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Beyond the real world: Metaverse adoption patterns in tourism among Gen Z and Millennials

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ABSTRACT

The Metaverse opens a digital realm that offers transformative possibilities for the sector, promising to reshape the way tourists explore, experience, and interact with destinations. The objective of this research is to measure the acceptance of Metaverse technology within the tourism industry, with a particular focus on the adoption patterns among Gen Z and Millennials from a given high education institution. The methodology consisted of a PLS-SEM analysis based on a sample of 218 users, based on the Unified Theory of Acceptance and Use of Technology (UTAUT-2 model), which is identified as a robust model for analysing the gap in Metaverse usage. The results of this work reveal that the tested model has a high predictability power according to the behavioural intention of use of Metaverse in tourism. Specifically, the facilitating conditions, the price value, the social influence, and the intention to visit a destination become significant factors. Also, these findings prove that the Metaverse evolution could be analysed with this model to also test the changes in acceptance patterns concerning the other constructs.

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KEYWORDS
Metaverse; tourism industry; virtual experiences; UTAUT-2 model; disruptive businesses

1. Introduction

The tourism industry is experiencing a transformative revolution, intensified by the COVID-19 outbreak in early 2020. This change is propelled by technological advancements, paving the way for innovative business ventures. Augmented and virtual reality experiences, already gaining traction (Muñoz-Saavedra et al., 2020), are becoming increasingly significant within the context of the Metaverse, reshaping perceptions of technology's future in tourism (Buhalis & Karatay, 2022).

The concept of the Metaverse has evolved significantly over decades, driven by advancements in computer science that have facilitated major sociological shifts in human interaction and communication (Kayakoku, 2023). From the initial speculations in the 1960s, the 1970s and 1980s saw critical developments in virtual reality technologies, like head-mounted display visors, enabling user immersion in virtual worlds (Di Natale et al., 2020). The advent of Second Life in 2003 marked a significant milestone towards the Metaverse concept, offering a space where virtual interactions could potentially mirror real-world economies and interactions (Cammack, 2010; Dionisio et al., 2013). The proliferation of the internet and the popularity of online games during the 1990s, alongside platforms like Roblox emerging in 2006, significantly contributed to the Metaverse's conceptualisation, laying a solid foundation for evolving social and economic interactions in a shared virtual space (Ball, 2020; Davis et al., 2009; Sweeney, 2019).

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The integration of virtual reality (VR) with the tourism industry marks a transformative approach to the dissemination and consumption of tourism experiences. VR has been utilised to offer immersive previews of destinations, thus facilitating informed choices among potential travellers (Peštek & Savan, 2020). In the face of challenges such as overtourism and the COVID-19 pandemic, virtual tourism has surfaced as a practical substitute for conventional travel, becoming integral to destination marketing and enhancing actual visitations through digital exploration options during travel constraints (Riesa & Haries, 2022). The pandemic has further highlighted virtual tourism's affordability and safety, offering a risk-free, cost-effective travel alternative (Sarkady et al., 2021), also in terms of the Agenda 2030 framework (Puig-Cabrera et al., 2023).

The context of immersive technological advances and economic recovery have become incentives for companies to initiate new formulas to capitalise on the Metaverse and to offer adapted services, products, and virtual experiences aimed at customers of new generations of digital natives (Buhalis & Karatay, 2022). Furthermore, it is essential to incorporate the psychographic profile integral to the normalisation, acceptance, and utilisation of immersive technology in daily life. This includes a psychological profile of the primary consumers, namely the Millennial and Z generations, who exhibit a high degree of social involvement, an extroverted personality, and a keen interest in novelty and emerging social trends (Rodrigues et al., 2024; Kozinets et al., 2017). Consequently, technology has evolved into a faithful instrument of consumption, and there is a prevailing predisposition to inhabit a digital-native environment.

This research provides an innovative and unprecedented examination of the Metaverse and its potential impacts, challenges, and opportunities within the tourism industry, a rapidly evolving sector strongly influenced by advancements in digital technologies. By adopting the Unified Theory of Acceptance and Use of Technology (UTAUT-2) model (Besson & Gauttier, 2023; Mohamad et al., 2021), a well-established theoretical framework in the context of Information and Communication Technologies (ICT), this study offers a novel and insightful exploration of the interactions between users and the emergent Metaverse technology. The study is particularly groundbreaking as it represents the first application of the UTAUT-2 model to the Metaverse within the tourism industry, which holds vast potential for business evolution, user experience enhancement, and sustainability. Therefore, this research significantly contributes to the understanding of the Metaverse's role and impact in tourism, filling a gap in current literature and aiding in shaping future directions and strategies in the industry as well as the research agenda within this realm.

The goal of this research is to measure the acceptance of Metaverse technology within the tourism industry, with a particular focus on the adoption patterns among Gen Z and Millennials. By leveraging the theoretical framework provided by the Unified Theory of Acceptance and Use of Technology (UTAUT-2), we delve into understanding how this emerging technology is being embraced and the formation of usage patterns in the Metaverse. This digital realm offers transformative possibilities for the sector, promising to reshape the way tourists explore, experience, and interact with destinations. To achieve this, a PLS-SEM analysis was carried out based on a sample of 218 users, drawing upon the UTAUT-2 model constructs.

Following the introduction, this paper is organised as follows: Section 2 delves into the literature review of the Metaverse, deepening into the relationship of this technology with the tourism industry, its opportunities and its interrelationships based on the UTAUT-2 model, including the hypotheses to be tested in this research. Section 3 discusses the methodology employed to analyse the intention of use of the Metaverse through the UTAUT-2 model. Section 5 encompasses and discusses all the results obtained in the analysis. Finally, this research concludes with Section 5, where conclusions, practical and theoretical implications, and future research directions are addressed.

2. Literature review

The Metaverse is a term used to describe a collective virtual universe that can be visited and explored by multiple online users. The Metaverse sets the stage for a virtual world, inducing a deep sense of

immersion and interaction for individuals with fellow users, objects, and even environments, similarly to their interactions in the real world (Ng, 2022). Critical to the successful rendering of the Metaverse are cutting-edge technologies such as virtual reality (VR) and augmented reality (AR). These technologies enable users to not only observe a virtual world on a screen but also to feel like they are an integral part of it. Additionally**,** Artificial intelligence (AI) and advanced data processing also play a crucial role, contributing to the Metaverse's evolution by paving the way for seamless and hyper-realistic interactions between users and the virtual world (Sparkes, 2021).

Regarding business applications, the Metaverse offers opportunities for creating virtual work environments, providing companies with a cost-efficient and collaborative solution. It facilitates the hosting of virtual fairs and events, allowing businesses to connect with a global audience efficiently. As for virtual communities, the Metaverse enables people to connect and collaborate more seamlessly and naturally, without geographical boundaries. This can lead to the formation of extensive global communities and networks around shared interests (Villarreal Satama, 2022).

However**,** the Metaverse is not devoid of challenges. With the creation of a shared virtual world where people interact, there's a considerable increase in personal and behavioural data. This raises significant concerns regarding privacy and security, as such data could potentially fall into the wrong hands and be misused. Additionally**,** there is also the risk of cyberbullying and harassment in the Metaverse, as users may feel more secure behind a screen and act differently than they would in the real world (Yıldız & Tanyıldızı, 2023). Furthermore**,** the Metaverse presents ethical and legal challenges. For example, who is responsible for damages caused in the Metaverse? How are intellectual property rights managed in the Metaverse? How do we ensure users respect rules and regulations within the Metaverse? (Moradiberelian, 2022) (Table 1).

2.1. The Metaverse in the tourist industry

The idea of a shared virtual universe, or Metaverse, has developed over several decades. Speculations about the potential to create a shared virtual world, where people could interact, emerged among computer scientists and science fiction writers in the early 1960s. By the 1970s and 1980s, the development of the first virtual reality technologies like head-mounted display goggles had begun, laying the groundwork for users to immerse themselves in virtual worlds (Ball, 2022).

The explosion of the internet and the rise of online gaming in the 1990s ignited a massive interest in the Metaverse. Online games such as World of Warcraft and Second Life gained rapid popularity, providing users with smoother interactions in virtual worlds (Moro-Visconti, 2022).

Recent technological advancements in recent years have elevated the level of immersion possible in the Metaverse. Virtual reality and augmented reality have become more user-accessible, while social media and online gaming platforms have made interactions in virtual worlds feel more natural.

Moreover, the Metaverse has attracted the interest of technology companies and investors, who recognise its enormous potential in sectors like entertainment, education, and business. Companies

Table 1. Theoretical framework of the Metaverse and its grounding in various disciplines.

Virtual reality and immersion	Artificial intelligence	Cyberculture and media theory	Philosophy and theory of mind	Economics and business
It relies on virtual reality technology to create an immersive environment where people can interact with objects and each other.	It leverages artificial intelligence to create virtual entities and interactive environments that can adapt to and react to user actions.	It is viewed as an extension of cyberculture and a form of online media, and is often analyzed in relation to the social and cultural change it entails.	It raises ethical and philosophical questions about the nature of reality and consciousness, and has been linked with the theory of mind and philosophy of consciousness.	It is becoming an emerging business field, with opportunities for content creation, commerce, advertising, and monetisation of online interaction.

Source: The authors

such as Facebook have initiated the development of Metaverse platforms like Facebook Horizon, and others have heavily invested in Metaverse technologies (Wang, 2020).

The Metaverse, as the next disruptive technology that bridges the physical and digital universes, promises transformative impacts on tourism management and marketing, offering immersive experiences in both real and virtual environments (Buhalis et al., 2022). This idea, rooted in early studies like Doyle and Kim's (2007) exploration of the real-virtual world interplay, evolved with Crespo et al.'s (2013) implementation of a GNU OpenSimulator-based virtual world. It highlighted the potential of Web 3.0, offering immersive website visits via avatars.

The application of the Metaverse in tourism has been gaining momentum in academia. Garrido-Iñigo and Rodríguez-Moreno (2015) analysed its use as a tool for language instruction among tourism students. Earnshaw and Sourin (2017) reviewed developments in shared virtual worlds and their paradigms, including online gaming and virtual reality living.

Also, Tsai (2022) proposed a theoretical framework based on enactive cognition and positive psychology to examine the Metaverse tours phenomenon and its impact on tourism intentions. Go & Kang (2023) explored the Metaverse's potential for sustainable tourism, suggesting it could enhance the tourism product range profitably. At the same time, Buhalis and Karatay (2022) discussed its opportunities and challenges to become a catalyst to change the traditional concepts and characteristics of tourism (Özdemir & Şahin, 2023).

Researchers have also begun evaluating the implications of virtual spaces and Metaverses for tourism, hospitality, and events sectors from different value chain perspectives (Filimonau et al., 2022; Liu & Park, 2024). Additionally, research agendas focusing on Metaverse experiences, changes in consumer behaviour, and marketing strategies have established (Gursoy et al., 2022).

Post-COVID-19, studies have underscored the role of virtual reality in boosting travel intentions (Lee, 2022) and identified a positive correlation between Metaverse travel preparedness and COVID-19 travel anxiety (Zaman et al., 2022). Wei (2022) proposed the blockchain-based Gemiverse as a solution to industry challenges and an avenue for building immersive experiences.

Metaverse applications in heritage tourism have also been discussed. Zhang et al. (2022) considered its potential for cultural heritage applications, including effective solutions for tour guiding, site maintenance, and heritage conservation. Also, Fan et al. (2022) further elaborated on a Metaverse-based framework for digital documentation of historical figures, facilitating both real and virtual heritage experiences.

Lastly, Huang et al. (2022) initiated discussions on the effects of audiovisual conditions and ambient temperature on tourists' thermal sensation and comfort in virtual tourism scenarios, underscoring the Metaverse's multidimensional potential for the tourism industry.

Our research pioneers the examination of Metaverse technology acceptance in the tourism industry, leveraging the Unified Theory of Acceptance and Use of Technology (UTAUT) model, marking a significant step in addressing a notable gap in academic literature. The selection of the Metaverse, due to its emergent nature, aims at revolutionising how tourists interact with destinations. The tailored application of the UTAUT model not only remarks its adaptability but provides empirical validation in this novel domain, extending the model's applicability. The findings yield substantial pragmatic and scholarly insights for stakeholders in the Metaverse and tourism ecosystem, aiding in policy formulation and strategic decision-making. By focusing on adoption patterns among Gen Z and Millennials, our analysis offers a generational perspective on Metaverse technology acceptance in tourism, contributing significantly towards understanding the interaction of different demographic cohorts with emerging technologies in the innovative nexus of the Metaverse and tourism.

2.2. Opportunities of the Metaverse for the tourism industry

2.2.1. Product life cycle of tourism: added value

The history of the tourism industry continues to progress, leaving behind traditional models, now mature, that have clearly reached their state of decline. These traditional models are losing

market share, lack competitive advantage, and have become anachronistic with current needs in digital environments due to their failure to offer new value to consumers and to adapt to the evolution of social, economic, and technological contexts. This transformation can be seen in the shift from physical travel agencies to online travel agencies (OTAs), or from hotels to holiday rentals. Therefore, given that tourism consumption changes and that new generations of digital natives are future consumers, a clear business opportunity scenario for tourism in the Metaverse is envisioned. It is anticipated that in the coming years the Metaverse will become one of the most important platforms for meetings between businesses and consumers (Zhang & Ye, 2023).

The Metaverse will certainly revolutionise the life cycle of travel. Where value is created, new business opportunities will emerge (Kraus et al., 2022). This scenario promises add value at all stages of the travel life cycle, necessitating a new reinterpretation of it (see Figure 1). Indeed, in its early stages, the Metaverse already contributes value by transforming the inspiration stage, in the way future tourists start getting suggestions for destinations, activities, and travel plans (Koo et al., 2023). Consequently, the trend is for value to be added to all the remaining stages: the decision stage, the behaviour stage, and the opinion stage.

2.2.2. Disruptive businesses: tourist products

As advancements in immersive technologies continue, they are expected to play an increasingly significant role in the sector (Go & Kang, 2023), thus enhancing marketing, customer relations, communication in decision-making processes, and guest experiences. However, before capitalising on the Metaverse, tourism businesses must design immersive experiences that people perceive as valuable, that add value, and for which sector actors are willing to pay.

The trend in tourism has long been marked by personalised and experiential products, with an innovative approach that strives to create attractive, immersive experiences capable of captivating customers' senses. This innovation is not necessarily reliant on technology alone, often serving merely as a tool, but it focuses on adding real value to the end consumer (Buhalis & Karatay, 2022). This principle forms the basis of the new set of Tourist Dimensions in the Metaverse, as outlined in Table 2, reflecting the ongoing quest to enhance user experiences in unique, value-added ways.

The Metaverse, a burgeoning digital universe, holds transformative potential for the tourism industry, offering manifold opportunities such as virtual tourism experiences. This innovative feature facilitates trip planning and serves as an alternative for those unable to physically travel, while also acting as a marketing platform for destinations via immersive advertising (Buhalis et al., 2023).

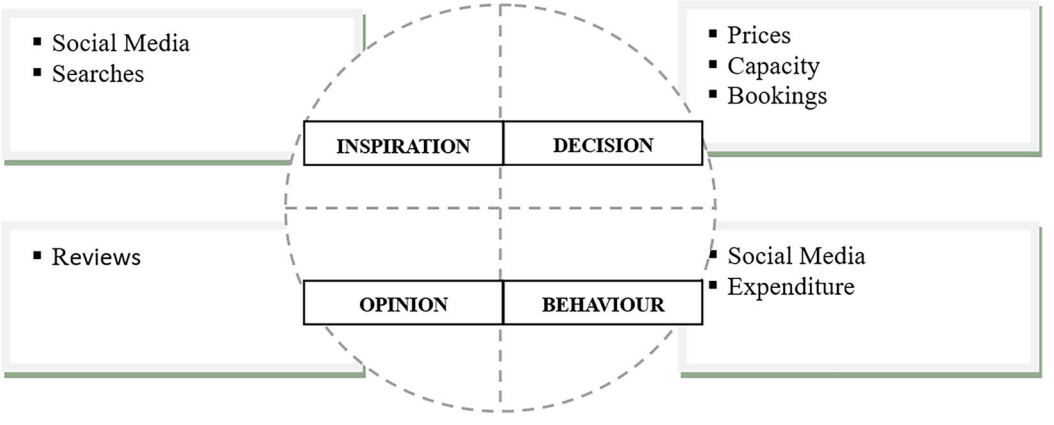

Figure 1. The Travel Life Cycle and the Influence of the Metaverse. Source: own elaboration.

Table 2. Set of Tourist Dimensions in the Metaverse

HEDONIC		PRACTICAL		HEALTHY	SUSTAINABLE
Entertainment and fun	*Adventures and darings*	*Educational and training*	*Business*	*Therapy treatment and phobia management*	*Responsible travel*
- Virtual flights - Virtual shows - Concerts - Attractions - Virtual games - Casinos	- Extreme sports	- Linguistic, cultural, historical, and social immersions - Hospitality professional training - Staff recruitment	- Inspirational demos - Hotel reservations, experiences, travel - Virtual sales of NFTs - Business partnerships	- Hodophobia (fear of travel) - Aerophobia - Vertigo - Agoraphobia - Physical recovery and quality of life in patients	- Carbon-neutral - Culturally non-invasive - Respectful of protected environments

Source: own elaboration.

However, challenges emerge alongside the potential (Kraus et al., 2022; Zhang & Ye, 2023). The lack of tangible and emotional interaction inherent to traditional tourism may negatively impact customer satisfaction. High development and maintenance costs could restrict access for some companies, while technological insecurity due to the Metaverse's novelty might induce risks. Data protection implications are substantial, as user data collection and storage raise privacy concerns. Additionally, the rise of virtual tourism might impact traditional tourism roles and local economies due to reduced physical travel. Finally, the inherent depersonalisation of Metaverse experiences could lessen their overall significance (Dwivedi et al., 2023).

2.3. Hypothetical relationships

The Unified Theory of Acceptance and Use of Technology (UTAUT) (Tsai, 2022; Venkatesh et al., 2003) is distinguished as one of the most influential theoretical frameworks for understanding the determinants of technology acceptance and use, user behaviour, and the process of technology adoption. This model integrates notable adoption approaches such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and the Technology Acceptance Model (TAM). The TAM has undergone numerous evolutions and refinements since its inception, including significant transformations such as TAM 2 (Venkatesh & Davis, 2000), UTAUT (Venkatesh et al., 2003), Wixom & Todd's integrative model (2005), and TAM 3 (Venkatesh & Bala, 2008), particularly in the domain of e-commerce.

The Metaverse, as a platform reflecting reality, simplifies user interaction and creates a conducive environment for applying the UTAUT-2 model hypothesis stating that 'Effort Expectancy positively affects users' behavioural intentions to use the Metaverse'. With norms and rules similar to the real world, users might find the transition to the Metaverse more intuitive, enhancing their willingness to use it. The perception of ease of use, which is an essential aspect of effort expectancy, could be influenced by factors such as easily navigable interfaces, user-friendly functionalities, and understandable information. The importance of accessible, high-quality tutorials and user support for enhancing this perception is significant, especially given the Metaverse's fundamental difference from traditional platforms like websites and apps, as it incorporates VR, AR, and AI elements. When users perceive a technology to be easy to use, or requiring less effort, it leads to an increased usage intention (Ha & Stoel, 2009). Therefore, effort expectancy can be a crucial factor for overcoming initial barriers to this expansive and immersive technology. Thus, the first hypothesis was formulated as follows:

H1. Effort Expectancy could positively affect users' behavioural intentions to use the Metaverse.

Facilitating conditions refer to the degree to which users believe that an organisational and technical infrastructure exists to support the use of a new system. In the Metaverse context, such conditions

have been largely influenced by the rapid digital transformation propelled by the global pandemic and the subsequent quarantine measures. These circumstances have led to an active introduction and expansion of immersive media platforms as a substitute for real-life activities. Companies like Nvidia and Meta have recognised and leveraged these conditions to promote the Metaverse as Web 3.0. The increasing number of users engaging with online platforms enhances the network's value exponentially, which further serves as a facilitating condition (Alkhwaldi, 2023). Thus, the second hypothesis is proposed as follows:

H2. Facilitating Conditions could positively affect users' behavioural intentions to use the Metaverse.

Regarding the Metaverse´s immersive nature, it provides users with a unique opportunity to craft their virtual identities, realities, and experiences. This facet can lead to a heightened sense of fantasisation, an emotional factor in which the user becomes engrossed in the idealised experiences offered by this digital realm (Alfaisal et al., 2022). Such a state can be influential in shaping user behaviour towards the Metaverse. Users who perceive the Metaverse as an exciting platform for manifesting their fantasies might be more inclined to engage with it, thus positively influencing their behavioural intentions. Therefore, the third hypothesis is stated as follows:

H3. Fantasization could positively affect users' behavioural intentions to use the Metaverse.

The hedonic motivation pertains to the pleasure and satisfaction users derive from immersive and interactive virtual experiences. The richness and variety of the Metaverse, with its novel, stimulating, and immersive environments, provide ample opportunities for leisure, escapism, and creative exploration. These aspects might spur a higher level of user engagement, thereby increasing behavioural intentions to use the Metaverse. Several studies on the adoption of information systems have evidenced the influence of hedonic motivation on the intention to employ a specific technology and its effective use (Karjaluoto et al., 2012; Van der Heijden, 2004). However, individual differences in hedonic motivation suggest that not all users might respond similarly. Some may be more influenced by the novelty and excitement of the Metaverse, while others might place more weight on functionality or convenience. As a result, the fourth hypothesis is framed as follows:

H4. Hedonic Motivation could positively affect users' behavioural intentions to use the Metaverse.

With the advent of broadband convergence networks and immersive reality-supporting technology, Metaverse users can experience a level of engagement and interaction unmatched by traditional media. This enriched media experience enables precise and rapid communication, similar to face-to-face interaction, fostering mutual understanding and facilitating effective task management. The Metaverse can thus improve users' task performance by providing accurate information for effective decision-making. It also enhances memory retention due to its immersive nature, leading to improved work productivity. The overall user experience is positively impacted, fostering satisfaction with the Metaverse platform. Therefore, the hypothesis emerges that performance expectancy could indeed positively affect users' behavioural intentions to use the Metaverse (Yang et al., 2022). Consequently, the fifth hypothesis is formulated as follows:

H5. Performance expectancy could positively affect users' behavioural intentions to use the Metaverse.

It is also essential to consider the price value, regarded as the cognitive balance between the perceived benefits of using the Metaverse and the associated financial cost for users (Dodds et al., 1991). Regarding the Metaverse, the costs can be monetary, such as the purchase of necessary hardware and software or the payment for platform services, but can also be non-monetary, such as time and effort spent on learning and navigating the new environment. The hypothesis suggests that if users perceive that the benefits of the Metaverse – such as immersive experiences, opportunities for social interaction, and access to unique digital content – outweigh these costs, they are more likely to intend to use it. Therefore, providers of Metaverse platforms and services must strive to enhance the perceived value by improving the quality and breadth of experiences offered, while also seeking

to reduce associated costs to encourage greater user engagement. As a result, the sixth hypothesis was constructed in this manner:

H6. Price Value could positively affect users' behavioural intentions to use the Metaverse.

Typically, more intense social influences are the reason why users perceive a technology as more beneficial, and this perception has an impact on use intentions and the decision to adopt a technological innovation (Delre et al., 2010; Venkatesh et al., 2003). Over time, social influence has become a nearly indispensable factor in the use of technology.

For Generation Z, who have grown up in the digital age, using advanced technologies such as the Metaverse is natural and often expected. Their comfort with creating and sharing User-Created Content (UCC), engaging on social networks, and transacting with virtual products through NFTs and cryptocurrencies exemplify their seamless blending of real and virtual worlds. The boundaries are increasingly blurred, and for this generation, their virtual self is as real and significant as their physical self. This societal shift, combined with the perception that using the Metaverse is essential for social relationships, enhances the social influence on Metaverse adoption. Thus, the study proposed the following hypothesis:

H7. Social Influence could positively affect users' behavioural intentions to use the Metaverse.

The COVID-19 pandemic has accelerated the need for virtual experiences, and the Metaverse, offering an expansive and immersive platform, potentially satisfies this demand. Thus, the user's intent to 'visit' locations within the Metaverse could be a significant factor for engagement (Ghali et al., 2024).

The hypothesis suggests that users may seek out virtual travel experiences in the Metaverse, triggered by the same motivations that encourage real-world tourism, such as exploration, learning, and social connection. Therefore, the Metaverse's ability to provide compelling destination experiences could positively affect user adoption. As a result, the hypothesis was proposed as follows:

H8. Destination Visit Intention could positively affect users' behavioural intentions to use the Metaverse.

The digitalisation and virtualisation of society is driven by several emerging technologies, each at different stages of Gartner's Hype Cycle (see Figure 2). The Metaverse, an interactive digital universe, was in the technology trigger stage in 2023, akin to augmented reality (AR) and virtual reality (VR). Both AR and VR, hindered by issues such as cost and technical limitations, are fluctuating between the peak of inflated expectations and the trough of disillusionment. However, they are integral to the Metaverse, providing key interaction interfaces.

Meanwhile, blockchain technology, having experienced its own hype cycle with cryptocurrencies, was entering the slope of enlightenment. It was finding mature applications in areas like smart contracts and secure supply chains and could play a crucial role in ensuring digital property and secure transactions in the Metaverse.

Artificial Intelligence (AI) was at various stages in the cycle depending on the specific aspect. For instance, machine learning was progressing towards the plateau of productivity. AI's role in the Metaverse is significant, driving personalised interactions and managing extensive data.

The future of the Metaverse largely hinges on the progress of these related technologies. As AR and VR surmount challenges, and AI and blockchain mature, the Metaverse could advance through the hype cycle stages to the plateau of productivity, where widespread adoption occurs. This lengthy process could take years, even decades, and will likely face numerous changes and uncertainties.

3. Methodology

In this study, we chose UTAUT-2 model considered as one of the most modern and frequently applied models in academic literature for measuring the acceptance and use of Information and Communication Technologies (ICT) in the context of individual consumption (Venkatesh, 2022;

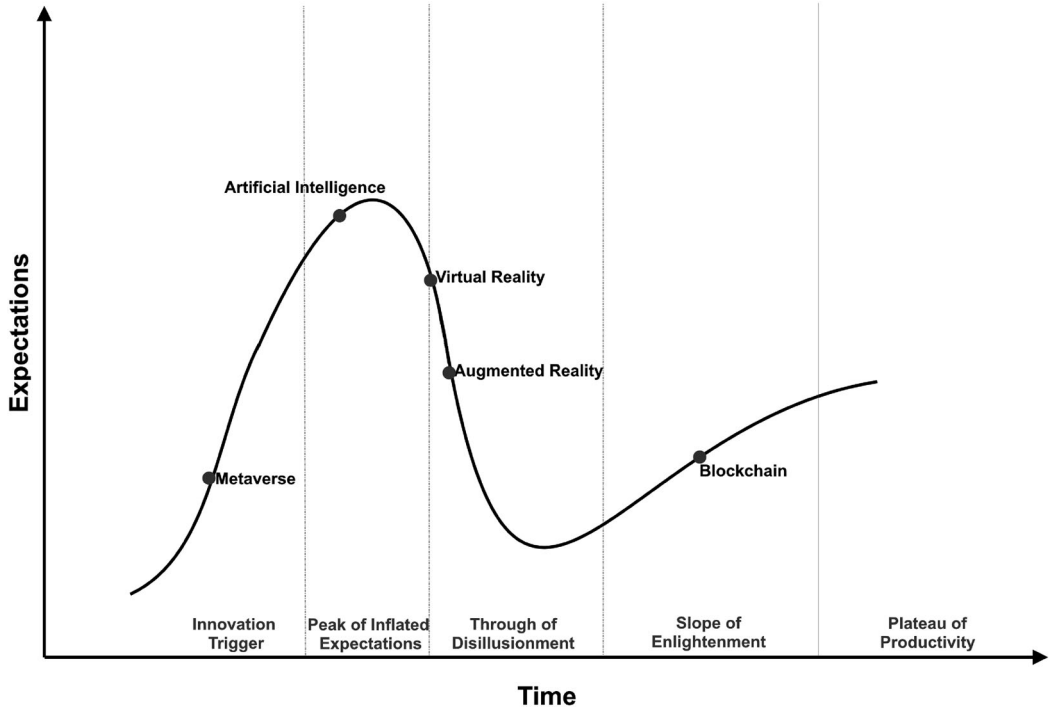

Figure 2. Hype Cycle for Emerging Technologies based on Gartner.

Venkatesh et al., 2012). This model includes a series of key variables: performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivations, price considerations, and habit. These elements aim to account for behavioural intentions, while facilitating conditions and behavioural intention aim to explain usage intention (Calderón-Fajardo et al., 2022).

We based on a sample of 218 individuals among Millennials and Generation Z, whose digital nativity affords them a unique perspective and interaction with the Metaverse.

Data analysis was conducted through PLS-SEM, following Ringle et al. (2009), using SmartPLS3, favoured for exploratory studies and latent construct modelling (Hair et al., 2011; Son & Benbasat, 2007). This SEM approach, supported by PLS and prevalent in sociological research, evaluates linear causal models (Haenlein & Kaplan, 2004), allowing for visual examination of variable interrelations. The model's validity was tested using the (t) statistic at a 5% significance level (Byrne, 2001).

3.1. Theoretical model

The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model was chosen to scrutinise the Metaverse given its efficacy in assessing the adoption of emergent technologies (Dwivedu et al., 2020). Its comprehensive framework facilitates an in-depth analysis of individual and contextual influences on Metaverse acceptance, aiding in understanding user interaction within these innovative virtual spaces. The adaptability of UTAUT2 is particularly pertinent for examining user dynamics within the Metaverse's evolving landscape, offering crucial insights for its industry's stakeholders.

3.2. Sampling and data collection

Data for the UTAUT2 model analysis was sourced via a Google Forms survey, administered to a non-random sample of 218 university students from the Catholic University of Murcia (UCAM), aged 19–

40 and familiar with the Metaverse. The demographic composition included 38.5% women, 59.4% men, and 2.1% other genders, with a distribution of 61.4% aged 19–29 and 38.6% aged 30-40. The study specifically concentrated on Generation Z and Millennials, whose digital nativity and propensity to embrace novel technologies like the Metaverse provide a unique perspective on its adoption patterns (Zhang et al., 2023). Both Millennials and Generation Z were treated as part of the same sample to encapsulate their shared attributes as early adopters and digitally inclined users, crucial for understanding the dynamics of metaverse tourism.

The UTAUT2 model, with its analytical capabilities encompassing performance expectancy, effort expectancy, and social influence, offers a robust framework for understanding the motivations and challenges faced by these generations within the Metaverse. By focusing on these younger generations and excluding older ones, who might face technological challenges or hold conservative tech attitudes, the study maintains its relevance and sharp focus on the target demographic.

Attitudes and consensus levels were measured using a 5-point Likert scale, as informed by Venkatesh et al. (2012) and Venkatesh (2022). To mitigate common method bias, as suggested by Chang et al. (2010) and Podsakoff et al. (2003), the questionnaire was meticulously designed to ensure clarity and avoid response bias, while also maintaining participant confidentiality. Moreover, all participants were involved in VR-based initiatives at UCAM within their degree, guaranteeing a foundational understanding of and exposure to virtual environments such as Metaverse, essential for the study's context. Prior to the survey, a brief overview of the metaverse tourism concept was provided to harmonise the participants' understanding, thereby ensuring the reliability and applicability of the collected data in the context of our research.

Regarding the sample size for the PLS-SEM analysis, our study adheres to the '10-times rule' as proposed by Hair et al. (2011). This guideline suggests that the sample size in a PLS-SEM study should be at least ten times the maximum number of outer model links pointing at any single latent variable. With the maximum number of outer links in our model being 8, the rule stipulates a minimum sample size of 80. However, to be on the safe side in terms of sample size, one might recommend 100 cases with the objective of improving accuracy (Assaker et al., 2012). Our sample of 218 participants substantially exceeds this threshold, ensuring the statistical robustness and reliability of our PLS-SEM analysis, in line with other works with similar samples (Hong et al., 2020; Munawar et al., 2022; Park et al., 2019). This sizeable sample not only aligns with the methodological recommendations but also underscores our focus on uncovering emergent trends and insights in metaverse tourism within a specific, digitally literate population.

4. Results and discussion

4.1. Measurement model

Table 3 presents the psychometric properties of the model, including assessments of reliability, convergent validity, and discriminant validity. The reliability of the model structures is confirmed through the application of the Partial Least Squares (PLS) method. The reliability of each item is demonstrated by its standard loading and Cronbach's alpha values, both of which exceed the minimum threshold of 0.70. Moreover, the variables exhibit satisfactory composite reliability (CR) values, surpassing the threshold level of 0.80.

To evaluate the convergent validity, the average variance extracted (AVE) is examined. The AVE values for each variable, exceeding 0.50, indicate that the model possesses convergent validity according to the established criteria (Hair et al., 2019). Additionally, the presence of multicollinearity among the regression variables is evaluated using the variance inflation factor (VIF). The VIF values ranging from 1.172 to 1.907 align with the criterion of ≤ 5, which indicates an acceptable level of multicollinearity within the model (Hair et al., 2017).

Table 4 displays the test of discriminant validity that was conducted by assessing the average variance extracted (AVE) for each construct, which yielded values surpassing the squared correlations

Table 3. Item loadings, construct reliability, and convergent validity.

Variable	Items	Standard loadings	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)	VIF
Behavioural Intention (BI)	BI1	0.869	0.809	0.810	0.723	1.907
	BI2	0.820				1.589
	BI3	0.862				1.900
Effort Expectancy (EE)	EE1	0.803	0.740	0.772	0.656	1.579
	EE2	0.872				1.602
	EE3	0.750				1.336
	EE4	0.821				1.490
Facilitating Conditions (FC)	FC1	0.799	0.703	0.704	0.628	1.475
	FC2	0.756				1.256
	FC3	0.862				1.850
Fantasisation (FN)	FN1	0.743	0.766	0.807	0.675	1.561
	FN2	0.853				1.472
	FN3	0.720				1.367
Hedonic Motivation (HM)	HM1	0.816	0.646	0.679	0.574	1.172
	HM2	0.733				1.338
	HM3	0.817				1.634
Performance Expectancy (PE)	PE1	0.756	0.731	0.778	0.551	1.421
	PE2	0.819				1.470
	PE3	0.542				1.198
Price Value (PV)	PV1	0.802	0.718	0.726	0.640	1.418
	PV2	0.847				1.562
	PV3	0.747				1.332
Social Influence (SI)	SI1	0.800	0.730	0.757	0.555	1.611
	SI2	0.837				1.686
	SI3	0.683				1.323
	SI4	0.641				1.244
Destination Visit Intention (VI)	VI1	0.709	0.734	0.795	0.647	1.366
	VI2	0.878				1.529
	VI3	0.817				1.504

between the focal construct and all other constructs. This notable disparity between the AVE values and the squared correlations provides robust evidence and affirm the distinctiveness and non-overlapping nature of the constructs under scrutiny. Thus, confirming the presence of discriminant validity within the model. To further analyse the discriminant validity, the heterotrait-monotrait (HTMT) correlations were employed. The HTMT ratio, as a crucial metric in this analysis, must not exceed 1.00, following Henseler et al. (2015) suggestions. The conclusion of this test is that all conceptual variables successfully passed the discriminant validity test as stated in Table 5.

4.2. Assessment of the structural model

The structural model was evaluated concerning the predictive relevance of endogenous variables and the path significance. To do so, the coefficient of determination ($R^2 = 0.633$) and the Stone–Geisser's blindfolding process ($Q^2 = 0.623$) were analysed (Ringle et al., 2009). Being both values

Table 4. Constructs correlation coefficients and the square root of AVE (in italics on diagonal). Based on Fornell & Larcker (1981) discriminant validity test.

Variable	1	2	3	4	5	6	7	8	9
(1) Behavioural Intention (BI)	0.851								
(2) Effort Expectancy (EE)	0.306	0.810							
(3) Facilitating Conditions (FC)	0.698	0.415	0.793						
(4) Fantasisation (FN)	0.330	0.325	0.346	0.821					
(5) Hedonic Motivation (HM)	0.469	0.385	0.484	0.438	0.758				
(6) Performance Expectancy (PE)	0.419	0.283	0.344	0.404	0.536	0.742			
(7) Price Value (PV)	0.677	0.393	0.611	0.369	0.505	0.473	0.800		
(8) Social Influence (SI)	0.681	0.277	0.583	0.328	0.407	0.500	0.581	0.745	
(9) Destination Visit Intention (VI)	0.430	0.249	0.369	0.539	0.504	0.421	0.436	0.360	0.804

Table 5. Heterotrait-Monotrait (HTMT) ratio of correlations.

Variable	1	2	3	4	5	6	7	8	9
(1) Behavioural Intention (BI)	0.386								
(2) Effort Expectancy (EE)	0.723	0.574							
(3) Facilitating Conditions (FC)	0.400	0.450	0.483						
(4) Fantasisation (FN)	0.614	0.529	0.678	0.649					
(5) Hedonic Motivation (HM)	0.515	0.406	0.443	0.552	0.811				
(6) Performance Expectancy (PE)	0.887	0.529	0.855	0.503	0.693	0.650			
(7) Price Value (PV)	0.874	0.369	0.789	0.429	0.554	0.648	0.793		
(8) Social Influence (SI)	0.530	0.328	0.490	0.714	0.745	0.608	0.599	0.469	
(9) Destination Visit Intention (VI)	0.386								0.386

>0, it is concluded that the endogenous variables contained in the tested model have enough explanatory power and predictive relevancy. As stated in Table 6, the UTAUT-2 model explains the intention of use of Metaverse according to 4 out of 8 tested hypotheses. Specifically, the supported hypotheses where: (H2) FC→ BI ($t = 5.739$, $\beta = 0.336$, $p < 0.01$); (H6) PV → BI ($t = 4.309$, $\beta = 0.270$, $p < 0.01$); (H7) SI→ BI ($t = 5.830$, $\beta = 0.311$, $p < 0.01$); and (H8) VI → BI ($t = 1.719$, $\beta = 0.094$, $p < 0.10$). These results are reflected on the Figure 3:

4.3. The UTAUT-2 model as a predictor of intentional use of Metaverse in tourism

While the UTAUT-2 model is already utilised to evaluate the technology acceptance among users (Foroughi et al., 2023; Mustafa et al., 2022), the number of studies applying this model specifically to the Metaverse remains limited. Despite this, the model's applicability to the Metaverse is growing, particularly in areas such as sports (Yang et al., 2022), social sustainability (Arpaci et al., 2022), educational learning (Teng et al., 2022) or events industry (Ariza-Montes et al., 2023). According to Gartner technology consulting, by 2026, 25% of people will spend at least 1 h/day in the Metaverse for education, shopping, and leisure, though the market's conviction in this technology is not yet firm (Besson & Gauttier, 2023).

In this research, the UTAUT-2 model explains approximately 63.3% of the variance in behavioural intention to use the Metaverse in the tourism sector among Generation Z and Millennials. This is based on four explanatory constructs: (1) facilitating conditions; (2) price value; (3) social influence; and (4) visiting intention.

Regarding facilitating conditions, the increase of means and knowledge to use the Metaverse for touristic purposes could significantly affect the intentional behaviour of Millennials and Generation Z individuals. This aligns with other studies (Choi, 2022; Yang et al., 2022). As the Metaverse's presence

Table 6. Hypothesis testing through bootstrapping analysis.

Direct effects		Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values	Decision
H1	EE -> BI	−0.049	−0.044	0.049	0.999	0.318	Unsupported
H2	FC -> BI	0.336	0.335	0.058	5.739	0.000***	Supported
H3	FN -> BI	−0.033	−0.027	0.059	0.568	0.570	Unsupported
H4	HM -> BI	0.036	0.033	0.057	0.634	0.526	Unsupported
H5	PE -> BI	−0.011	−0.011	0.056	0.202	0.840	Unsupported
H6	PV -> BI	0.270	0.264	0.063	4.309	0.000***	Supported
H7	SI -> BI	0.311	0.314	0.053	5.830	0.000***	Supported
H8	VI -> BI	0.094	0.095	0.055	1.719	0.086*	Supported

***Significant at the 0.001 level.
*Significant at the 0.10 level.

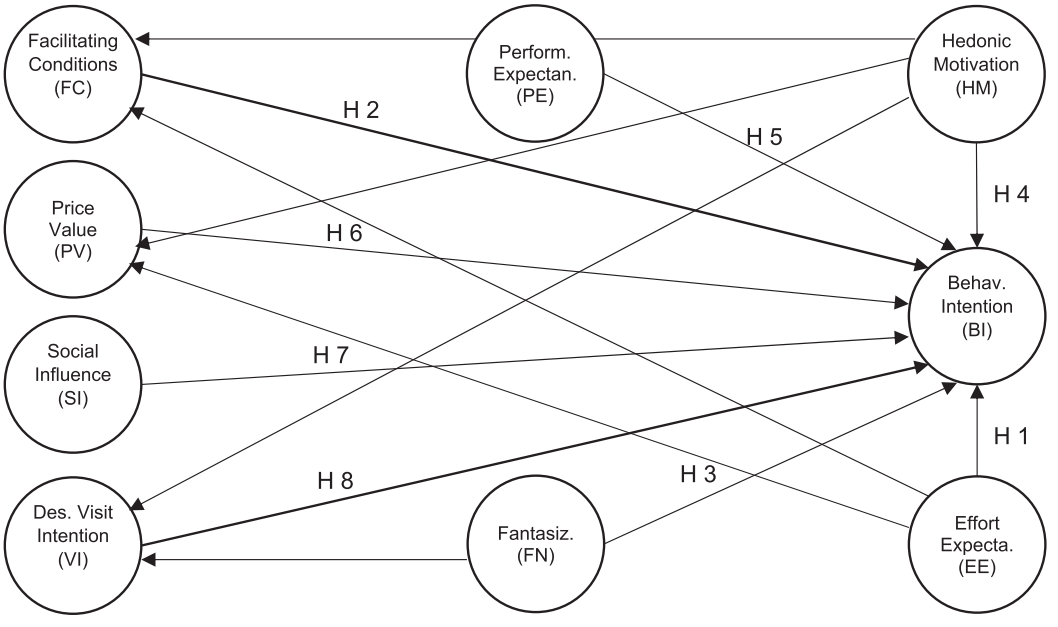

Figure 3. Proposed Theoretical model. Source: own elaboration.

in tourism grows, so does the accessibility of the necessary means and knowledge, supporting Hypothesis 2 **(H2)**. In this context, it is anticipated that the development of the Metaverse in the tourism sector will be driven primarily by entities offering innovative products and experiences (Alkhwaldi, 2023; Go & Kang, 2023). Therefore, these entities bear the responsibility of providing all necessary resources and IT support to facilitate Metaverse use. If this support is forthcoming, significant barriers to Metaverse acceptance and usage could be eliminated. This is particularly evident when potential users perceive direct benefits from using it, such as virtual fam trips, interactive travel planning, and virtual participation in fairs and trades.

As for the impact of price value on the intention to use the Metaverse, a direct relationship is evident. However, various factors influence the subjective valuation of a commodity, including economic incentive, emotional involvement, functional utility, or social context (Peng et al., 2019). If individuals perceive the advantages of engaging with the Metaverse as outweighing its financial cost, this would positively impact Metaverse usage, thus supporting Hypothesis 6 (H6). These findings are consistent with those of other researchers (Arpaci et al., 2022; Shen et al., 2022). Specifically, in an online context, price value is a marker of quality perception (Lopes et al., 2023). Furthermore, combining price value with prestige value and playfulness could be a compelling condition for a higher level of tourists' intention toward online travel purchases (Dogra et al., 2023). Therefore, the Metaverse's blend of price value, playfulness, and prestige could be a strategic approach to fostering its intentional use, especially when integrated into products or experiences offered by tourism companies.

Social influence has also been identified as a significant construct with a direct effect on behavioural intention. This aligns with research suggesting a collective effect on individual decisions regarding technology use (Arpaci et al., 2022; Mitchell et al., 2022), thereby supporting Hypothesis 7 (H7). In particular, the Metaverse has shown that social influence contributes to gaining adopter**s** (Alkhwaldi; Lee & Kim, 2022). This aligns with the construct of visit intention to a destination, which was also found to be an explanatory construct for using the Metaverse, supporting Hypothesis 8 (H8). Some authors view the Metaverse as a key tool for tourism destination marketing (Tsai, 2022) and as an influential factor in potential visitors' destination choices (Buhalis et al., 2022). Given the

Metaverse's immersive nature, which allows for real-time social interactions, users can instantly share their virtual tourism experiences. This immediate and dynamic information exchange could contribute to the formation of collective opinions, influencing the decision-making process of potential travellers. Specifically, on the supply side, businesses operating within the Metaverse could leverage social influence as a strategic marketing and brand-building tool. Effective use of social influence could lead to increased visibility, trust, and customer loyalty within the Metaverse tourism ecosystem, thus enhancing visit intention. As the Metaverse continues to develop within the tourism sector and gains more adopters, its influence and the visit intention of destinations are likely to become significant factors.

Conversely, effort expectancy, fantasisation, hedonic motivation, and performance expectancy were not identified as significant constructs, indicating that Hypotheses 1 (H1), 3 (H3), 4 (H4), and 5 (H5) are unsupported. Although the UTAUT2 model explains the acceptance and use of emerging technological solutions, it does not differentiate between different stages of a technology's evolution (Venkatesh, 2022; Venkatesh et al., 2012). Aligned with Gartner's Hype Cycle (Figure 2), as the Metaverse evolves from early stages to a more consolidated scenario, the tested hypotheses of the UTAUT2 model are expected to become significant and potentially intensify the already supported ones. The Metaverse's status as an experimental technology in the tourism sector (Buhalis et al., 2023) is a reason why some tested hypotheses and conceptual relationships are not supported, as these constructs (effort expectancy, fantasisation, hedonic motivation, and performance expectancy) have not yet fully materialised in the sector. In fact, the UTAUT model has demonstrated validity and significance in explaining the acceptance and use of the Metaverse in areas where this technology is more developed, such as education performance (Alkhwaldi, 2023), social sustainability understanding (Arpaci et al., 2022), and digital usage understanding (Chan et al., 2023), among others. Therefore, depending on the different scenarios of the Metaverse's development within the tourism sector, the UTAUT-2 model's representativeness and significance regarding its constructs and interrelationships are expected to evolve (Besson & Gauttier, 2023).

5. Conclusion

The main goal of this research was to measure the acceptance of Metaverse technology within the tourism industry, with a particular focus on the adoption patterns among Gen Z and Millennials.

This research introduces two significant methodological innovations in the realm of technological adoption studies. Firstly, the study stands out in its bespoke adaptation of the UTAUT-2 model to the unique context of the Metaverse, which is characterised by profound immersion, real-time social interaction, and collaborative world-building. Such distinct features necessitated a thorough re-evaluation and modification of the conventional UTAUT-2 variables, ensuring their relevance and applicability to this novel digital landscape.

Secondly, this study integrates emergent variables unique to the Metaverse, such as 'Fantasization FN)', and 'Destination Visit Intention (VI)', which were previously unexplored in standard UTAUT-2 applications. 'Fantasization' captures the allure of the Metaverse, allowing users to experience imaginative realms beyond physical reality, while 'Destination Visit Intention' provides insights into users' specific intentions within the Metaverse. These methodological advancements not only highlight the Metaverse's uniqueness but also enhance the UTAUT-2 model's depth and applicability, positioning this research as a landmark in Metaverse studies.

On the one hand, the UTAUT-2 model proved to be effective in predicting the acceptance and use of emerging technologies such as the Metaverse. Thus, this work contributes to the existing body of knowledge by examining this technology´s acceptance and use within the tourism sector and early adopters (Millennials and gen Z).

On the other hand, the results of this work revealed that the UTAUT-2 model partially predicts behavioural intentions, supporting 4 out of 8 hypotheses. Specifically, facilitating conditions, the price value, the social influence as well as the intention to visit a destination are identified as

direct drivers for becoming Metaverse users within the tourism sector. Moreover, these findings indicate that the evolution of the Metaverse can be analysed using this model to test changes in acceptance patterns regarding the other constructs.

These insights are valuable for tourism businesses considering incorporating the Metaverse into their operations. They highlight the need for effective technology adoption strategies that can overcome existing barriers and promote the use of the Metaverse in the tourism industry. The facilitating conditions were revealed as an important pillar that tourism suppliers need to guarantee so that the Metaverse industry can gain importance in the tourism industry, thus, ITC resources and support are necessary so that the products and experiences can really take place in a virtual reality space. Concerning the price value of Metaverse, a combination with playfulness together with prestige value could become an important strategy to foster the intentional use of this technology when it is included in a product or experience provided by a tourism company.

Also, the findings on social influence and visit intention reveal significant opportunities for leveraging the Metaverse in the tourism industry. Social influence should be used as a strategic tool for marketing and brand building aligning with the existing empirical evidence on the effects of online communities on travel decision. Effective social influence can lead to increased visibility, trust, and customer loyalty within the Metaverse tourism ecosystem and increase the visit intention.

Finally, our findings help to bridge the gap in the existing literature, providing a solid foundation for future research and offering practical guidance for tourism organisations seeking to navigate the shifting landscape of the Metaverse. This contribution to the current literature, coupled with our evidence-based recommendations, has the potential to stimulate innovation and growth within the tourism sector in the Metaverse.

5.1. Theoretical contributions

The theoretical contributions of this research can be summarised in four main points.

First, this work significantly contributes to the field of immersive technologies like the Metaverse in tourism. Recent research has primarily focused on Metaverse from a theoretical approach in terms of potential opportunities and challenges (Buhalis & Karatay, 2022) as a tool to both enhancing the experience of potential visitors in destinations (Buhalis et al., 2022; Gursoy et al., 2022; Koo et al., 2023) and fostering a more sustainable tourism model (Go & Kang, 2023) to change the traditional concepts and characteristics of this sector (Özdemir & Şahin, 2023). This study contributes to the existing literature by bridging the gap between theory and practice while bringing empirical evidence on the study of early adoption patterns and behavioural intentions towards Metaverse in tourism.

Second, this work contributes to a current research gap concerning the study of virtual spaces like Metaverse and tourism intentional behaviour (Filimonau et al., 2022). Previous studies primarily focused on individuals´ sensory experiences of using Metaverse considering ambient factors such as audio-visual conditions and temperature comfort (Huang et al., 2022), as well as sentiments such as travel preparedness and anxiety (Zaman et al., 2022), and hedonia or eudaimonia of individuals (Tsai, 2022). However, the research on Metaverse and behavioural intention in tourism remains limited in terms of potential visitors adopting and using this technology. Thus, the findings of this work contribute to shed light on whether the acceptance and use patterns of Metaverse in tourism already exist or could potentially become a reality in a short-medium term.

Third, despite the evident gap on studying behavioural intention toward Metaverse in tourism, little research was conducted. This includes studying the self-determination theory, the technology acceptance model, and the theory of planned behaviour (Liu & Park, 2024; Zhang et al., 2023). Thus, one of the main novelties of this work is that it studies the Unified Theory of Acceptance and Use of Technology (UTAUT-2), being one of the most influential theoretical frameworks for understanding the determinants of technology acceptance and use, user behaviour, and the process of technology adoption. Specifically, this confirms the validity and application of UTAUT-2 model and Metaverse in

tourism, extrapolated from other diverse academic fields such as sports (Yang et al., 2022), social sustainability (Arpaci et al., 2022), events industry (Ariza-Montes et al., 2023), or educational learning (Teng et al., 2022), among others.

Fourth, the results of this work reveal that the UTAUT-2 model has a high predictability power according to the behavioural intention of use of Metaverse towards tourism among early adopters, such as Gen Z and Millennials, whose digital nativity and propensity to embrace novel technologies like the Metaverse provide a unique perspective on its adoption patterns (Zhang et al., 2023). Additionally, this study integrated two additional constructs unique to the Metaverse in tourism, such as *fantasisation* and *destination visit intention* that could be considered in future research works once that the convergent and discrimination validity were tested.

Finally, the pioneering application of the UTAUT-2 model to the Metaverse within the tourism industry offers a comprehensive understanding of the factors driving the intention to use this technology and provides a robust framework for future studies in tourism. Consequently, this study also acts as a catalyst for an extensive exploration of emerging technologies in tourism. Given the relevance of the Metaverse within early adopters visitors means that this kind of technology-driven value creation are also redefining tourist experiences, revealing the need for both public and private organisations adapting and innovating in the creation of personalised and experiential tourist experiences capable of captivating consumers' senses in an innovative way.

5.2. Practical contributions

From a managerial perspective, this study provides valuable guidance for tourism businesses and public entities on the importance of integrating the Metaverse into their strategic and operational performance.

First, as the Metaverse adds value at all stages of the tourism product life cycle, this work emphasises the need for tourism companies to reconsider their operational and customer interaction models. Adapting to an immersive digital environment will not only enable these companies to remain competitive but also meet the demands of consumers seeking richer and more personalised experiences.

Furthermore, the analysis of the opportunities the Metaverse offers for the creation of disruptive tourism products emphasises the need to develop immersive and personalised experiences that attract consumers. This focus on innovation in experience creation can serve as a key differentiator in the market, enabling tourism companies to capture the attention of Generation Z and Millennials, who value authenticity and personalisation in their travel experiences.

Lastly, the findings of this study act as a call to action for policymakers and tourism planners to explore the potential of the Metaverse as a tool for tourism promotion and development. The Metaverse's ability to offer virtual tourist experiences can be particularly beneficial in situations that limit physical tourism, such as the COVID-19 pandemic, offering a safe and accessible alternative for destination exploration.

This study also offers valuable contributions for public sector in terms of marketing and destination image management. The findings underline the importance of collaborating with technological innovators to develop Metaverse infrastructures that can serve as platforms for tourism promotion and development. By leveraging the Metaverse, tourism authorities can create attractive and educational virtual representations of their destinations, offering potential visitors an immersive preliminary experience that can increase interest and physical visits to the destination. This duality of practical applications underscores the transformative potential of the Metaverse in redefining tourism marketing practices and destination management. It offers a new dimension for visitor interaction, not only improving the visibility and appeal of the destination but also fostering more meaningful and sustainable tourism participation.

5.3. Limitations and future study

The limitations of this study are based mainly on the high degree of volatility and uncertainty, thus, the predictable power of the Metaverse as an emerging technology could be not so precise as studying the acceptance of a more consolidated technology. On the other hand, this work focused on generation Z and millennials, but prior generations should also be considered when the Metaverse reaches a bigger level of development. Thus, the future research line should focus on evaluating the acceptance of this technology along its evolution and different targets, apart from millennials and generation Z with a special focus on potential late adopters of technology.

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References

Alfaisal, R., Hashim, H., & Azizan, U. H. (2022). Metaverse system adoption in education: A systematic literature review. *Journal of Computers in Education*, 1–45.

Alkhwaldi, A.F. (2023). Understanding learners' intention toward Metaverse in higher education institutions from a developing country perspective: UTAUT and ISS integrated model. *Kybernetes*. https://doi.org/10.1108/k-03-2023-0459

Ariza-Montes, A., Quan, W., Radic, A., Yu, J., & Han, H. (2023). Human values and traveler behaviors: Metaverse for conferences and meetings. *Journal of Travel & Tourism Marketing*, *40*(6), 490–511. https://doi.org/10.1080/10548408.2023.2263766

Arpaci, I., Karatas, K., Kusci, I., & Al-Emran, M. (2022). Understanding the social sustainability of the Metaverse by integrating UTAUT2 and big five personality traits: A hybrid SEM-ANN approach. *Technology in Society*, *71*, 102120. https://doi.org/10.1016/j.techsoc.2022.102120

Assaker, G., Huang, S., & Hallak, R. (2012). Applications of partial least squares structural equation modeling in tourism research: A methodological review. *Tourism Analysis*, *17*(5), 679–686. https://doi.org/10.3727/108354212X13485873914128

Ball, M. (2020). *The metaverse: What it is, where to find it, and who will build it*. MatthewBall. Vc.

Ball, M. (2022). *The Metaverse: And how it will revolutionize everything*. Liveright Publishing.

Besson, M., & Gauttier, S. (2023). Business meetings in the metaverse: Stakeholder views evolve. *Journal of Business Strategy*. https://doi.org/10.1108/JBS-02-2023-0031

Bruner, G. C., & Kumar, A. (2005). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research*, *58*(5), 553–558. https://doi.org/10.1016/j.jbusres.2003.08.002

Buhalis, D., & Karatay, N. (2022). Mixed reality (MR) for generation Z in cultural heritage tourism towards Metaverse. In *Information and communication technologies in tourism 2022: Proceedings of the ENTER 2022 eTourism conference, January 16–27, 2022* (pp. 16–27). Springer International Publishing. https://doi.org/10.1007/978-3-030-94751-4_2

Buhalis, D., Leung, D., & Lin, M. (2023). Metaverse as a disruptive technology revolutionising tourism management and marketing. *Tourism Management*, *97*, 104724. https://doi.org/10.1016/j.tourman.2023.104724

Buhalis, D., Lin, M. S., & 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), 701–716. https://doi.org/10.1108/IJCHM-05-2022-0631

Byrne, B. M. (2001). *Structural equation modeling with AMOS: Basic concepts, applications, and programming.* Lawrence Erlbaum.

Calderón-Fajardo, V., Carrasco-Santos, M. J., and Rossi Jimenez, C. (2022). The intention of consumers to use augmented reality apps in gastronomy – case of Málaga. *Current Issues in Tourism*, 1446–1462. https://doi.org/10.1080/13683500.2022.2056002

Cammack, R. G. (2010). Location-based service use: A metaverse investigation. *Journal of Location Based Services*, *4*(1), 53–65. https://doi.org/10.1080/17489721003742827

Chan, Y. K., Tang, Y. M., & Teng, L. (2023). A comparative analysis of digital health usage intentions towards the adoption of virtual reality in telerehabilitation. *International Journal of Medical Informatics*, *174*, 105042. https://doi.org/10.1016/j.ijmedinf.2023.105042

Chang, S. J., Van Witteloostuijn, A., and Eden, L. (2010). From the editors: Common method variance in international business research. *Journal of International Business Studies*, 41(2), 178-184. https://doi.org/10.1057/jibs.2009.88

Choi, Y. (2022). A study on factors affecting the user experience of metaverse service. *International Journal of Information Systems in the Service Sector*, *14*(1), 1–17. https://doi.org/10.4018/IJISSS.313379

Crespo, R. G., Escobar, R. F., Aguilar, L. J., Velazco, S., and Sanz, A. G. C. (2013). Use of ARIMA mathematical analysis to model the implementation of expert system courses by means of free software OpenSim and Sloodle platforms in virtual university campuses. *Expert Systems with Applications*, *40*(18), 7381–7390. https://doi.org/10.1016/j.eswa.2013.06.054

Davis, A., Murphy, J., Owens, D., Khazanchi, D., & Zigurs, I. (2009). Avatars, people, and virtual worlds: Foundations for research in metaverses. *Journal of the Association for Information Systems*, *10*(2), 90. https://doi.org/10.17705/1jais.00183

Delre, S. A., Jager, W., Bijmolt, T. H., & Janssen, M. A. (2010). Will it spread or not? The effects of social influences and network topology on innovation diffusion. *Journal of Product Innovation Management*, *27*(2), 267–282. https://doi.org/10.1111/j.1540-5885.2010.00714.x

Di Natale, A. F., Repetto, C., Riva, G., & Villani, D. (2020). Immersive virtual reality in K-12 and higher education: A 10-year systematic review of empirical research. *British Journal of Educational Technology*, *51*(6), 2006–2033. https://doi.org/10.1111/bjet.13030

Dionisio, J. D. N., Burns, W. G., III, & Gilbert, R. (2013). 3D Virtual worlds and the metaverse. *ACM Computing Surveys*, *45*(3), 1-38. https://doi.org/10.1145/2480741.2480751

Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, 307–319. https://doi.org/10.1177/002224379102800305

Dogra, N., Adil, M., Sadiq, M., Rafiq, F., and Paul, J. (2023). Demystifying tourists' intention to purchase travel online: The moderating role of technical anxiety and attitude. *Current Issues in Tourism*, *26*(13), 2164–2183. https://doi.org/10.1080/13683500.2022.2078688

Doyle, D., & Kim, T. (2007). Embodied narrative: The virtual nomad and the meta dreamer. *International Journal of Performance Arts and Digital Media*, *3*(2-3), 209–222. https://doi.org/10.1386/padm.3.2-3.209_1

Dwivedi, Y. K., Kshetri, N., Hughes, L., Rana, N. P., Baabdullah, A. M., Kar, A. K., Koohang, A., Ribeiro-Navarrete, S., Belei, N., Balakrishnan, J., Basu, S., Behl, A., Davies, G. H., Dutot, V., Dwivedi, R., Evans, L., Felix, R., Foster-Fletcher, R., Giannakis, M., … Yan, M. (2023). Exploring the darkverse: A multi-perspective analysis of the negative societal impacts of the metaverse. *Information Systems Frontiers*, *25*, 2071–2114. https://doi.org/10.1007/s10796-023-10400-x

Dwivedu, Y. K., Rana, N. P., Tamilmani, K., & Raman, R. (2020). A meta-analysis based modified unified theory of acceptance and use of technology (meta-UTAUT): A review of emerging literature. *Current Opinion in Psychology*, *36*, 13–18. https://doi.org/10.1016/j.copsyc.2020.03.008

Earnshaw, R., & Sourin, A. (2017). Case study: Shared virtual and augmented environments for creative applications. In *Research and development in the academy, creative industries and applications* (pp. 49–64). https://doi.org/10.1007/978-3-319-54081-8_5

Fan, Z., Chen, C., & Huang, H. (2022). Immersive cultural heritage digital documentation and information service for historical figure Metaverse: A case of Zhu Xi, Song Dynasty, China. *Heritage Science*, *10*(1), 148. https://doi.org/10.1186/s40494-022-00749-8

Filimonau, V., Ashton, M., & Stankov, U. (2022). Virtual spaces as the future of consumption in tourism, hospitality and events. *Journal of Tourism Futures*, (ahead-of-print). https://doi.org/10.1108/jtf-07-2022-0174

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.

Foroughi, B., Sitthisirinan, S., Iranmanesh, M., Nikbin, D., & Ghobakhloo, M. (2023). Determinants of travel apps continuance usage intention: Extension of technology continuance theory. *Current Issues in Tourism*, 619–635. https://doi.org/10.1080/13683500.2023.2169109

Garrido-Iñigo, P., & Rodríguez-Moreno, F. (2015). The reality of virtual worlds: Pros and cons of their application to foreign language teaching. *Interactive Learning Environments*, *23*(4), 453–470. https://doi.org/10.1080/10494820.2013.788034

Ghali, Z., Rather, R. A., & Khan, I. (2024). Investigating metaverse marketing-enabled consumers' social presence, attachment, engagement and (re)visit intentions. *Journal of Retailing and Consumer Services*, *77*, 103671. https://doi.org/10.1016/j.jretconser.2023.103671

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

Gursoy, D., Malodia, S., & 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), 527–534. https://doi.org/10.1080/19368623.2022.2072504

Ha, S., & Stoel, L. (2009). Consumer e-shopping acceptance: Antecedents in a technology acceptance model. *Journal of Business Research*, *62*(5), 565–571. https://doi.org/10.1016/j.jbusres.2008.06.016

Haenlein, M., & Kaplan, A. M. (2004). A beginner's guide to partial least squares analysis. *Understanding Statistics*, *3*(4), 283–297. https://doi.org/10.1207/s15328031us0304_4

Hair, J., Hollingsworth, C. L., Randolph, A. B. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management and Data Systems*, *117*, 442–458.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed, a Silver Bullet. *Journal of Marketing Theory and Practice*, *19* (2), 139–152. https://doi.org/10.2753/mtp1069-6679190202

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*, 115–135.

Hong, J. C., Hwang, M. Y., Liu, M. C., Tsai, C. R., & Tai, K. H. (2020). Metacognition in covariation reasoning relevant to performance achievement mediated by experiential values in a simulation game. *Educational Technology Research and Development*, *68*(3), 929–948. https://doi.org/10.1007/s11423-019-09711-1

Huang, X. T., Wang, J., Wang, Z., Wang, L., & Cheng, C. (2022). Experimental study on the influence of virtual tourism spatial situation on the tourists' temperature comfort in the context of Metaverse. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1062876

Karjaluoto, H., Jayawardhena, C., Leppäniemi, M., & Pihlström, M. (2012). How value and trust influence loyalty in wireless telecommunications industry. *Telecommunications Policy*, *36*(8), 636–649. https://doi.org/10.1016/j.telpol.2012.04.012

Kayakoku, H. (2023). History and development of virtual worlds and metaverse. In *Metaverse: Technologies, opportunities and threats* (pp. 19–30). Springer Nature Singapore. https://doi.org/10.1007/978-981-99-4641-9_2

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

Kozinets, R., Patterson, A., & Ashman, R. (2017). Networks of desire: How technology increases our passion to consume. *Journal of Consumer Research*, *43*(5), 659-682. https://doi.org/10.1093/jcr/ucw061

Kraus, S., Kanbach, D. K., Krysta, P. M., Steinhoff, M. M., & Tomini, N. (2022). Facebook and the creation of the metaverse: Radical business model innovation or incremental transformation? *International Journal of Entrepreneurial Behavior & Research*, *28*(9), 52–77. https://doi.org/10.1108/IJEBR-12-2021-0984

Lee, U. K. (2022). Tourism using virtual reality: Media richness and information system successes. *Sustainability*, *14*(7), 3975. https://doi.org/10.3390/su14073975

Lee, U. K., & Kim, H. (2022). UTAUT in Metaverse: An "Ifland" case. *Journal of Theoretical and Applied Electronic Commerce Research*, *17*(2), 613–635. https://doi.org/10.3390/jtaer17020032

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/jtr.2616

Lopes, A. I., Dens, N., De Pelsmacker, P., & Malthouse, E. C. (2023). Managerial response strategies to eWOM: A framework and research agenda for webcare. *Tourism Management*, *98*, 104739.

Mitchell, K. M., Holtz, B. E., & McCarroll, A. M. (2022). Assessing college students' perceptions of and intentions to use a mobile app for mental health. *Telemedicine and e-Health*, *28*(4), 566–574. https://doi.org/10.1089/tmj.2021.0106

Mohamad, M. A., Hanafiah, M. H., & Radzi, S. M. (2021). Understanding tourist mobile hotel booking behaviour: Incorporating perceived enjoyment and perceived price value in the modified Technology Acceptance Model. *Tourism & Management Studies*, *17*(1), 19–30. https://doi.org/10.18089/tms.2021.170102

Moradiberelian, M. (2022). An introduction to the implications and legal challenges of metaverse. *Legal Research Quarterly*, *25*(Special Issue of Law &Technology), 363–392.

Moro-Visconti, R. (2022). Metaverse: A digital network valuation. In *The valuation of digital intangibles: Technology, marketing, and the metaverse* (pp. 515–559). Springer International Publishing. https://doi.org/10.1007/978-3-031-09237-4_18

Munawar, S., Yousaf, H. Q., Ahmed, M., & Rehman, S. (2022). Effects of green human resource management on green innovation through green human capital, environmental knowledge, and managerial environmental concern. *Journal of Hospitality and Tourism Management*, *52*, 141–150. https://doi.org/10.1016/j.jhtm.2022.06.009

Muñoz-Saavedra, L., Miró-Amarante, L., & Domínguez-Morales, M. (2020). Augmented and virtual reality evolution and future tendency. *Applied Sciences*, *10*(1), 322. https://doi.org/10.3390/app10010322

Mustafa, S., Zhang, W., Anwar, S., Jamil, K., & Rana, S. (2022). An integrated model of UTAUT2 to understand consumers' 5G technology acceptance using SEM-ANN approach. *Scientific Reports*, *12*(1), 20056. https://doi.org/10.1038/s41598-022-24532-8

Ng, D. T. K. (2022). What is the Metaverse? Definitions, technologies and the community of inquiry. *Australasian Journal of Educational Technology*, *38*(4), 190-205. https://doi.org/10.14742/ajet.7945

Özdemir, G., & Şahin, S. Z. (2023). How does Metaverse affect the tourism industry? Current practices and future forecasts. *Current Issues in Tourism*, 1–15. https://doi.org/10.1080/13683500.2023.2238111

Park, J. Y., Back, R. M., Bufquin, D., & Shapoval, V. (2019). Servicescape, positive affect, satisfaction and behavioral intentions: The moderating role of familiarity. *International Journal of Hospitality Management*, *78*, 102–111. https://doi.org/10.1016/j.ijhm.2018.11.003

Peng, L., Zhang, W., Wang, X., & Liang, S. (2019). Moderating effects of time pressure on the relationship between perceived value and purchase intention in social E-commerce sales promotion: Considering the impact of product involvement. *Information and Management*, *56*(2), 317–328.

Peštek, A., & Savan, M. (2020). Traveling before traveling: Virtual reality marketing in support of greater tourism sustainability. *Acta Turistica*, *32*(1), 39–74. https://doi.org/10.22598/at/2020.32.1.39

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879. https://doi.org/10.1037/0021-9010.88.5.879

Puig-Cabrera, M., Martínez-del Vas, G., Beltrán-Bueno, M. Á., & Nuevo-López, A. (2023). Tourism towards the well-being of small island developing states: Tourism agenda 2030. *Tourism Review*, *78*(2), 614-629. https://doi.org/10.1108/TR-02-2022-0100

Riesa, R. M., & Haries, A. (2022). Investigation of people familiarity towards virtual tourism as an alternative to travel. *Economics, Business, Accounting & Society Review*, *1*(3), 179–185. https://doi.org/10.55980/ebasr.v1i3.30

Ringle, C. M., Wende, S., & Will, A. (2009). Finite mixture partial least squares analysis: Methodology and numerical examples. In *Handbook of partial least squares: Concepts, methods and applications* (pp. 195–218). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-32827-8_9

Rodrigues, M. A., Carvalho, M. A., Oliveira, L., & Barbosa, A. (2024). How digital influencer content and characteristics influence Generation Y persuasiveness and purchase intention. *Tourism & Management Studies*, *20*(2). https://doi.org/10.18089/tms.20240203

Sarkady, D., Neuburger, L., & Egger, R. (2021). Virtual reality as a travel substitution tool during COVID-19. In *Information and communication technologies in tourism 2021: Proceedings of the ENTER 2021 eTourism conference, January 19–22, 2021* (pp. 452–463). Springer International Publishing. https://doi.org/10.1007/978-3-030-65785-7_44

Shen, S., Xu, K., Sotiriadis, M., & Wang, Y. (2022). Exploring the factors influencing the adoption and usage of Augmented Reality and Virtual Reality applications in tourism education within the context of COVID-19 pandemic. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *30*, 100373. https://doi.org/10.1016/j.jhlste.2022.100373

Son, J. Y., and Benbasat, I. (2007). Organizational buyers' adoption and Use of B2B electronic marketplaces: Efficiency- and legitimacy-oriented perspectives. *Journal of Management Information Systems, 24*(1), 55–99. https://doi.org/10.2753/MIS0742-1222240102

Sparkes, M. (2021). 3D-printed steel bridge takes the load in Amsterdam. *New Scientist*, *251*(3344), 18. https://doi.org/10.1016/s0262-4079(21)01277-x

Sweeney, T. (2019). Foundational principles & technologies for the metaverse. In ACM SIGGraph 2019 Talks (pp. 1–1). https://doi.org/10.1145/3306307.3339844

Teng, Z., Cai, Y., Gao, Y., Zhang, X., and Li, X. (2022). Factors affecting learners' adoption of an educational metaverse platform: An empirical study based on an extended UTAUT model. *Mobile Information Systems*. https://doi.org/10.1155/2022/5479215

Tsai, S. (2022). Investigating Metaverse marketing for travel and tourism. *Journal of Vacation Marketing*, 13567667221145715. https://doi.org/10.1177/13567667221145715

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, 695–704. https://doi.org/10.2307/25148660

Venkatesh, V. (2022). Adoption and use of AI tools: A research agenda grounded in UTAUT. *Annals of Operations Research*, 641–652. https://doi.org/10.1007/s10479-020-03918-9

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27, 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36, 157–178. https://doi.org/10.2307/41410412

Villarreal Satama, F. L. (2022). Metaverso-implicaciones de la indstria del futuro. *Communication Papers*, *11*(23), 47–59. https://doi.org/10.33115/udg_bib/cp.v11i23.22830

Wang, M. (2020). Social VR: A New form of social communication in the future or a beautiful illusion? *Journal of Physics: Conference series*, *1518*(1), 012032. https://doi.org/10.1088/1742-6596/1518/1/012032

Wei, D. (2022). Gemiverse: The blockchain-based professional certification and tourism platform with its own ecosystem in the Metaverse. *International Journal of Geoheritage and Parks*, *10*(2), 322–336. https://doi.org/10.1016/j.ijgeop.2022.05.004

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research*, *16*(1), 85–102. https://doi.org/10.1287/isre.1050.0042

Yang, F., Ren, L., & Gu, C. (2022). A study of college students' intention to use metaverse technology for basketball learning based on UTAUT2. *Heliyon*, *8*(9), e10562. https://doi.org/10.1016/j.heliyon.2022.e10562

Yıldız, İ., and Tanyıldızı, N. İ. (2023). An analysis of news containing cyberbullying in the metaverse. In *Handbook of research on bullying in media and beyond* (pp. 196–214). IGI Global. https://doi.org/10.4018/978-1-6684-5426-8.ch012

Zaman, U., Koo, I., Abbasi, S., Raza, S. H., & Qureshi, M. G. (2022). Meet your digital twin in space? Profiling international expat's readiness for Metaverse space travel, tech-savviness, COVID-19 travel anxiety, and travel fear of missing out. *Sustainability*, *14*(11), 6441. https://doi.org/10.3390/su14116441

Zhang, J., Quoquab, F., & Mohammad, J. (2023). Metaverse tourism and Gen-Z and Gen-Y's motivation: "will you, or won't you travel virtually? *Tourism Review*, *79*. https://doi.org/10.1108/TR-06-2023-0393

Zhang, Q., & Ye, Q. (2023). R2V platform's business model reconstruction in the metaverse era: Based on network effects and bundling. *Information Processing & Management*, *60*(6), 103503. doi:10.1016/j.ipm.2023.103503

Zhang, X., Yang, D., Yow, C. H., Huang, L., Wu, X., Huang, X., Guo, J., Zhou, S., & Cai, Y. (2022). Metaverse for cultural heritages. *Electronics*, *11*(22), 3730. https://doi.org/10.3390/electronics11223730