 2024). Furthermore, tourism-focused small and medium-sized enterprises are increasingly adopting metaverse technology, not necessarily for immediate performance improvement, but to enhance business satisfaction and support long-term strategic growth (Ledesma-Chaves et al., 2024).

2.2. Theoretical Framework and hypotheses development

2.1.1 Constructivism Learning Theory

Constructivism Learning Theory serves as the framework for this research, focusing on how individuals and groups construct knowledge through experiences and interactions. This theory offers valuable insights into the adoption and engagement with emerging technologies, including the metaverse, in tourism. Constructivism is divided into two main types: cognitive constructivism and social constructivism. Cognitive constructivism, rooted in Jean Piaget's work, emphasises the role of individual cognitive processes in learning. Learners actively construct knowledge by integrating new experiences with their existing cognitive frameworks. In the context of metaverse adoption, users engage in self-directed exploration and reflection, constructing understanding through virtual travel experiences (Falk & Dierking, 2002). Social constructivism, based on Lev Vygotsky's theories, highlights the significance of social interactions in the learning process. Knowledge is co-constructed through dialogue, collaboration, and cultural contexts. Within the metaverse, social constructivism is evident in shared virtual experiences, where users interact with others, exchange ideas, and build collective understanding (Pernecky, 2012).

Constructivism Learning Theory provides a robust framework for understanding how users interact with and derive value from the metaverse in tourism. The interplay between cognitive and social constructivism highlights the dual importance of individual and collective experiences. By engaging with immersive environments and participating in shared virtual activities, users construct meaningful and impactful tourism experiences. This theoretical perspective not only informs the design of metaverse applications but also identifies ways to enhance user engagement, satisfaction, and learning outcomes. In the context of the metaverse, active learning, knowledge construction, reflection and adaptation, personalised learning, and social interaction combine to shape user engagement and learning outcomes.

Active learning emphasises participation and engagement, while knowledge construction involves synthesising new information by connecting it to prior knowledge and experiences (Nurhasnah, Sepriyanti & Kustati, 2024). The educational value of VR, particularly through active learning and knowledge construction, is well established in the literature, with studies highlighting a direct correlation between the level of immersion and learning outcomes (Pellas et al., 2021).

Knowledge construction, reflection, and adaptation are very important in evaluating the educational value of the metaverse. The immersive nature of the metaverse enables users to actively engage with simulated environments, fostering direct interaction with content. Users of immersive technology form connections between virtual experiences and their existing knowledge, which enhances memory retention and understanding. This engagement directly reflects the educational value of the tours by providing learners with opportunities to absorb information. Users can construct knowledge by integrating new experiences from virtual tours or cultural heritage sites into their existing frameworks, enriching their understanding of the destination (Ballantyne & Packer, 2011). Reflection is a critical component, allowing users to adapt their perceptions based on personal experiences and reshape their understanding through discussions and feedback from peers. This iterative process deepens learning outcomes and fosters a dynamic interplay between individual and collective insights (Falk et al., 2007). Knowledge adaptation encourages an ongoing process of learning, where learners are not just absorbing information but also actively engaging with it, revising their understanding as they gain new insights. The continuous cycle of reflection and adaptation ensures that the learning process remains dynamic and evolving (Nurhasnah, Sepriyanti & Kustati, 2024).

Therefore, in this article, we propose the following hypothesis:

H1. Active learning positively influences metaverse based-learning efficiency in tourism.

H2. Knowledge construction, knowledge reflection and adaptation positively influence metaverse based-learning efficiency in tourism.

Social interaction involves collaborative and communicative learning with others, which is a cornerstone of Constructivism. Social interactions enrich learning by incorporating diverse perspectives and encouraging active dialogue, enhancing understanding and engagement (Nurhasnah, Sepriyanti & Kustati, 2024). Interaction in the metaverse supports collaborative learning, where group activities such as multiplayer explorations or virtual guided tours promote shared knowledge construction (Pernecky, 2012). These experiences are further enhanced by personalised learning features, which tailor content and activities to individual preferences, ensuring meaningful engagement (Falk, 2009). Personalised learning is an educational approach that adapts learning experiences to meet the unique needs, preferences, strengths, and interests of individual learners. It allows participants to progress at their own pace and focus on areas of personal interest (Pernecky, 2012). As the metaverse is highly adaptable, this platform enables personalised learning paths, catering to individual preferences and learning styles, which enhances the overall educational value of virtual cultural tours.

Therefore, in this article we propose the following hypotheses:

H3. Personalized learning positively influences metaverse based-learning efficiency in tourism.

H4. Learning by social interaction positively influences metaverse based-learning efficiency in tourism.

3. Methodology

3.1 Research design

This study employs a survey-based research methodology to evaluate the educational value of the metaverse, incorporating principles of Constructivist Learning Theory. The measurement instrument included four constructs as independent variables: Active Learning (AL), comprising four items; Knowledge Construction, Reflection and Adaptation (KC), consisting of seven items; Personalised Learning (PL), comprising three items; and Learning by Social Interaction (LSI), consisting of three items. Their influence on Learning Outcomes Efficiency (LE), comprising five items, was assessed. The items were carefully worded to focus specifically on the use of the metaverse in tourism-related activities. A five-point Likert scale was used to measure responses for all questions related to the constructs, which are outlined in Table 1.

Table 1. Constructs

Construct	Code	Item*	Code Item	No. of items
Active Learning	AL	I actively participate in tasks and touristic activities within the Metaverse	AL 1	4
		The Metaverse allows me to learn by doing rather than just observing in touristic activities	AL2	
		I often solve problems or complete challenges in the metaverse setting in tourism related settings.	AL3	
		The immersive tourist experiences keeps me mentally engaged in the learning experience process.	AL4	

Construct	Code	Item*	Code Item	No. of items
Knowledge Construction, Reflection and Adaptation	KC	I construct my own understanding through tasks in the Metaverse.	KC1	7
		The learning touristic environment encourages me to connect new knowledge with what I already know.	KC2	
		I feel empowered to explore and generate new ideas during touristic events in the Metaverse.	KC3	
		I develop deeper understanding through trial-and-error in the virtual touristic environment.	KC4	
		I reflect on what I've learned after each Metaverse session.	KC5	
		I adapt my strategies based on feedback or outcomes within the virtual touristic environment.	KC6	
		I make conscious efforts to improve how I learn through Metaverse in tourism activities.	KC7	
Personalized Learning	PL	The Metaverse touristic environment adjusts to my individual learning pace.	PL1	3
		I can choose learning paths or activities that suit my interests when learning about touristic destinations.	PL2	
		I have touristic content tailored to my travel needs.	PL3	
Learning by Social Interaction	LSI	I collaborate with other learners in the Metaverse space.	LSI1	3
		I learn from discussions and exchanges with others in the virtual environment about touristic destinations.	LSI2	
		The Metaverse enables real-time group learning about tourism.	LSI3	
Learning Efficiency	LE	The Metaverse makes learning touristic destinations more enjoyable and exciting.	LE1	5
		I feel immersed when exploring touristic destinations in the Metaverse.	LE2	
		I am motivated to spend more time exploring and learning in Metaverse about touristic destinations.	LE3	
		I have learned more effectively about touristic destinations through the Metaverse than in traditional settings (schools, books, videos).	LE4	
		My overall touristic knowledge has improved due to learning in this environment.	LE5	

**All items are measured on a Likert scale of 1–5: 1 = strongly disagree, 5 = strongly agree*
Source: own computation

3.2 Sample collection and analysis

The questionnaire was distributed in Romania between 1 March and 31 March 2025 to 38 participants. The survey was created using Google Forms and printed copies. The Google Forms survey was shared as a link and QR code via multiple channels to maximise reach. Specifically, online distribution used social platforms such as Facebook and WhatsApp, which have proven effective in reaching potential respondents and collecting valuable feedback. The printed copies were distributed near a VR/AR setting to reach knowledgeable respondents. Respondents were selected using a targeted sampling approach, focusing on individuals with at least a basic understanding of or interest in digital experiences in tourism, ensuring the sample's relevance to the research objectives. Of the 38 participants, 30 provided valid responses. The overall response rate was 78.95%, based on the total number of distributed surveys, both online and physical, which aligns with expected rates for voluntary academic research of this type. Although the sample size of 30 valid responses may be considered relatively small, it is satisfactory in the context of this study. Viglia and Dolnicar (2020) argue that there is no universally ideal sample size for experiments in tourism and hospitality. In fact, small sample sizes are not uncommon in experimental research; Smith and Little (2018) suggest that some of the most significant and reliable findings in psychology have emerged from studies with smaller sample sizes. Research on digital experiences in tourism has also used small sample sizes; for example, studies by Marchiori et al. (2017) with 23 participants, Huang et al. (2012) with 42 participants, and Lee and Oh (2007) with 51 participants all demonstrate that valuable insights and meaningful results can be derived from relatively small samples. Therefore, the sample size of 30 respondents in this study is appropriate for a pilot study. The data were compiled using SMART-PLS4 software, and structural equation modelling (SEM) was employed to evaluate the proposed model and test hypotheses H1–H4.

4. Results

4.1 Profile of participants

The first two characteristics assessed among the respondents are age group and gender. Of the 30 respondents, 13 (43.33%) were male and 17 (56.67%) were female. For age, four intervals were defined: 18–28 years, 29–44 years, 45–60 years, and 61–78 years, with an additional category for those over 65 years, corresponding to different generational groups. The largest proportion of respondents falls within the 29–44 age group (53.33%), followed by the 18–28 age group (33.33%), and then the 45–60 age group (6.67%). The survey respondents include members of Generations X, Y, and Z, often referred to as digital natives, who also represent two of the most significant segments in the tourism industry. In Europe, the Millennial group (Generation Y) constitutes a substantial market, accounting for nearly half of all travel expenditure. Generation X, positioned between Baby Boomers and Millennials, generally shows a moderate level of interest in and adoption of technology, including emerging innovations such as virtual reality. While they may not engage with technology as extensively as Millennials and Generation Z, they still show notable interest in its applications, particularly in tourism and immersive experiences. Generations Y and Z, in particular, display a strong passion for travel, creating new opportunities for companies, including those in the technology sector. Younger individuals tend to travel more frequently and for longer periods, seeking transformative and impactful experiences. Consequently, Generation Z is showing increasing demand for immersive products and services (Buhalis & Karatay, 2022).

When evaluating emerging technologies such as mixed reality, including augmented reality (AR) and virtual reality (VR), willingness to adopt such innovations becomes a crucial factor (Buhalis & Karatay, 2022). These digitally proficient generations, often termed digital natives, display a strong affinity for digital experiences due to their intrinsic interest in technology (Boland, 2017). Millennials are characterised as a "high-tech" generation, while Generation Z is the first age group consistently connected to multiple devices and digital platforms. As this trend continues, the adoption of VR applications for tourism among Generation Z is increasing. According to Boland (2017), the highest interest in VR is observed among individuals aged 18–34 years. Collectively, these generations serve as an appropriate target audience for studying the intent to engage with the metaverse, particularly within the tourism sector, aligning with the study's objectives.

Some participants (86.67%) rarely engage with the metaverse, indicating that virtual worlds and immersive experiences are not a regular part of their digital activities. Only a small proportion (13.33%) reported using the metaverse monthly, suggesting that although some consistent engagement exists, it remains relatively uncommon within the group. Travel habits among participants are varied, with most individuals (63.33%) travelling every few months, making this the most common frequency. A smaller segment (10.00%) travels monthly, likely due to work or personal commitments requiring regular movement. Meanwhile, 13.33% reported travelling once or twice a year, and another 13.33% rarely travel.

4.2 Reliability and validity of the model

To evaluate the reliability and validity of the model, we used SmartPLS. The initial analysis included all measurement items, and the results showed acceptable values for Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) across all constructs. However, the Fornell-Larcker criterion indicated that the discriminant validity of the PL construct was not fully achieved, as its square root of AVE (0.844) was lower than its correlation with KC (0.863). Upon closer examination of the outer loadings, item PL2 had the lowest loading (0.767). Following best practices in PLS-SEM, we removed PL2 and re-estimated the model, evaluating the reliability and validity again. The adjusted model is presented in Figure 1.

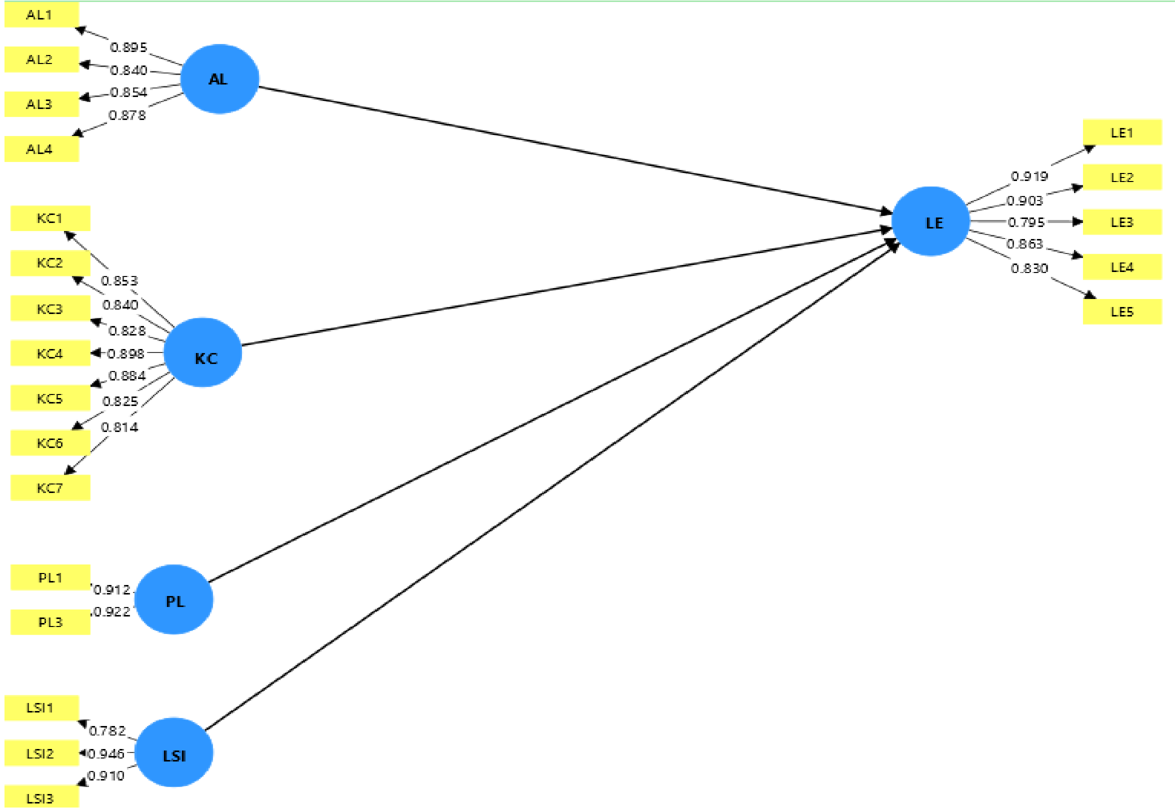

Figure 1. The proposed model with factor loading
Source: own computation (2025)

The results obtained after this adjustment for Cronbach's alpha, composite reliability, and average variance extracted (AVE) for each construct are shown in Table 2, while the initial results are presented in Table 3. Cronbach's alpha is a statistical measure used to assess the internal consistency or reliability of a scale, indicating the extent to which individual items within a construct are correlated. This coefficient ranges from 0 to 1, with higher values indicating stronger internal consistency. A value of 1 denotes perfect reliability, while lower values suggest weaker coherence among items. The computed Cronbach's alpha values for the constructs in this study are 0.890 for AL, 0.935 for KC, 0.858 for LSI, 0.811 for PL, and 0.914 for LE, demonstrating an acceptable to high level of internal consistency across all constructs. Notably, two values exceed 0.90 and the other three are between 0.80and 0.90, suggesting strong internal reliability and well-structured measurement scales. Factor loadings for all items exceed 0.7, as shown in Fig. 1, which is considered highly desirable (Hair et al., 2010).

The AVE values reported in Table 2 all exceed the recommended threshold of 0.50, ranging from 0.721 to 0.841, indicating strong convergent validity. Comparing the results, after the adjustment (elimination of PL2), the AVE for PL increased from 0.712 to 0.841. The composite reliability values in Table 2 are above 0.7 for all constructs, with scores ranging from 0.913 to 0.948, reinforcing the robustness of the measurement model. Additionally, after the adjustment, the composite reliability of PL improved from 0.881 to 0.914.

Table 2. Confirmatory factor analysis - results obtained after the adjustment

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AL	0.890	0.891	0.924	0.752
KC	0.935	0.938	0.948	0.721
LE	0.914	0.915	0.936	0.745
LSI	0.858	0.904	0.913	0.778

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
PL	0.811	0.813	0.914	0.841

**PL2 was excluded from PLS-SEM simulation*
Source: own computation (2025)

Table 3. Confirmatory factor analysis - initial results

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AL	0.890	0.891	0.924	0.752
KC	0.935	0.938	0.948	0.721
LE	0.914	0.915	0.936	0.745
LSI	0.858	0.905	0.913	0.778
PL	0.797	0.811	0.881	0.712

**All items were included in PLS-SEM simulation*
Source: own computation (2025)

Table 4 and Table 5 present the square root of AVE on the diagonal of the tables and the correlations between constructs below the diagonal. After the adjustment, the AVE for PL increased from 0.712 to 0.841, and its square root (0.917) became higher than all inter-construct correlations, confirming discriminant validity.

Table 4. Discriminant validity assessed using Fornell-Lacker criterion - results obtained after the adjustment

Construct	AL	KC	LE	LSI	PL
AL	0.867				
KC	0.841	0.849			
LE	0.789	0.832	0.863		
LSI	0.796	0.665	0.855	0.882	
PL	0.812	0.802	0.771	0.684	0.917

**PL2 was excluded from PLS-SEM simulation*
Source: own computation (2025)

Table 5. Discriminant validity assessed using Fornell-Lacker criterion - initial results

Construct	AL	KC	LE	LSI	PL
AL	0.867				
KC	0.841	0.849			
LE	0.789	0.832	0.863		
LSI	0.796	0.665	0.855	0.882	
PL	0.798	0.863	0.789	0.635	0.844

**All items were included in PLS-SEM simulation*
Source: own computation (2025)

These results confirm that the measurement instrument exhibits satisfactory reliability and validity, ensuring that the constructs accurately represent the intended theoretical concepts. Normality was assessed by analysing skewness and kurtosis statistics, as normality is a key assumption in SEM models. All skewness and kurtosis values are within the acceptable range of ±2, indicating that the variable distributions do not significantly deviate from normality. The final model demonstrates improved properties; therefore, hypothesis testing was conducted using the revised model.

4.3 Model testing

To examine the influence of active learning, knowledge construction, reflection and adaptation, personalised learning, and learning through social interaction on metaverse-based learning efficiency in tourism, I employed partial least squares structural equation modelling (PLS-SEM) with a bootstrapping procedure (5,000 resamples, one-tailed test, 95% confidence level). The results of the hypothesis testing are presented in Table 6. The analysis indicates that knowledge construction has a significant positive effect on metaverse-based learning efficiency in tourism (β = 0.141, t = 3.779, $p < 0.001$), supporting H2. Similarly, learning through social interaction demonstrates a significant positive impact on metaverse-based learning efficiency in tourism (β = 0.125, t = 4.899, $p < 0.001$), supporting H3. These findings suggest that both knowledge construction and social interaction play crucial roles in enhancing learning efficiency.

The influence of active learning on metaverse-based learning efficiency in tourism was not statistically significant (β = 0.173, t = 1.459, p = 0.072), leading to the rejection of H1. Similarly, personalised learning did not show a significant effect on metaverse-based learning efficiency in tourism (β = 0.134, t = 0.976, p = 0.165), resulting in the rejection of H4. These results suggest that, although active and personalised learning approaches are valuable, their direct impact on learning efficiency may require further investigation, possibly considering moderating variables or alternative methodological approaches.

Table 6. Model testing

Construct	Standard deviation (STDEV)	t-statistics	p-values	Hypothesis	Result
AL -> LE	0.173	1.459	0.072	H1	Not Supported
KC -> LE	0.141	3.779	0.000	H2	Supported
LSI -> LE	0.125	4.899	0.000	H3	Supported
PL -> LE	0.134	0.976	0.165	H4	Not Supported

Source: own computation (2025)

In summary, the findings emphasise the crucial role of knowledge construction and social learning in enhancing learning efficiency, while highlighting the need for further research into the mechanisms underlying the effects of active and personalised learning strategies.

5. Discussion

The objective of this study was to explore the educational value of the metaverse in tourism learning, based on Constructivist Learning Theory principles. By examining how active learning, knowledge construction, personalised learning, and social interaction within a metaverse-based environment influence learning efficiency, the research offers relevant insights for both theory and practice. The results highlight knowledge construction (H2) and learning through social interaction (H3) as significant positive predictors of learning efficiency in metaverse-based tourism education. These findings are consistent with existing literature, which emphasises that constructivist approaches, where learners actively build and reflect on knowledge, are essential for achieving meaningful learning outcomes. In particular, the significant role of social interaction supports the premise that learning is inherently a social process, and that peer collaboration, discussions, and group activities within immersive environments enhance understanding and engagement (Garrison et al., 2000; Chou & Chan, 2016).

The strong positive relationship between knowledge construction and learning efficiency suggests that the metaverse offers an effective environment for learners to explore, experiment, and connect new knowledge to prior experiences. The virtual, interactive, and immersive nature of the metaverse likely enhances this process by offering experiential learning opportunities that extend beyond traditional educational settings (Beck, Rainoldi & Egger, 2019). This supports the constructivist principle that learners actively build knowledge through experience, as the metaverse's immersive environments facilitate dynamic exploration and experimentation in tourism contexts (Chung et al., 2015). Similarly, the significant influence of learning through social interaction demonstrates the metaverse's potential to foster collaborative learning experiences. Virtual environments that support real-time communication and group-based exploration enable participants to share knowledge, challenge ideas, and develop a deeper understanding of tourism-related content (Disztinger, Schlogl & Groth, 2017). These findings are consistent with research highlighting the role of peer interaction and social presence in enhancing engagement and learning outcomes in digital environments (Correia Loureiro, Guerreiro & Ali, 2020).

This is particularly relevant given the demographic profile of the participants in this study, most of whom belong to Generation Y and Z, often referred to as digital natives. These generations, known for their strong affinity for technology and immersive experiences (Boland, 2017; Buhalis & Karatay, 2022), are naturally inclined to benefit from interactive and socially enriched metaverse platforms. However, the majority of participants (86.67%) rarely engage with the metaverse, which may indicate a gap between interest and actual usage, potentially due to barriers such as accessibility, limited exposure, or insufficiently immersive design. Despite their technological proficiency, their limited experience with the metaverse could have influenced their overall perception of its learning value, particularly regarding features such as personalisation and active participation.

Importantly, these results align with broader tourism trends that integrate immersive environments. As Schiopu et al. (2022) highlight, the pandemic led to increased interest in virtual reality-based tourism solutions due to greater safety concerns, travel anxiety, and structural constraints. Their study found that, although travel-related fears and restrictions increased interest in VR tourism, this behavioural intention was significantly mediated by the perceived usefulness and ease of use of the technology. In other words, virtual alternatives became attractive only when users considered them functional and user-friendly. This underscores the need for metaverse platforms in education not only to simulate reality, but also to provide highly usable and immersive environments that promote learner engagement and perceived value.

The age distribution of the participants further supports the strategic targeting of immersive educational technologies toward younger demographics. Over 86% of the respondents were between the ages of 18–44, a segment that includes Millennials and Gen Z demographics most receptive to digital innovation and VR adoption (Boland, 2017). The fact that these groups dominate both the travel and edtech markets reinforces the relevance of metaverse-based tourism education within this cohort.

Interestingly, Schiopu et al. (2022) also emphasise that the social dimension of virtual tourism, such as interaction with companions, remains underdeveloped in non-immersive formats, potentially limiting engagement. Their findings support our emphasis on social interaction as a driver of learning efficiency. Immersive and interactive environments that replicate social presence can increase emotional engagement and the desire to use such platforms, particularly compared to solitary or static formats. Studies by Lin et al. (2022), Vishwakarma et al. (2021), and Orús, Ibanez-Sanchez, and Flavian (2021) further highlight that immersion and interactivity are critical to user satisfaction, perceived value, and emotional response in virtual environments. These insights are directly relevant to the design of educational experiences in the metaverse, suggesting that shared presence and emotional engagement are essential components of effective virtual learning in tourism.

Conversely, active learning (H1) and personalised learning (H4) did not show statistically significant effects on learning efficiency. Although these approaches are often highlighted as critical components of effective digital learning environments, their lack of significant influence in this study may be due to several factors. One possible explanation is the limited exposure of participants to metaverse environments, as indicated by the finding that 86.67% of respondents rarely engage with the metaverse. Therefore, participants may not have fully experienced or utilised the active and personalised learning features offered by the platform, reducing their perceived impact on learning efficiency.

Additionally, the small sample size may have limited the ability to detect weaker but potentially meaningful effects, particularly for constructs such as active and personalised learning. While small sample sizes are accepted in exploratory research, especially within tourism studies (Marchiori et al., 2017; Huang et al., 2012), future studies with larger and more diverse samples could provide further clarity regarding these relationships.

Another factor to consider is the high educational level of participants, with over 76% holding a master's or doctorate degree. While such academic backgrounds suggest a higher cognitive ability to engage with complex content, they may also influence preferences for structured, goal-oriented learning strategies rather than playful or experimental forms of active learning, especially in relatively unfamiliar environments like the metaverse.

It is also worth noting that personalised learning may depend on more advanced system features, such as AI-driven content adaptation, which may not have been fully present or perceived in the metaverse experiences explored by participants. This is consistent with research indicating that technologies like augmented reality and virtual reality can enhance personalised learning through tailored content delivery, although their effectiveness depends on sophisticated system design (Chung, Han & Joun, 2015). The integration of adaptive learning algorithms in virtual environments can facilitate customised educational experiences, enabling learners to engage with tourism-related content at their own pace and level of understanding. This suggests an avenue for future research to investigate how specific technological functionalities, including adaptive learning algorithms, could enhance personalisation and subsequently improve learning outcomes (Disztinger, Schlogl & Groth, 2017).

Moreover, the findings of this study reinforce the relevance of constructivist learning principles, particularly the focus on knowledge construction and social interaction, in enhancing the effectiveness of metaverse-based learning for tourism. As most participants travel every few months (63.33%) and are therefore likely to have a practical interest in tourism, the potential for metaverse-based educational tools to simulate meaningful, destination-related experiences becomes even more significant. As pandemic-era shifts in consumer behaviour illustrate, the success of VR and metaverse applications depends not only on technological novelty but also on their ability to meet psychological needs such as connection, presence, and perceived control. Future research and instructional design should therefore aim to develop metaverse-based tourism education that fosters authentic social interaction, emotional engagement, and ease of use, especially as these factors become increasingly critical in a post-pandemic educational landscape.

This study contributes to the growing discourse on the integration of immersive technologies in tourism education, particularly within the context of the "age of acceleration" (Xiang, 2018, citing Negroponte, 2016, and Friedman, 1995). As rapid technological change transforms the way tourism is experienced and understood, virtual platforms such as the metaverse are becoming increasingly significant. This research offers a novel theoretical contribution by exploring the educational value of the metaverse in tourism through the lens of Constructivist Learning Theory.

While previous literature has debated the substitutability of VR for physical travel (Guttentag, 2010; Chung, 2015), our findings extend this discussion by positioning the metaverse as an educational medium rather than simply a travel substitute. Unlike traditional VR applications designed to replicate touristic experiences, the metaverse enables knowledge construction, social interaction, and reflection, which are key dimensions of experiential learning.

Our results also align with emerging research showing that user perception, particularly regarding authenticity and engagement, drives behavioural intention in virtual environments (Li & Chen, 2019; Kim et al., 2020a). However, this study is among the first to highlight that knowledge construction and social collaboration are more influential than active or personalised learning in this context, suggesting a shift in how immersive environments support learning outcomes.

Moreover, by incorporating constructivist pedagogical variables rather than focusing solely on technology acceptance metrics, this integration supports a broader conceptualisation of immersive learning in tourism and encourages future researchers to explore the intersection of educational psychology and virtual experience design. From a practical perspective, the study provides actionable insights for educators, content developers, and tourism stakeholders exploring the metaverse as an educational tool. In line with research emphasising ease of use and perceived usefulness in virtual environments (Huang et al., 2013; Li & Chen, 2019), our findings highlight the importance of designing metaverse-based learning experiences that promote authentic, socially interactive, and reflective engagement.

Given that active learning and personalised learning showed limited influence on learning efficiency, designers should carefully consider how these elements are integrated into immersive platforms. Ineffective implementation may result from poor instructional design or misalignment with learners' digital literacy levels. Emphasis should instead be placed on fostering collaborative tasks, shared exploration, and guided reflection to maximise educational outcomes.

The study also suggests that interest in immersive technologies may mediate learning outcomes, similar to how previous research identified enjoyment or flow as mediators of behavioural intention in VR settings (Kim et al., 2020a; Huang et al., 2012). This has direct implications for the marketing and adoption strategies of educational metaverse applications: targeting digitally curious or tech-savvy learners may result in higher engagement and improved learning transfer.

Finally, as the tourism sector faces increasing pressure to adopt sustainable and resilient models, the metaverse presents a promising opportunity. In line with global initiatives such as the UN's Sustainable Development Goal 13 on Climate Action (UN, 2020a; 2020b), immersive education can reduce the carbon footprint associated with physical travel while still providing rich destination-based learning experiences. By utilising the metaverse for tourism education, institutions and organisations can help build a more adaptive and environmentally responsible tourism model.

6. Conclusions

This pilot study offers preliminary insights into the educational potential of the metaverse in tourism learning environments. The findings highlight the significant role of knowledge construction and learning through social interaction in enhancing metaverse learning efficiency, suggesting that collaborative and reflective learning processes are essential for effective knowledge acquisition in immersive digital environments. Active learning and personalised learning did not show statistically significant effects on metaverse-based learning efficiency in tourism. Although these approaches are widely recognised for their educational benefits, their lack of direct impact in this study suggests that additional factors – such as design, learner motivation, or digital literacy in the metaverse – may mediate their effectiveness. Further research should explore these dynamics, incorporating more comprehensive models that account for potential moderating or mediating influences. The study demonstrates the educational value of the metaverse in tourism settings.

The implications of these findings are multifaceted. First, they underscore the need for tourism educators and instructional designers to emphasize social and collaborative elements when developing metaverse-based curricula. Rather than focusing solely on individual engagement or adaptive content, the design of immersive learning experiences should prioritize peer interaction, group reflection, and shared knowledge construction. Additionally, the results imply that successful implementation of metaverse learning environments requires a more nuanced understanding of learners' digital readiness and contextual factors that may affect engagement and learning outcomes.

Despite its contributions, this study has several limitations that should be acknowledged. It was conducted with a small sample of 30 respondents from a single country (Romania). As the metaverse and its associated learning experiences are still in their early stages, particularly in developing nations such as Romania, the findings may not be fully generalisable to broader populations or different educational contexts. Future studies should include larger and more diverse samples to enhance the robustness of the results. Additionally, the research was limited to perceptual responses gathered from both online and physical media sources, but only within Bucharest. This narrow scope may not fully capture the perspectives of learners from other regions or educational settings. To address this, future studies should include larger, more diverse samples from multiple geographical and cultural settings to enhance the external validity of the results.

Furthermore, all respondents held at least a bachelor's degree, which limits the representativeness of the sample. Learners with lower levels of education may have different experiences or perceptions of metaverse-based learning, an aspect not captured in this research. Future studies should include participants from a wider range of educational backgrounds to better understand the broader applicability of the findings.

Data collection relied exclusively on a questionnaire-based survey, which, while effective for capturing perceptions and self-reported experiences, is inherently susceptible to biases such as social desirability or limited response depth. To overcome these limitations, future research should adopt a mixed-methods approach, incorporating both quantitative and qualitative methods, such as interviews, focus groups, or observational techniques, as well as objective performance metrics. This would provide a more comprehensive and nuanced understanding of the factors influencing learning efficiency within metaverse-based tourism education.

Acknowledgement

I extend my gratitude to Prof. Dr. Hornoiu Remus-Ion for his supervision of the research activities that led to the results presented in this paper.

References

Akyürek, S., Genç, G., Çalık, İ. and Şengel, Ü. (2024). Metaverse in tourism education: A mixed method on vision, challenges and extended technology acceptance model. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 35, 100503. https://doi.org/10.1016/j.jhlste.2024.100503.

Ballantyne, R. and Packer, J. (2011). Using tourism free-choice learning experiences to promote environmentally sustainable behaviour: the role of post-visit 'action resources'. *Environmental Education Research*, 17(2), pp. 201-215. https://doi.org/10.1080/13504622.2010.530645.

Beck, J., Rainoldi, M. and Egger, R., (2019). Virtual reality in tourism: a state-of-the-art review. *Tourism Review*. 74 (3), pp. 586-612. https://doi.org/10.1108/TR-03-2017-0049.

Boland, M. (2017). *How do consumers really feel about VR/ARtillry Insights*. [online] Available at <https://www.thevrara.com/blog2/2017/8/28/how-do-consumersreally-feel-about-vr-new-report.> [Accessed 25 March 2025].

Buhalis, D., and Karatay, N. (2022). Mixed reality (MR) for Generation Z in cultural heritage tourism towards metaverse. In ENTER22 e-Tourism Conference, *Springer, Cham,* pp. 16-27. https://doi.org/10.1007/978-3-030-94751-4_2.

Buhalis, D., Lin, M. S. and Leung, D. (2022). 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, X., Zou, D., Xie, H. and Wang, F.L., 2023. Metaverse in Education: Contributors, Cooperations, and Research Themes. *IEEE Transactions on Learning Technologies*, 16(6), pp. 1111–1129. https://doi.org/10.1109/TLT.2023.3277952.

Chen, Z. (2022). Exploring the application scenarios and issues facing Metaverse technology in education. *Interactive Learning Environments*, 32(5), pp. 1975–1987 https://doi.org/10.1080/10494820. 2022.2133148.

Chowdhury, R. and Frank, M. (2021). The Metaverse: What it is, where to find it, and how to thrive in it. *Harvard Business Review*. [online] Available at: <https://hbr.org/2021/09/the-metaverse-what-it-is-where-to-find-it-and-how-to-thrive-in-it. [Accessed 23 March 2025].

Chua, H. W. and Yu, Z. (2023). A systematic literature review of the acceptability of the use of Metaverse in education over 16 years. *Journal of Computers in Education*, 11, pp. 615-665. https://doi.org/10.1007/s40692-023-00273-z.

Chung, N., Han, H. and Joun, Y. (2015). Tourists' intention to visit a destination: The role of augmented reality (AR) application for a heritage site. *Computer Human Behaviour* 50, pp. 588-599. https://doi.org/10.1016/j.chb.2015.02.068.

Chou, S.W. and Chan, H.C. (2016). Social presence and learner interactions in a virtual learning environment: A study of asynchronous discussion forums. *International Journal of Distance Education Technologies,* 14(4), pp. 1-15. https://doi.org/10.1111/jcal.12107.

Correia Loureiro, S.M., Guerreiro, J. and Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: a text-mining approach. *Tourism Management.* 77, pp. 104–128. https://doi.org/10.1016/j.tourman.2019.104028.

Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. *Journal of Metaverse*, 1(1), pp. 1-8. https://doi.org/10.48550/arXiv.2112.12068.

Disztinger, P., Schlogl, S. and Groth, A. (2017). Technology acceptance of virtual reality for travel planning, in Schegg, R. and Stangl, B. (Eds), *Information and Communication Technologies in Tourism,* 2017 Proceedings of the International Conference in Rome, Italy, 24-26 January, Cham: Springer, pp. 255-268. https://doi.org/10.1007/978-3-319-51168-9_19.

Falk, J. H. (2009). *Identity and the museum visitor experience*. Walnut Creek, CA: Left Coast Press.

Falk, J. H. and Dierking, L.D. (2002). *Lessons without limit: How free-choice learning is transforming education*. Walnut Creek, CA: AltaMira Press.

Falk, J. H. (2007). Investigating public science interest and understanding: Evidence for the importance of free-choice learning. *Public Understanding of Science*, 16(4), pp. 455-469. https://doi.org/10.1177/ 0963662506064240.

Garrison, D.R., Anderson, T. and Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education,* 2(2-3), pp. 87-105. https://doi.org/10.1016/S1096-7516(00)00016-6.

Go, H. and Kang, M. (2023). Metaverse tourism for sustainable tourism development: Tourism agenda 2030. *Tourism Review*, 78(2), pp. 381–394. https://doi.org/10.1108/TR-02-2022-0102.

Gursoy, D., Malodia, S., and Dhir, A. (2022). The metaverse in the hospitality and tourism industry: An overview of current trends and future research directions. *Journal of Hospitality Marketing & Management*, 31(5), pp. 527-534. https://doi.org/10.1080/19368623.2022.2072504.

Gurrin, C., Smeaton, A.F. and Doherty, A. R. (2014). Lifelogging: Personal big data. *Foundations and Trends® in information retrieval*, 8(1), pp. 1–125. http://dx.doi.org/10.1561/1500000033.

Guttentag, D.A., (2010). Virtual reality: applications and implications for tourism. *Tourism Management* 31, pp. 637-651. https://doi.org/10.1016/j.tourman.2009.07.003.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2010). *Multivariate Data Analysis*, 7th ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Huang, Y.-C, Backman, K.J. and Backman, S.J. (2012). Exploring the impacts of involvement and flow experiences in Second Life on people's travel intentions. *Journal of Hospitality and Tourism Technology*, 3(1), pp. 4-23. https://doi.org/10.1108/17579881211206507.

Huang, Y.-C., Backman, S.J., Backman, K.J. and Moore, DeW, (2013). Exploring user acceptance of 3D virtual worlds in travel and tourism marketing. *Tour. Manag.* 36, pp. 490-501. https://doi.org/10.1016/ j.tourman.2012.09.009.

Hui, J., Zhou, Y., Oubibi, M., Di, W., Zhang, L. and Zhang, S. (2022). Research on art teaching practice supported by Virtual Reality (VR) technology in the primary schools. *Sustainability,* 14(3), pp. 1-15. https://doi.org/10.3390/su14031246.

Inmor, S., Na-Nan, K., Phanniphong, K., Jaturat, N. and Hirnšal, M. (2025). Unveiling the metaverse: The mediating role of social interaction in enhancing tourism experiences. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(1), 100461. https://doi.org/10.1016/j.joitmc.2024.100461.

Jagatheesaperumal, S.K., Ahmad, K., Al-Fuqaha, A., and Qadir, J. (2022). Advancing education through extended reality and internet of everything enabled metaverses: Applications, challenges, and open issues. *IEEE Transactions on Learning Technologie*s, 17, pp. 1120-1139. https://doi.org/10.1109/TLT.2024.3358859.

Kaddoura, S. and Al Husseiny, F. (2023). The rising trend of Metaverse in education: Challenges, opportunities, and ethical considerations. *Peer Journal of Computer Science*, 9, e1252. https://doi.org/10.7717/peerj-cs.1252.

Kim, M.J., Lee, C.K. and Jung, T. (2020a). Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model. J. *Travel Res.* 59(1), pp. 69-89. https://doi.org/10.1177/0047287518818915.

Kye, B., Han, N., Kim, E., Park, Y. and Jo, S. (2021). Educational applications of metaverse: Possibilities and limitations. *Journal of Educational Evaluation for Health Professions*, 18, pp. 1-13. https://doi.org/10.3352/jeehp.2021.18.32.

Ledesma-Chaves, P., Gil-Cordero, E., Navarro-García, A. and Maldonado-López, B. (2024). Satisfaction and performance expectations for the adoption of the metaverse in tourism SMEs. *Journal of Innovation & Knowledge*, 9(3), 100535. https://doi.org/10.1016/j.jik.2024.100535.

Lee, O. and Oh, J. E. (2007). The impact of virtual reality functions of a hotel website on travel anxiety. *CyberPsychology & Behavior*, 10(4), pp. 584–586. https://doi.org/10.1089/cpb.2007.9987.

Li, T. and Chen, Y., 2019. Will virtual reality be a double-edged sword? Exploring the moderation effects of the expected enjoyment of a destination on travel intention. *Journal of Destination. Marketing and Management.* 12, pp. 15-26. https://doi.org/10.1016/j.jdmm.2019.02.003.

Mandal, S., Paul, J., Kotni, D. P. and Chintaluri, M. G. (2024). The orientation of Gen Zs towards metaverse tourism. *Journal of Destination Marketing & Management*, 32, 100871. https://doi.org/10.1016/j.jdmm.2024.100871.

Maghaydah, S., Al-Emran, M., Maheshwari, P. and Al-Sharafi, M. A. (2024). Factors affecting metaverse adoption in education: A systematic review, adoption framework, and future research agenda. *Heliyon,* 10(7), e28602. https://doi.org/10.1016/j.heliyon.2024.e28602.

Marchiori, E., Niforatos, E. and Preto, L. (2017). Measuring the media effects of a Tourism-Related virtual reality experience using biophysical data. In: R. Schegg and B. Stangl, eds. *Information and Communication Technologies in Tourism 2017: Proceedings of the International Conference.* Cham: Springer, pp. 199–210. https://doi.org/10.1007/978-3-319-51168-9_15.

Nurhasnah, N., Sepriyanti, N. and Kustati, M. (2024). Learning theories according to constructivism theory. *Journal International Inspire Education Technology,* 3(1), pp. 19-30. https://doi.org/10.55849/jiiet.v3i1.577.

Orús, C., Ibanez-Sanchez, S. and Flavian, C. (2021). Enhancing the customer experience with virtual and augmented reality: the impact of content and device type, *International. Journal of Hospitality. Management*. 98103019. https://doi.org/10.1016/j.ijhm.2021.103019.

Park, S. M. and Kim, Y. G. (2022). A Metaverse: Taxonomy, components, applications, and open challenges. *IEEE Access,* 10, pp. 4209-4251. https://doi.org/10.1109/ACCESS.2021.3140175.

Pernecky, T. (2012). Constructionism: Critical pointers for tourism studies. *Annals of Tourism Research*, 39(2), pp. 1116-1137. https://doi.org/10.1016/j.annals.2011.12.010.

Pellas, N., Mystakidis, S. and Kazanidis, I. (2021). Immersive virtual reality in K-12 and higher education: A systematic review of the last decade scientific literature, *Virtual Reality*, 25 (2021), pp. 835-861. https://doi.org/10.1007/s10055-020-00489-9.

Petr, C. and Caudan, P. (2024). Ethical marketing framework for metaverse simulated experiences of tourism (SET): An exploration of consumers' aspirations and fears. *Journal of Retailing and Consumer Services*, 79, p.103785. https://doi.org/10.1016/j.jretconser.2024.103785.

Petrica, A.-L. (2024). Navigating the metaverse: Unreavelling its impact on tourism, *Cactus the Tourism Journal for Research, Education, Culture and Soul*, 6(1), pp. 28-42. https://doi.org/10.24818/CTS/6/2024/1.04.

Sánchez-Amboage, E. et al., (2024). Tourism marketing in the metaverse: A systematic literature review, building blocks, and future research directions. *Plos One,* 19(5), p.e0300599. https://doi.org/10.5281/zenodo.10782765.

Schiopu, A.F., Hornoiu, R.I., Padurean, A.M. and Nica, A.-M. (2022). Constrained and virtually traveling? Exploring the effect of travel constraints on intention to use virtual reality in tourism. *Technology in Society*, 71, p.102091. doi:10.1016/j.techsoc.2022.102091.

Shin, H. and Kang, J. (2024). How does the metaverse travel experience influence virtual and actual travel behaviors? Focusing on the role of telepresence and avatar identification. *Journal of Hospitality and Tourism Management*, 58, pp. 174-183. https://doi.org/10.1016/j.jhtm.2023.12.009.

Smith, P. L. and Little, D. R. (2018). Small is beautiful: In defense of the small-N design. *Psychonomic Bulletin & Review*, 25, pp. 2083-2101. https://doi.org/10.3758/s13423-018-1451-8.

Stephenson, N. (1992). *Snow Crash*. New York, NY: Bantam Books.

UN (2020a). About the Sustainable Development Goals. *United Nations* [online] Available at <https://www.un.org/sustainabledevelopment/sustainabledevelopment-goals/>, [Accessed March 19, 2025].

UN (2020b). COVID-19: Embracing digital government during the pandemic and beyond, Division for Public Institutions and Digital Government. *United Nations Department of Economic and Social Affairs, Policy Brief 61*. [online] Available at <https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-61-covid-19-embracing-digital-government-during-the-pandemic-and-beyond/>, [Accessed March 22, 2025].

Viglia, G. and Dolnicar, F. (2020). A review of experiments in tourism and hospitality. *Annals of Tourism Research*, 80, 102858. https://doi.org/10.1016/j.annals.2020.102858.

Vishwakarma, P., Mukherjee, S. and Datta, B. (2021) Travelers' intention to adopt virtual reality: a consumer value perspective, *Journal of Destination. Marketing and Management.* 17 100456. https://doi.org/10.1016/j.jdmm.2020.100456.

Wang, Y., Zhang, Y. and Wu, X. (2022). An exploratory study of user acceptance of Horizon Home Metaverse. *Journal of Ambient Intelligence and Humanized Computing*, 12(6), pp. 5661-5674. https://doi.org/10.1007/s12652-021-03205-5.

Weinberger, M., (2022). What Is Metaverse?. A Definition Based on Qualitative Meta-Synthesis. *Future Internet*, 14(11), p.310. https://doi.org/10.3390/fi14110310.

Xiang, Z., (2018). From digitization to the age of acceleration: On information technology and tourism. *Tourism Management. Perspect*. 25, pp. 147–150. https://doi.org/10.1016/j.tmp.2017.11.023.

Zhou, Z., Chen, Z. and Jin, X.-L. (2024), A review of the literature on the metaverse: definition, technologies, and user behaviors, *Internet Research*, 34(1), pp. 129-148. https://doi.org/10.1108/INTR-08-2022-0687.