

Navigating Complexity in Future Tourism Metaverses: A Review of Requirements, Designs, and Interactions

Saikat Gochhait^{1*}

¹Symbiosis Institute of
Digital and Telecom
Management, Symbiosis
International Deemed
University, India

Abstract

The development of shared value in the metaverse and the transformation of perspectives and benefits arising from its advent, especially in tourism, is a domain of research that this paper aims to contribute to. With the above observation of future tourism metaverses, this research attempts to describe the complexity of requirements, designs, and interactions that should be considered for future tourism metaverses towards experiencing the importance of metaverse in tourism. We report findings from a systematic literature examination of 82 peer-reviewed papers published in the Scopus databases, using terminology including but not limited to tourism, tourist, holiday, vacation, hospitality, and metaverse. The research results show that the metaverse can drastically change tourism by providing virtual, hyper-realistic experiences to complement physical journeys. The attributes of metaverse tourism, including stimulus modalities, strength in accessibility, interactivity, amenities, activities, ancillary services, etc., are identified in this work as being vital for maximizing customer satisfaction and engagement. Explore virtuality before reality: Virtual reality (VR), augmented reality (AR), or mixed reality (MR) allows tourists to go through destinations virtually prior to a physical visit; these advancements support better travel planning and decision-making. Moreover, it highlights the significance of inclusive design and adaptive technologies to enhance accessibility to metaverse tourism for diverse audiences. This research contributes to theoretical and practical context throughout the discourse of employing the metaverse for digital marketing, branding, and revenue generation but also integrates environmental aspects of travel through the reduction of related emissions. The implication that emerges from examining the complex requirements and design of metaverse tourism can lay the groundwork for future research and projects in this work area in an interdisciplinary, collaborative, and human-centered design approach.

Keywords: Metaverse, Virtual experience, Technologies, Tourism Experience

INTRODUCTION

Metaverse describes the creation of virtual worlds that revolve around social connections. This new concept (advanced technology) can take many forms, from virtual reality (VR) experiences where users are identified in a digitally transformed environment to augmented reality (AR) connections of the physical world or interactions via video games. The metaverse concept is often associated with users having access to a digital avatar that is then used to communicate with others who are active in the metaverse (Dwivedi et al., 2022, 2023; Buhalis, 2020). In addition to the social component, companies are also exploring the various opportunities the metaverse offers to reach customers wherever they are. This has led to the metaverse being seen as one of the emerging digital trends. As commerce opportunities continue to grow and user adoption increases, the metaverse is likely to play a greater role in the various sectors of the global economy/marketplace, improving communication and customer satisfaction (Katz, 2022). The concept of the metaverse has been evolving since the 1990s and has recently become a more recognized concept with the development of technology. This has paved the way for metaverse tourism, which businesses in this sector are keen to capitalize on.

In the tourism industry, the ongoing adoption of information and communication technologies (ICT) has changed the basis of competition and led to significant disruption in the tourism industry (see Dwivedi et al., 2022; Law et al., 2015; Werthner & Klein, 1999). Thank you to (Buhalis, 2003) earlier work,

Correspondence address:

Saikat Gochhait

Email : sgochhait@gmail.com

Address : Symbiosis Institute of Digital and Telecom Management, Symbiosis International Deemed University, India

which stated that the Internet fundamentally changed strategic and operational practices in the tourism and hospitality industry in the late 1990s. Buhalis, 2020 argued that numerous networks and smartphones have developed an intelligent information structure that is changing the travel and tourism industry in the medium to long term. It is imperative to note that the promotion of destinations through virtual worlds connected to the physical environment, such as hotels, airlines, and related tourism businesses to showcase their products to international tourists or travelers; the Internet is, therefore, crucial support for tourism providers to deliver services directly to their customers, which then reduces dependence on intermediaries and increases competitive advantage. Nevertheless, researchers (Chang & Sokol, 2022; Buhalis et al., 2020; Guttentag & Smith, 2017) point to technological platforms that are redefining the sharing economy in disruptive ways, such as Airbnb in rooms and Uber in transportation. With the rapid development of mobile devices like smartphones and the booming mobile commerce, they have been recognized as strong facilitators of disruptive innovations in tourism and hospitality (Wang et al., 2016). Mobile technologies also deepen contextual significance and enable context-aware, real-time shared value co-creation (Buhalis, 2020). Furthermore, it has been found that engaging users through company mobile applications can increase the purchase volume and frequency of purchases, highlighting the necessity of interactive and user-focused designs (Buhalis, 2003).

(Porter & Heppelmann, 2014) stated that due to the growth of new technologies in the digital landscape (i.e., development of 5G +mobile networks) and the Internet of Things (IoT), (Rauschnabel et al., 2022) configuration enables 3-dimensional (3D) simulations (models) and strengthens the benefits of immersive technologies such as mixed reality (MR), AR and VR. To this end, a combined experience in the virtual and physical universe offers unique opportunities for tourism providers as well as for interaction with different stakeholders (Rauschnabel, 2022). The use of these immersive technologies would motivate tourists to view destinations and services before visiting, even if users can complement real experiences with virtual experiences at the destination (Loureiro et al., 2020).

In this study, we reiterate that the metaverse is still essentially conceptual and has not yet been completed or realized in the mainstream. However, there is evidence that games are being adopted by the masses (Katz, 2022). It is an undeniable fact that scientists from different fields are collaborating to explore, structure, organize, and visualize the future of the metaverse (Dwivedi et al., 2022, 2023; Koohang et al., 2023). Based on the above assertions, this study argues that the metaverse will be successful when digital environments provide users with hyper-realistic virtual conversations, experiences, and transactions in a sustainable manner. In doing so, the study aims to explore and discover the patterns (opportunities and challenges) that the metaverse initiates for tourism providers in the context of enhancing the customer experience while promoting the process of co-creating value. In other words, the study explores the elements that will manifest in the emergence and progress of the metaverse, particularly the complex requirements, designs, and interactions that future tourism metaverses will consider. More importantly, the potential impact of digitalization became apparent when COVID-19 prompted many people around the globe to meet, learn, socialize, consult, and engage in online venues. However, this development was two-dimensional, unclear, and often seemed artificial. The metaverse, on the other hand, is characterized by the innovations and opportunities that come from immersion, allowing users to interact and feel natural in both the physical and digital worlds. According to (Lundmark, 2022), "by 2030, every physical device that can be digitally connected will be. Ultimately, every action in the digital world will affect the physical world and vice versa. So, the metaverse is not dependent on a virtual reality headset. Rather, it is the confluence of complementary technologies, including cloud and edge computing (close to the data source), artificial intelligence, blockchain, the Internet of Things, virtual reality, augmented reality, and digital twins."

The metaverse allows tourists to use immersion to suggest tourist destinations and associations virtually before arrival (Buhalis et al., 2022). An important aspect of the metaverse in tourism is that tours are based on virtual tours that use 360-degree or 3D media modality technology. The impact of metaverse experiences on the future of tourism is, therefore, undeniable. The technology is redefining the way users explore, plan, and carry out their travel activities. This ranges from virtual city tours to the preservation of cultural heritage. 3D Internet offers ways to ensure sustainability, inclusivity, and enriching experiences for tourism providers and users. The metaverse, proposed in previous literature (Dwivedi et al., 2022, 2023; Buhalis, 2020; Law et al., 2015; Werthner & Klein, 1999; Chang & Sokol, 2022; Buhalis et al., 2020; Guttentag & Smith, 2017), is described as the next disruptive technology that will impact society in the future by enabling immersive experiences in virtual and physical environments. Scientists and practitioners claim that the metaverse is still in the conceptual stage, which would eventually connect the physical and digital universes and allow users to switch between them seamlessly. The new world (digital immersion) offers individuals the opportunity to travel in time and virtually experience ancient encounters, space exploration, or dangerous natural phenomena (e.g.,

volcanic eruptions). In addition to recreation and leisure, users can also discover immersive environments for learning, working, trading, exploring interests, and socializing with like-minded people (Buhalis, 2003). This can be seen in gaming ecosystems where players actively interact in the metaverse.

Here, too, the metaverse is expected to change strategic management and marketing in the travel and tourism sector, as it is still at the experimental stage. It improves destination awareness and brand positioning as well as effective and efficient management and coordination through the use of digital twins. Furthermore, in metaverse tourism, visiting and engaging with destinations using accessible digital devices (such as cell phones and computers, VR headsets, AR data glasses, and MR headsets) is expected to motivate real travel rather than replace it largely. This study provides a catalog of scholarly articles to explore how the metaverse can transform tourism experiences and consequently influence strategic tourism management and marketing practices. In an effort to understand the role of metaverse tourism, the review helps explore the underlying causes of the disruption that metaverse brings to tourism destinations and organizations and identifies the building blocks of metaverse tourism by considering relevant elements that have the potential to increase the adoption of metaverse in tourism, including complex requirements, designs, and interactions that future tourism metaverses will consider. The research questions are:

1. How will mixed reality and virtual reality tourism experiences be empowered in the metaverse era?
2. How do disruptive behavior and experiences affect travel industry marketing and management?
3. What are the key elements of Metaverse Tourism that Enhance the Travel Experience?

LITERATURE REVIEW

Overview of Tourism Experience Journey

Scientists involved in metaverse studies believe that the future universe will have a significant impact on the tourism and hospitality industry by changing the guest (or visitor) experience before, during, and after their visit. Tourism services are a social, cultural, and economic phenomenon, and people travel to places outside their usual environment for personal or business/professional purposes, including conferences and exhibitions. As a result, the merging of the real experience with the virtual world is disruptive and transformative, bringing significant opportunities and challenges for all stakeholders in the ecosystem (Kandampully et al., 2022). Metaverse is leading to a dynamic transformation of the tourism ecosystem, resulting in a reengineering of business processes across all functions and operations, as well as the development and implementation of strategic management practices in the tourism sector. Although the metaverse ventures in the tourism and hospitality context are gradually encouraging, they are still at a very early stage. To this, the work of (Gursoy et al., 2022) suggested that "Metaverse applications such as these are revolutionizing the hospitality and tourism industry as virtual hotels, destinations, and tours alter how people select lodging and destinations, make bookings, and even attend concerts. Although the metaverse cannot replace in-person travel, improvements in technology and sophistication in the quality of virtual reality (VR) headsets have made metaverse hospitality and tourism apps increasingly immersive".

Furthermore, over time, tourism and hospitality researchers have focused on the existing methods and practices that were part of the previous visualization in the metaverse. The work of (Buhalis & Karatay, 2022), for example, conducted 18 semi-structured interviews to explore Generation Z's experiences of cultural heritage in the MR environment. They concluded that heritage destinations should consider using MR to enhance customer experiences, which is the foundation for the metaverse of the future. (Um et al., 2022) A case study of Incheon in South Korea was added to the literature to explore the link between metaverse and smart tourism development. In their work, they extended the metaverse concept in the context of smart tourism to a reality-based metaverse and a virtuality-based metaverse by taking inspiration from the development of smart tourism in Incheon. Furthermore, (Gursoy et al., 2022) added to the growing literature by examining the creation of metaverse experiences from the directions of motives (i.e., hedonic and functional perspectives) and interactivity (i.e., low and high) to offer further insights for hospitality and tourism scholars. In this regard, (Gursoy et al., 2022) believe that the expected opportunity of the metaverse will attract the attention of more scholars in the future.

With the discovery of this universe and considering the process of the tourism experience journey (i.e., before, during, and after the physical visit), tourism investors, designers, builders, and managers should henceforth utilize the emerging opportunities of the metaverse to develop their digital existence for a competitive tourism sector (Neuhofer et al., 2014). In the physical environment, tourism investors need space for their activities, mobilize funds, develop attractive concepts and experiences, and implement a project to build a tourism metaverse. In doing so, designers and developers need to create design-thinking concepts and develop appropriate structures. Tourism managers need to hire experts (human resources) who use their skills

and knowledge to manage digital devices and thus facilitate the implementation of the metaverse. Ultimately, management needs to develop strategic management systems to operate the tourism metaverse architecture that has been put in place. Marketing strategies need to be developed to attract and retain customers with the aim of optimizing profitability (Stoyanova-Bozhkova et al., 2020).

Metaverse and Tourism Technology

In view of the increasing discussion about the metaverse among scientists and practitioners, the metaverse is now considered one of the most promising tourism concepts. With the continuous development of the metaverse in the field of tourism activities and the opportunities it offers, and the increasing acceptance of these new opportunities, it is expected that the new development (metaverse) will play an increasingly important role in the tourism sector in the long term by strengthening communication and improving the overall experience of tourists (customers). There is no doubt that tourism will also contribute to the economy, and the tourism sector cannot be ignored. In 2021, the global population of travel and tourism was very strong, and the compound annual growth rate (CAGR) is expected to increase rapidly during the forecast period (Redding, 2023). The forecast indicates an increased focus on the development of cutting-edge immersive technologies such as AR and VR, which will be accompanied by a rapid integration of MR platforms into the tourism sector. It is the result of the metaverse's growing potential to take tourism and hospitality to the next level, which should lead to an increase in market revenues. It is also important to note that the metaverse can support the transformation of expensive destinations or attractions into accessible places. Nonetheless, it promotes unknown places to popular destinations, old places to young places, and mature places to youthful places (Yew & Chandrashekar, 2023). Similarly, the anticipated universe (metaverse in tourism) can provide pragmatic solutions to deep-rooted concerns by bridging the gap between inequalities in tourism to create opportunities for true diversity in tourism. Moreover, the use of digital AR and VR devices serves as a tool for rebranding and enhanced marketing that consequently promotes the expected tourism experience (Buhalis, 2022; Yew & Chandrashekar, 2023). The growing awareness of the metaverse's potential to transform the tourism industry is an evidence-based phenomenon that encourages concerted and collaborative efforts between technology developers, inventors, policymakers, and metaverse companies to create robust worlds and platforms for alternative universes that will drive revenue growth in the tourism market in the future.

Elements of Metaverse Tourism

The persona of a tourism destination is characterized by the totality of the distinctive traits that constitute its identity and differentiate it from other destinations (Buhalis et al., 2023). We could create new experiences in the metaverse as travel becomes more enabled and augmented by smart technologies, so there is a big opportunity to start new business ventures. Here, we refer to core elements as critical features that platform operators and system developers must accept to satisfy the required needs of their customers and stakeholders. Three essential components are required to design immersive virtual tourism experiences, namely, customer stimulus modalities, accessibility, and the use of interactivity (Buhalis et al., 2023). An auxiliary component of Metaverse Tourism, on the other hand, can accompany standard elements to increase customer experience and satisfaction. These components consist of accommodation, experiences, and value-added services, together forming a more enriching and personalized virtual travel experience (Buhalis et al., 2023).

Tourists' sensory experience in a destination is significantly enhanced through stimulus modalities that impact user engagement, perception, and telepresence. Thus, it is important to provide networked sensory stimuli, like multisensory technology (Santoso et al., 2022), to make these possible. An additional core component is accessibility, that is, making sure that the metaverse tourism ecosystem is inclusive and available to all and anywhere. This facilitates this on the back of solid communication networks and infrastructure as well as token-driven ecosystems that empower the deployment of blockchain-based tokens focused on incentivizing equitable and transparent environments (Toennissen et al., 2020). As one of the pillars of metaverse tourism, interactivity, defined as a multi-faceted concept that enriches users' user engagement and participation in the metaverse (Park & Kim, 2022), is one of the key expectations of modern tourists.

Supporting elements akin to amenities—where guests can consider digital versions of hotels, eating places, and different public amenities—are integral to the comfortability and happiness of users (Kim & Han, 2022). Activities (from leisure to gaming) are as essential for attracting tourists and sharing distinctive virtual experiences to target diverse demographics (Uysal et al., 2016). Lastly, ancillary services enhance the total tourism experience by purporting the technologies, such as digital twins and smart objects, that create or supplement the bridge between virtual and physical interactions (Koo et al., 2022). These factors have been

considered in the present study together to contribute to the tourism experience journey covering pre-trip, on-site, and post-trip phases and demonstrate the transformative potential of metaverse tourism. The interaction between the elements of Metaverse Tourism and their impact on the tourism experience journey can be seen in Figure 1.

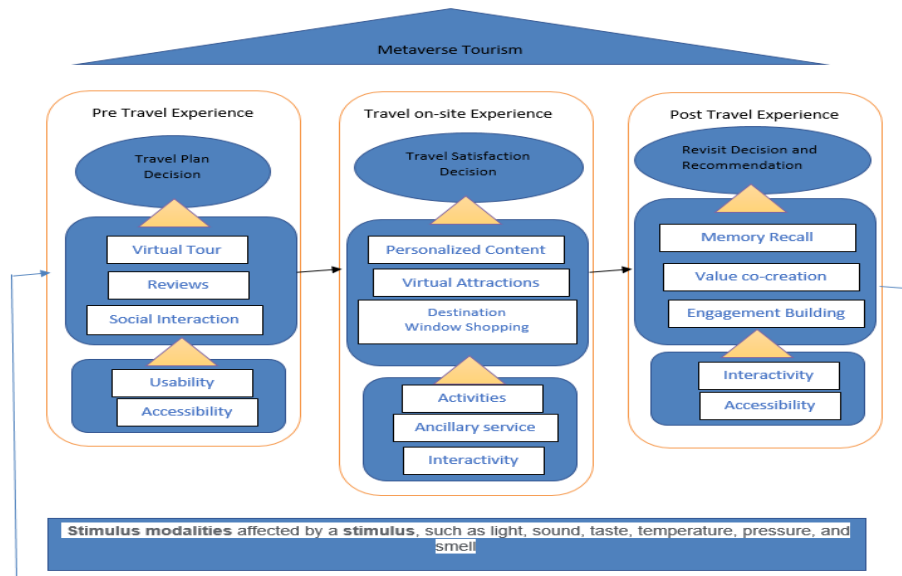


Figure 1. Metaverse Tourism Experience Journey And Its Elements

Source: Research data, 2025

Stimulus modalities: Enhancing the sensory modalities of tourists or users is one of the most important elements for Metaverse Tourism to improve the tourism experience, including user engagement, user perception, and the feeling of telepresence in a destination. Digital sensory stimuli or multisensory technology is required to address this element (Santoso et al., 2022). **Accessibility:** Accessibility is also the most important element of metaverse tourism and is related to the level of infrastructure and interaction. Communication and network are crucial factors in developing easy access for the tourist/user who can log into the Metaverse Tourism ecosystem from anywhere. A token-driven ecosystem is a crucial component of a modern metaverse as it utilizes blockchain-based tokens to provide a fair and transparent ecology that are monetary representations for the community (Toennissen et al., 2020). **Interactivity:** As one of the most popular tourism technologies in recent years, customers expect interactivity in the metaverse. (Park and Kim, 2022) defined interactivity as a multi-layered concept that has been explored in three research directions.

Amenities: Amenities refer to the facilities available at tourist destinations. These factors have a direct impact on visitors and determine the quality of services offered by these organizations. Generally, these facilities are located both inside and outside the overall destination. This can help to improve the comfort of visitors to a destination. These variables include hotels and accommodations as well as restaurants, public facilities, shopping centers, and more. Amenities are an important factor that plays an essential role in improving the user experience and enhancing the customers' experience when using the facilities (Kim & Han, 2022). In Metaverse Tourism, the term amenities is defined similarly to technology for leisure activities. The potential users of Metaverse Tourism expect an exclusive representation of their tourism property, supporting facilities, and surroundings. **Activities:** It is common knowledge that tourist activities refer to all kinds of activities that visitors can undertake at a destination. There are a number of activities that attract tourists to a particular destination. A destination can offer a variety of activities to its visitors.

Activities such as sightseeing, swimming, going out, gaming, and photography are just some of these options (Uysal et al., 2016). To increase the attractiveness and competitiveness of metaverse tourism, real and virtual activities need to be considered equally. We can also create a different atmosphere for targeted tourists in the virtual environment. For example, we can offer street art activities to attract young adult travelers. At the same time, we can set up a symphony orchestra to entertain older guests. With Metaverse Tourism, destination management can create unique virtual offerings by providing a flexible service and attraction that replaces the traditional perspective of seeing and enjoying the destination. **Ancillary services:** The ancillary services component describes the supporting facilities in and around tourist destinations. While technology is

all the rage in designing transformative hospitality experiences, in real life, travel and expeditions are an irreplaceable art form that cannot be replaced by technology.

During the pandemic, the travel and hospitality industry has opened up new revenue streams from ancillary services and has since become a major source of revenue for businesses. We have witnessed the transformation of travel as it evolved beyond the confines of the earth into the metaverse, but the digital sphere cannot replace the true beauty of the world and all its wonders. Metaverse solutions will use technologies such as digital twins to monitor, simulate, and remotely control physical assets with virtual objects. Concepts such as "smart objects" will gain traction, allowing virtual objects to work with real objects through virtual-to-real (V2R), real-to-virtual (R2V), and virtual-to-virtual (V2V) interactions. Metaverse tourism is distributed across the Tourism Experience Journey, which begins with the pre-trip, on-site, and post-trip experience (Koo et al., 2022). In the following section, we want to understand how these elements can be used in the different stages of the tourism experience journey and what impact this has on the experience.

METHODS

This study incorporates the PRISMA framework, which analyses the future of tourism in the metaverse. Specifically, it investigates published works in the Scopus database and relevant indexed journals. The study relied on search keywords such as "tourism," "tourist," "holiday," "vacation," "hospitality," and "metaverse." A total of 82 documents were obtained within the scope of this research and represented in Figure 2. This research incorporates the author and country of origin. The study aimed to answer the following questions:

1. Is there additional research supporting mixed tourism experiences in both physical and virtual worlds, especially in the upcoming metaverse era?
2. Can potential disruptions in tourist behaviors and experiences be explored, and what are the implications for tourism management and marketing?
3. Before suggesting a research agenda based on the components of the metaverse, what are the challenges and risks that are emerging for Tourism Management and Marketing within the metaverse?
4. Which key elements in Metaverse Tourism can be utilized to enhance the travel experience? Is it feasible to identify the implications of these elements for the Tourism Experience Journey?

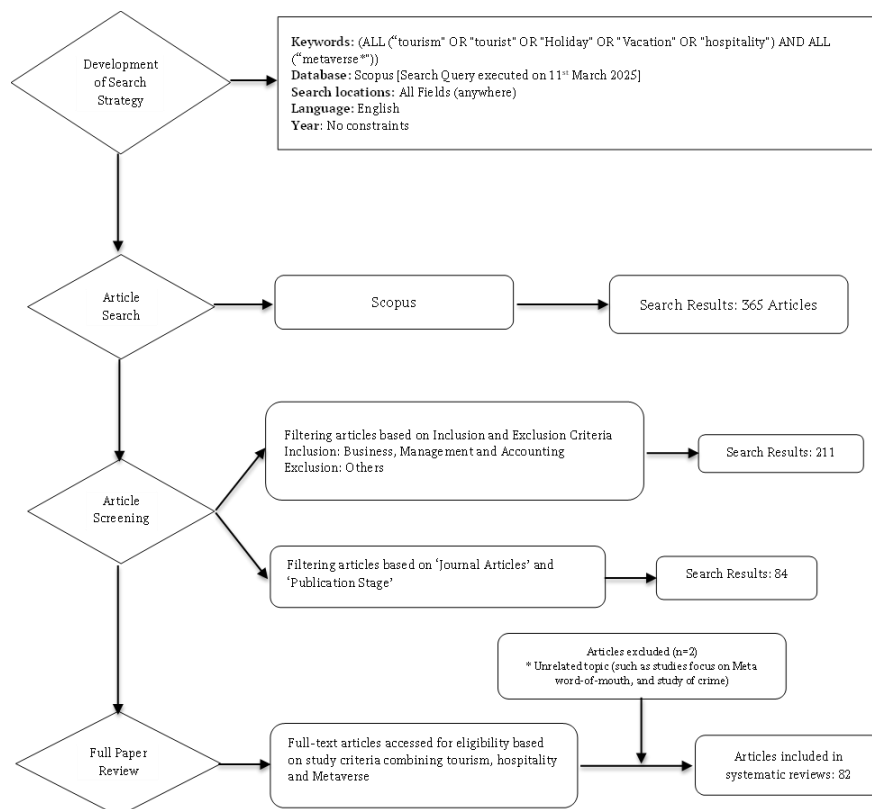


Figure 2. Study Selection And Evaluation Based on PRISMA Framework (Moher et al., 2009)

A VOSviewer program was utilized for bibliometric analysis in this study. This software package is intended to analyze and visualize extensive bibliographic data sets. VOSViewer features a proprietary algorithm utilizing a modularity-based clustering technique akin to multidimensional scaling, which was initiated using an intelligent local motion algorithm. Complex designs, requirements, and interactions will undergo scrutiny in the context of bibliometric analysis, and future tourism metaverse can accommodate them. (Hollensen et al., 2022) suggest that there has been a recent surge in interest in the metaverse among brands and companies. According to (Kraus et al., 2022), this trend has been increasing over the past 3-4 years, with researchers conducting numerous studies on the topic during this period. It is noteworthy that these studies were conducted within the last 3-4 years, thus ensuring their relevance and selection for this particular time frame. Upon conducting a literature review, it is evident that few empirical studies on the metaverse exist. Given the limited scope of research on this topic, it can be inferred that the metaverse is a novel area, and the lack of theoretical investigations has impeded its empirical studies. Therefore, this study aims to contribute to the development of theoretical insights and guide empirical research in this direction. Bibliometric data sources were obtained through content analyses of eleven studies.

The VOSviewer system was utilized to obtain bibliometric data. The primary rationale for using VOSviewer is that it offers visual mapping (Paul & Bhukya, 2021). Subsequently, a conceptual model is proposed based on the outcomes of the accessed study. Due to the current interest in the metaverse for empirical studies, few investigations have been conducted. The limited number of studies on the metaverse proves that this is a novel research area, and as a result, empirical studies have not yet been established due to the absence of theoretical studies in this field (Van & Waltman, 2010; Waltman et al., 2010). Therefore, this study aims to bolster the present theory and provide guidance for empirical studies. Only three empirical studies were conducted in 2021. The content analysis of eleven studies was conducted using bibliometric data sources, with VOSviewer utilized for this purpose due to its ability to provide visual mapping (Paul et al. Bhukya, 2021). The findings from these studies have led to the development of a conceptual model.

RESULTS AND DISCUSSION

Keywords Analysis

The search results included a simple keyword search of "tourism" OR "tourist," OR "Holiday," OR "Vacation," OR "hospitality," or "metaverse." This resulted in 153 total articles. It was further refined to filter papers published in the subject areas of "Business, Management and Accounting," "Social Science," and "Economics, Econometrics, and Finance". This gave a final result of 92 articles. These keywords were used as a search item in the title section of articles to find more accurate articles to meet the research's objectives. When searching the Scopus database for bibliographic data related to tourism, tourists, holidays, hospitality, and metaverse, only publications published between 2015 and 2023 were considered. In the initial search, 116 articles were found, which were then narrowed down using the criteria outlined in the following sections. Our Scopus searches were limited to publications in the English language. Scopus, widely regarded as the largest and most organized database for quantitative studies (Donthu et al., 2021), has found a total of 82 English documents. After eliminating four duplicates and discarding one irrelevant document, this method produced 82 interconnected publications between 2015 and 2024.

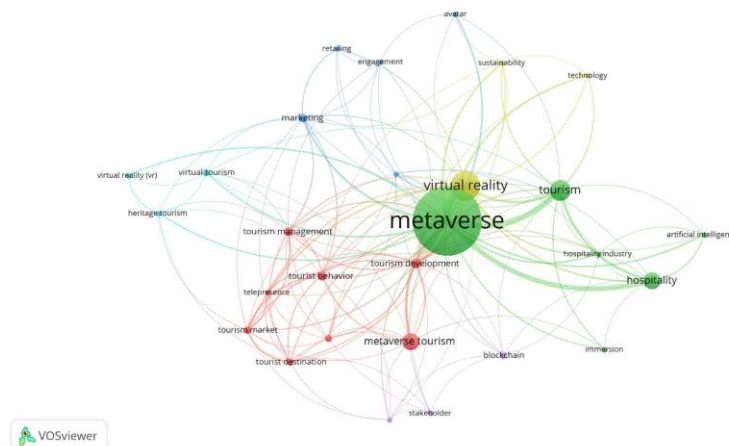


Figure 3. Bibliometric Analysis of The Keywords of "metaverse" and "tourism" OR "tourist" OR "Holiday" OR "Vacation" OR "hospitality"

Further, we conducted cooccurrence keyword analysis in this study by using VOSviewer for a better understanding of visualization through textual data analysis (Bizel, 2023). The node size describes how frequently the words are used, and each color showcases the group of words combined into clusters that connect the relations between one topic and the other (Van Eck & Waltman, 2017).

Four main clusters, green, yellow, red, and blue, are more commonly used keywords than other clusters. The green cluster comprises metaverse, tourism, the hospitality industry, hospitality and artificial intelligence. The yellow cluster consists of virtual reality, sustainability and technology. Then, the red cluster includes tourism management, tourist behaviour, tourism market, tourist destination, telepresence, tourism development, and metaverse tourism. Lastly, the blue cluster represents marketing, virtual tourism, virtual reality, heritage tourism, marketing, avatar, retailing and engagement, as depicted in Figure 3. This highlights that the research theme is still in the nascent phase, and there are opportunities to explore and examine the study.

Figure 4 presents the publications by country. The graph suggests much research emanating in this field from Asian countries. The UK is the only developed country that has more than 10 papers in this field. All other developed countries have fewer than 10 publications.

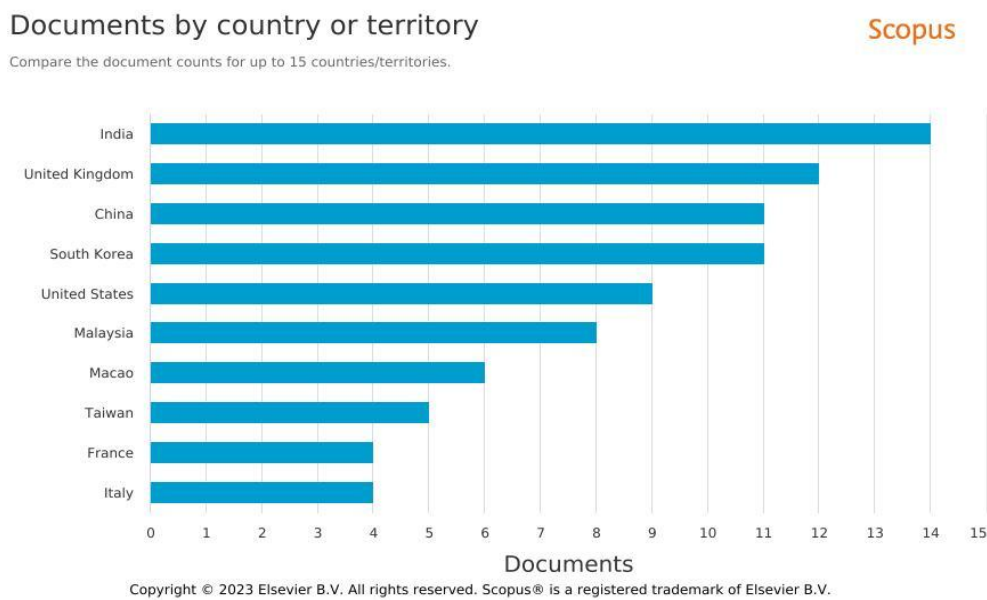


Figure 4. Country-wise Publications
Source: Scopus Database

Figure 5 provides the type of research published on the metaverse and tourism industry. Out of the shortlisted papers, 65.9% were articles, 9.1% were book chapters, 6.1% were conference proceedings, 6.1% were reviews, 2.4% were books, 2.4% were editorials, and 3.7% were notes. Excluded from the initial findings were editorials, letters, notes, and articles written in Russian, Chinese, Italian, Japanese, and French.

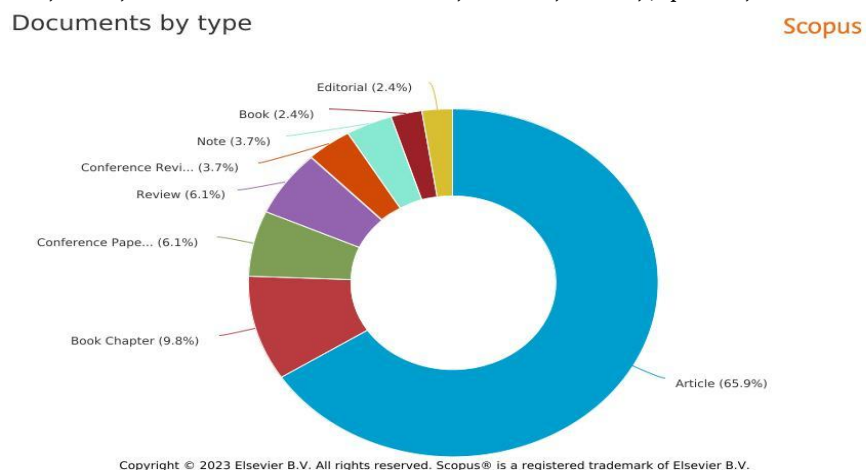


Figure 5: Document types (Source: Scopus database)

Discussion

This study aimed to understand and strengthen mixed tourism in the physical and virtual world in the upcoming metaverse era and to highlight the gaps in the existing literature. This enabled the study to identify future directions for complex requirements, designs and interactions that users will consider in the upcoming metaverse of tourism. To achieve the research objective, the study conducted a systematic literature review of 82 peer-reviewed articles on the metaverse. The results of the literature review show that the metaverse has the potential to revolutionize the tourism industry by offering a combined experience that connects the virtual and physical worlds. The metaverse allows tourists to explore destinations virtually before physically visiting them (Dwivedi et al., 2022; Koohang et al., 2023).

In this way, travellers can get a feel for the place, see the attractions and better plan their itinerary. Virtual exploration allows users to navigate through digital replicas of real-life destinations. They can walk through streets, explore landmarks and get a feel for the local environment through virtual reality (VR) or augmented reality (AR) experiences (Chang & Sokol, 2022; Buhalis et al., 2020; Dwivedi et al., 2023). This immersive preview helps travellers make more informed decisions about which destinations match their interests and preferences. For example, tourist centres such as hotels and resorts can create a virtual tour of their facilities, showing rooms, amenities and the surrounding area. This gives potential guests a realistic preview of the accommodation before they make a reservation. In addition, potential tourists can enjoy virtual tours and exhibitions at museums, historical sites and cultural institutions (Guttentag & Smith, 2017; Gursoy et al., 2022). This enables a virtual cultural experience that can provide a deeper understanding of the destination's heritage and enrich the travel experience.

The study also identified elements of metaverse tourism that improve the customer experience and customer satisfaction. These elements are incentive modalities, accessibility, interactivity, amenities, activities and value-added services. In the context of metaverse tourism, stimulus modalities refer to the various sensory inputs and experiences that contribute to users' immersion and engagement in the virtual environment (Fan et al., 2022). These modalities aim to simulate real sensations and enhance the sense of presence to make the virtual tourism experience more authentic and engaging. The most important stimulation modalities in metaverse tourism include visual stimulation, auditory stimulation, haptic feedback, olfactory simulation and gustatory simulation. In terms of visual stimuli, high-quality graphics, realistic sceneries, and visually appealing landscapes can contribute to visual stimuli (Santoso et al., 2022). Sophisticated graphics and 3D modelling techniques can create lifelike representations of destinations, landmarks, and environments to provide a visual experience for the user. Detailed visual representations, including lighting effects and textures, contribute to the overall sense of presence, making users feel truly present in the virtual tourism space. Auditory stimulation is enhanced by realistic soundscapes, ambient sounds, and accurately reproduced environmental sounds (Park et al., 2023; Chen et al., 2023). Spatial audio technology can help to reproduce sound sources in specific locations, creating a 3D listening experience. Haptic feedback allows users to feel tactile sensations in the virtual world. This can include vibration, pressure or resistance in response to virtual interactions or environmental elements (Sun et al., 2022). For example, potential tourists might feel the sensation of walking on different surfaces or feeling the breeze in the virtual environment. Olfactory stimuli involve recreating scents to evoke a sense of smell in the virtual tourist environment (Cowan et al., 2023). This can increase the realism of the experience by introducing the aroma of specific places, such as the scent of a forest, a beach or a busy market. Taste stimuli are about simulating the taste within the virtual tourist space (Zhao et al., 2022). Even though this technology is difficult to implement, this modality could enhance the virtual culinary experience by allowing users to taste virtual food and drinks associated with specific destinations.

The accessibility element of metaverse tourism focuses on ensuring that the virtual travel experience is inclusive and accessible to a diverse audience, including people with physical or other disabilities (Dudley et al., 2023; Toennissen et al., 2020). This modality aims to break down barriers and make virtual tourism experiences accessible to all. Key accessibility modalities that can improve access to metaverse tourism include inclusive design, adaptive technology, customizable user interfaces and multimodal interfaces. Inclusive design involves design principles that ensure metaverse tourism is accessible to users with different abilities (Zallio and Clarkson, 2022). This includes considerations for navigation, interaction and information presentation. Adaptive technologies that work seamlessly with assistive technologies such as screen readers, voice commands or tools that make it easier for people with disabilities to access and navigate the metaverse should also be considered in future metaverse tourism. The customizable user interface will allow users to adapt the metaverse tourism to their specific needs. This could include customizing colour schemes for better visibility, selecting preferred input methods or configuring navigation settings. The multimodal interface can

also provide flexibility in metaverse tourism interaction by offering different modes of interaction for users with different abilities (Chen et al., 2023). For example, voice commands can be an alternative to traditional input methods and make metaverse tourism accessible to those who have difficulty using a keyboard or mouse.

The interactivity modality in metaverse tourism refers to the level of engagement and interaction that users can experience within the virtual environment (Yoon et al., 2022; Park and Kim, 2022; Zallio and Clarkson, 2022). It comprises a set of features and capabilities that serve to make the tourist experience in the metaverse more dynamic, participatory and responsive to users' actions. Key interactivity modalities that can enhance interactivity in metaverse tourism include user engagement and real-time interaction. User engagement refers to the level of user involvement and interest in the metaverse tourism experience (Albayati et al., 2023). Interactivity aims to captivate users and immerse them in the virtual environment to ensure that they participate in the virtual environment and are not just passive observers. For example, metaverse tourism platforms can offer virtual tours to popular destinations in the form of games. Users can be presented with challenges and tasks related to the place they are virtually visiting. They can earn points or rewards for completing tasks such as finding gems and taking virtual photos. Real-time interaction allows users to immediately engage with the virtual environment and other users (Hennig-Thurau et al., 2023). It facilitates dynamic conversations, collaborative exploration and shared adventures, making the metaverse seem alive and responsive. For example, real-time guided tours can be offered on the metaverse platforms, where users can interact with professional guides, ask questions, and request stops at specific points of interest. The services, facilities and features in metaverse destinations enhance the overall tourist experience. These variables are the amenities in metaverse tourism (Kim & Han, 2022). Virtual transportation, such as flights, trains and tours, will be recreated so you can embark on virtual travel adventures. The virtual modes of transportation are designed to recreate the feeling and excitement of a real trip so that users feel like they are on a journey.

The activity modality in the metaverse refers to the experiences, adventures and activities that visitors can undertake in the virtual environment (Uysal et al., 2016; Go and Kang, 20223). These activities are for exploration, education and entertainment in the tourist destinations of the metaverse. Virtual tours and visits, cultural immersion and interactive workshops are important aspects of the activity modality in the metaverse. Virtual tours are designed to give users the opportunity to explore virtual destinations to a high degree. Potential visitors can navigate through detailed 3D environments, interact with elements and receive informational commentary to enhance their understanding of the place. Cultural immersion activities offer authentic experiences that simulate the traditions, rituals and celebrations of a particular culture. Visitors can participate in virtual festivals, ceremonies and cultural events to learn more about other cultures.

Practical Implications

The paper has important practical implications. These Implications shed light on how metaverse tourism can be implemented, experienced and optimized. Optimizing the elements of metaverse tourism will increase traveller engagement and satisfaction. Travellers can expect more immersive, interactive and personalized travel experiences in the metaverse. They can virtually explore destinations, participate in activities and interact with others, providing a rich alternative to physical travel. Tourism providers can use the metaverse for digital marketing and branding.

Creating an immersive and brand-enhancing virtual environment can attract new customers and provide a unique virtual experience to build brand loyalty. Tourism providers can generate revenue by offering high-quality virtual experiences and diversifying their revenue streams. Virtual goods and souvenirs can be virtually sold to users, creating additional revenue streams. Tourism providers can virtually reduce the cost of physical infrastructure, maintenance, staff and overheads, resulting in more sustainable business operations. Virtual experiences allow travellers to reduce their carbon footprint by opting for virtual travel, contributing to environmental sustainability by minimizing travel-related emissions. The metaverse provides data collection and analytics tools that enable tourism providers to gain insights into user behaviour and preferences that can inform service improvement and personalization. This improves the delivery of relevant content and offers it to potential travellers, optimizing engagement and conversion rates. Metaverse tourism can facilitate practical cross-cultural learning and understanding, which travellers and tourism providers can use to create meaningful connections, share knowledge and foster cultural appreciation. This can promote cultural enrichment and global understanding.

Theoretical Implications

The elements of metaverse tourism, including the metaverse itself, the stimulus modalities, the modality of accessibility, the modality of interactivity, the modality of amenities, the modality of activity, and the

modality of ancillary services, have several theoretical implications for tourism and technology. The elements discussed in this study contribute to the concept of experiential tourism. They provide a theoretical framework to understand how virtual environments can create immersive, memorable, and transformative travel experiences for users. Researchers can investigate how these elements influence users' perceptions and emotional attachment to destinations and experiences. The metaverse elements can inform the development of user experience (UX) and customer satisfaction models in tourism. Theoretical implications include how the design, accessibility, interactivity, and amenities of virtual environments influence user satisfaction and loyalty. Researchers can study user preferences and behaviour in the metaverse. The metaverse and its complex requirements raise questions about the theoretical constructs underlying technology adoption. Researchers can explore the nuances of trust in virtual destinations, the dynamics of social influence, and the path of adoption in metaverse tourism. This can help refine models and frameworks for technology adoption.

Limitations And Future Research Directions

One of the main limitations of this research is the relative lack of research that focuses specifically on the intersection of complex demands, designs and interactions in the context of metaverse tourism. Metaverse tourism is a rapidly evolving field, and research on the complex aspects of its requirements and designs is still emerging. Therefore, it was difficult to find a sufficient number of relevant studies to include in the review, possibly resulting in a limited pool of data sources. There may be a bias in the existing literature with a tendency to publish research findings that show positive results or significant progress in metaverse tourism. Negative results or studies that highlight challenges and limitations may be underrepresented. This bias may affect the comprehensiveness of the review and limit the scope of findings and conclusions.

Furthermore, while there are many conceptual or theoretical papers on this topic, empirical studies that provide concrete data and evidence for the consideration of complex demands, designs and interactions in metaverse tourism are undoubtedly limited. A review paper relies on a body of empirical work to draw evidence-based conclusions, and this limitation may affect the depth of our review's findings. Building on the limitations of this study, researchers can explore the following directions to improve our understanding of this evolving phenomenon further. First, longitudinal studies should be conducted to track the evolution of metaverse tourism platforms and their complex requirements and designs over time. This approach can provide valuable insights into the trends, challenges and opportunities that arise as technology and user expectations evolve. Secondly, researchers can engage in interdisciplinary collaboration between computer science, tourism management, ethics, law and other relevant fields. Interdisciplinary teams can more effectively address the complex and multi-layered nature of metaverse tourism and ensure a well-rounded approach to research and design. Third, researchers should prioritize studies that explore user-centred design approaches, where complex requirements and interactions are designed with the user experience in mind. This research can help ensure that metaverse tourism platforms are intuitive, engaging and meet user expectations.

CONCLUSION

This study systematically reviewed and analyzed the emerging role of the metaverse in shaping future tourism experiences by examining the complex interplay of design, interaction, and technological requirements. Drawing from 82 peer-reviewed publications, the research highlighted how immersive technologies—such as virtual, augmented, and mixed reality—can redefine pre-trip planning, on-site experiences, and post-trip engagement. The identification of key elements such as stimulus modalities, interactivity, accessibility, and ancillary services offers a foundational framework for developing inclusive, adaptive, and engaging metaverse tourism ecosystems.

Theoretically, this study contributes to the evolving discourse on experiential tourism and digital transformation while practically offering actionable insights for tourism stakeholders seeking to integrate virtual platforms into their services. Although the metaverse remains in its nascent stages, its potential to disrupt and enhance traditional tourism models is evident. Future research is encouraged to deepen empirical investigations, explore interdisciplinary approaches, and advance user-centred design strategies that ensure equitable access and sustained engagement within the digital tourism landscape.

REFERENCES

- Albayati, H., Alistarbad, N., & Rho, J. (2023). Assessing engagement decisions in NFT metaverse based on the theory of planned behavior (TPB). *Telematics and Informatics Reports*, 10. <https://doi.org/10.1016/j.teler.2023.100045>
- Bizel, G. (2023). A bibliometric analysis: Metaverse in education concept. *Journal of Metaverse*, 3(2), 133–143.

- Buhalis, D. (2020). Technology in tourism—from information communication technologies to eTourism and smart tourism towards ambient intelligence tourism: A perspective article. *Tourism Review*, 75(1), 267–272. <https://doi.org/10.1108/TR-06-2019-0258>
- Buhalis, D., & Karatay, N. (2022). Mixed reality (MR) for Generation Z in cultural heritage tourism towards metaverse. In J. L. Stienmetz, B. Ferrer-Rosell, & D. Massimo (Eds.), *Information and Communication Technologies in Tourism 2022* (pp. 16–27). Springer.
- 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>
- Buhalis, D., Lin, M. S., & Leung, D. (2023). Metaverse as a driver for customer experience and value co-creation: Implications for hospitality and tourism management and marketing. *International Journal of Contemporary Hospitality Management*, 35. <https://doi.org/10.1108/IJCHM-05-2022-0631>
- Chang, H. H., & Sokol, D. D. (2022). How incumbents respond to competition from innovative disruptors in the sharing economy—The impact of Airbnb on hotel performance. *Strategic Management Journal*, 43(3), 425–446.
- Chen, C., Zhang, K. Z. K., Chu, Z., & Lee, M. (2023). Augmented reality in the metaverse market: The role of multimodal sensory interaction. *Internet Research*, ahead-of-print. <https://doi.org/10.1108/INTR-08-2022-0670>
- Cowan, K., Ketron, S., Kostyk, A., & Kristofferson, K. (2023). Can you smell the (virtual) roses? The influence of olfactory cues in virtual reality on immersion and positive brand responses. *Journal of Retailing*, 99(3), 385–399.
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296.
- Dwivedi, Y., Hughes, L., Baabdullah, A., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M., ... & Wamba, F. (2022). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 66, 102542.
- Dwivedi, Y., Hughes, L., Wang, Y., Alalwan, A. A., Ahn, S., Balakrishnan, J., ... & Wirtz, J. (2023). How metaverse will change the future of marketing: Implications for research and practice. *Psychology & Marketing*. <https://doi.org/10.1002/mar.21767>
- 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). <https://doi.org/10.1186/s40494-022-00749-8>
- Go, H., & Kang, M. (2023). Metaverse tourism for sustainable tourism development: *Tourism Agenda 2030*. *Tourism Review*, 78(2), 381–394.
- 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.
- Guttentag, D. A., & Smith, S. L. J. (2017). Assessing Airbnb as a disruptive innovation relative to hotels: Substitution and comparative performance expectations. *International Journal of Hospitality Management*, 61, 1–10.
- Hennig-Thurau, T., Aliman, D., Herting, A., Cziehso, G., Linder, M., & Kubler, R. (2023). Social interactions in the metaverse: Framework, initial evidence, and research roadmap. *Journal of the Academy of Marketing Science*, 51, 889–913. <https://doi.org/10.1007/s11747-022-00908-0>
- Hollensen, S., Kotler, P., & Opresnik, M. O. (2022). Metaverse—The new marketing universe. *Journal of Business Strategy*. <https://doi.org/10.1108/JBS-01-2022-0014>
- Kandampully, J., Bilgihan, A., & Amer, S. M. (2022). Linking servicescape and experiencescape: Creating a collective focus for the service industry. *Journal of Service Management*. <https://doi.org/10.1108/IJOSM-08-2021-0301>
- Kim, J. J., & Han, H. (2022). Redefining in-room amenities for hotel staycationers in the new era of tourism: A deep dive into guest wellbeing and intentions. *International Journal of Hospitality Management*, 102, 103168.
- Koo, C., Kwon, J., Chung, N., & Kim, J. (2022). Metaverse tourism: Conceptual framework and research propositions. *Current Issues in Tourism*. <https://doi.org/10.1080/13683500.2022.2122781>
- 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.
- Law, R., Leung, R., Lo, A., Leung, D., & Fong, L. H. N. (2015). Distribution channel in hospitality and tourism: Revisiting disintermediation from the perspectives of hotels and travel agencies. *International Journal of Contemporary Hospitality Management*, 27(3), 431–452.
- Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. *Tourism Management*, 77, 104028.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., ... (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Journal of Chinese Integrative Medicine*, 7, 889–896.
- Neuhofer, B., Buhalis, D., & Ladkin, A. (2014). A typology of technology-enhanced tourism experiences. *International Journal of Tourism Research*, 16(4), 340–350.
- Park, S.-M., & Kim, Y.-G. (2022). A metaverse: Taxonomy, components, applications, and open challenges. *IEEE Access*, 10, 4209–4251.
- Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, 92(11), 64–88.
- Pratt, M. K. (2018). Metaverse pros and cons: Top benefits and challenges. *Journal of Metaverse*, 4, 1–20.
- Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality. *Computers in Human Behavior*, 133, 107289.
- Redding, G. (2023). SPRING/SUMMER 2024 Trend Report. *iApparel Journal*. <https://internationalappareljournal.com/trend-report-spring-summer-2024-january-2023-issue/>
- Santoso, H. B., Wang, J.-C., & Windasari, N. A. (2022). Impact of multisensory extended reality on tourism experience journey. *Journal of Hospitality and Tourism Technology*, 13(3), 356–385.
- Stoyanova-Bozhkova, S., Paskova, T., & Buhalis, D. (2020). Emotional intelligence: A competitive advantage for tourism and hospitality managers. *Tourism Recreation Research*, 47(4), 359–371.
- Sun, Z., Zhu, M., Shan, X., & Lee, C. (2022). Augmented tactile-perception and haptic feedback rings as human-machine interfaces aiming for immersive interactions. *Nature Communications*, 13(1).
- Tönnissen, S., Beinke, J. H., & Teuteberg, F. (2020). Understanding token-based ecosystems: A taxonomy of blockchain-based business models of start-ups. *Electronic Markets*, 30(2), 307–323.
- Um, T., Kim, H., Kim, H., Lee, J., Koo, C., & Chung, N. (2022). Travel Incheon as a metaverse: Smart tourism cities development case in Korea. In J. L. Stienmetz, B. Ferrer-Rosell, & D. Massimo (Eds.), *Information and Communication Technologies in Tourism 2022* (pp. 226–231). Springer.
- Uysal, M., Sirgy, M. J., Woo, E., & Kim, H. L. (2016). Quality of life (QOL) and well-being research in tourism. *Tourism Management*, 53, 244–261.
- Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538.
- Van Eck, N. J., & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111, 1053–1070.
- Waltman, L., Van Eck, N. J., & Noyons, E. C. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics*, 4(4), 629–635.
- Werthner, H., & Klein, S. (1999). *Information technology and tourism – A challenging relationship*. Springer.
- Yew, N. K., & Chandrashekar, R. (2023). Analysis of technology foresight for metaverse in the tourism sector by integrating quantitative approaches. *Journal of Numerical Optimization and Technology Management*, 1(1), 9–21.
- Yoon, H., Lee, Y., & Shin, C. (2022). Avatar-based metaverse interactions: A taxonomy, scenarios and enabling technologies. *Journal of Multimedia Information Systems*, 9(4), 293–298. <https://doi.org/10.33851/JMIS.2022.9.4.293>
- Zallio, M., & Clarkson, J. (2022). Designing the metaverse: A study on inclusion, diversity, equity, accessibility and safety for digital immersive environments. *Telematics and Informatics*, 75. <https://doi.org/10.1016/j.tele.2022.101909>
- Zhao, Y., Jiang, J., Chen, Y., Liu, R., Yang, Y., Xue, X., & Chen, S. (2022). Metaverse: Perspectives from graphics, interactions and visualisation. *Visual Informatics*, 6(1), 56–67.