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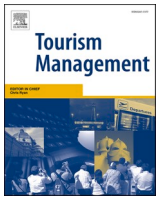

Metaverse as a disruptive technology revolutionising tourism management and marketing

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ABSTRACT

Metaverse is the next disruptive technology that will impact society in the coming decades, by enabling immersive experiences in both virtual and physical environments. Although still conceptual, Metaverse converges the physical and digital universe, allowing users to seamlessly traverse between them. Digital immersion offers opportunities for people to travel in time, supporting users to experience virtually ancient encounters, space explorations or dangerous natural phenomena, such as volcano eruptions. Users can explore immersive environments for working, learning, transacting, exploring interests and socialising with others. This is already evident in gaming ecosystems, where gamers effectively interact in the metaverse. Although still experimental, Metaverse is expected to revolutionize travel and tourism management and marketing. It empowers destination awareness, positioning and branding, as well as coordination and management, through digital twins. Metaverse provides opportunities to support trip planning, interaction and engagement, effectively transforming consumer behaviour. Visiting and engaging with destinations virtually is expected to motivate real travel, rather than replace it. This paper provides a vision of how Metaverse can revolutionize tourism experiences and transform tourism management and marketing. Drawing on a systematic review of scholarly works, articles from media and industry reports, this study defines and conceptualizes the Metaverse ecosystem for tourism and travel. It explores the foundations of the disruptions that Metaverse brings to tourism destinations and organisations and identifies the building blocks of Metaverse tourism. The study outlines research directions so that the tourism industry can take full advantage of the Metaverse capabilities and opportunities emerging as well as identify challenges for the future.

1. Introduction

Information and Communication Technologies (ICTs) have been revolutionising the base of competition by creating considerable disruptions in the tourism industry (Werthner & Klein, 1999). The advent of Global Distribution Systems (GDSs), such as Amadeus and Sabre in the 1980s, provided travel agencies with convenient platforms to collect information from various suppliers and reserve flights, hotels, and railways for consumers (Aamir & Atsan, 2020). The Internet disrupted and radically transformed the strategic and operational practices in tourism in the late 1990s (Buhalis, 2003). Extensive networks and smartphones developed a smart infostructure that revolutionizes travel and tourism (Buhalis, 2020) Through empowering destinations, hotels, airlines and others to promote their products to international travellers, the Internet supports tourism suppliers to distribute directly, reducing dependence on intermediaries and empowering their competitiveness (Law et al., 2015). Nevertheless, technology platforms fuel the development of new disruptive threats through the sharing economy (e.g., Airbnb, UBER etc) (Buhalis et al., 2020; Chang & Sokol, 2022; Guttentag & Smith, 2017).

The rapid development of smartphones and mobile commerce demonstrated their potential in enabling disruptive changes in tourism (Wang et al., 2016). Smartphones empower context relevancy, empowering the co-creation of value in real-time and within context (Buhalis, 2020). Engaging customers to participate in firm-owned mobile app activities can increase their purchase amount and frequency (Jang et al., 2021). The development of 5G + mobile networks and the Internet of Everything (Porter & Heppelmann, 2014) enables three-dimensional (3D) simulation and empowers the functionality of immersive technologies, such as mixed reality (MR), augmented reality

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(AR) and virtual reality (VR) (Rauschnabel et al., 2022). This provides unprecedented opportunities for tourism management and marketing as well as for engaging with multiple stakeholders immersively. Tourists can preview tourism destinations and services before purchasing whilst they can complement real experiences at the destination (Loureiro et al., 2020; Rauschnabel, 2022). Metaverse has drawn much attention after Facebook changed its name to Meta and repositioned its business around the Metaverse (Glover, 2022; Pew Research Center, 2022).

In this paper Metaverse is defined as the convergence of physical and digital universes, where users can seamlessly traverse between them for working, education and training, health, exploring interests and socialising with others. Metaverse is still largely conceptual and not clearly executed. Only in gaming there is already clear evidence of mainstream adoption by gamers (Katz, 2022). Academics from different disciplines work closely together to define, structure, organise and visualise the future of Metaverse (Dwivedi et al., 2022, 2023; Koohang et al., 2023). The current iterations of Metaverse allow users to create their avatars and explore different resources on digital platforms.

The true potential however can be achieved when digital environments support people to enjoy hyper-realistic virtual conversations, experiences, and transactions. The potential benefit of digitization was evident when COVID-19 forced most people around the world to meet, learn, socialize, consult and engage using online meeting platforms. However, this was two-dimensional, confusing and often felt unreal. The innovations and opportunities emerging from immersion allow users to interact naturally in both physical and digital environments. Lundmark (2022) explains *"By 2030, every physical device that can be digitally connected will be. Eventually, every action in the digital world will have an effect on the physical world, and vice versa. So, the metaverse isn't dependent on a virtual reality headset. Rather, it's the coming together of complementary technologies, including cloud and edge (near the data source) computing, artificial intelligence, blockchain, the internet of things, virtual reality, augmented reality and digital twins."*

Dwivedi et al. (2022) suggest that *"The metaverse has the potential to extend the physical world using augmented and virtual reality technologies allowing users to seamlessly interact within real and simulated environments using avatars and holograms. Virtual environments and immersive games (such as Second Life, Fortnite, Roblox and VRChat) have been described as antecedents of the metaverse and offer some insight to the potential socio-economic impact of a fully functional persistent cross platform metaverse"*. Metaverse enables users to communicate more expressively, via using hand gestures and showing body movements. Hence, it is often considered as an embodied Internet that can create an amplified sense of presence and make online interaction closer to the real world (Clegg, 2022). Metaverse, therefore, is expected to bring a range of innovations and disruptions in every aspect of life. This brings societal and cultural implications, as well as provides transformative opportunities and challenges for marketplaces and communities around the world (Dwivedi et al., 2023).

Metaverse is still largely a conceptual development rather than a commercial reality. Although still conceptual for most of the population, many have made metaverse their reality already. Pero (2022) explains that "brands like Fortnite, Meta, and Roblox, the metaverse is making an obvious impact on the way we socialize, shop, and play." He suggests that "there are two kinds of general kind of populations with the metaverse. There's what I call the metaverse natives, and the metaverse colonists. The metaverse natives are typically under 21, and their whole lives, they've grown up with interactive online gaming … they feel as comfortable, or more comfortable, socialising in digital spaces than they do in the real world. The metaverse colonists, naturally, live on the other side of that digital divide. The colonists think there's just a digital world, and the physical world — and the digital world is less than the physical world." (Pero, 2022).

Many news articles and industry reports explore the prospects and illustrate the business potential of Metaverse (e.g., Dwivedi et al., 2022; Dwivedi et al., 2023, Lundmark, 2022, Morris, 2022). However, details about how this disruptive technology may revolutionize consumer behaviour and management practices are limited. Many people have challenged that Metaverse is nothing but old wine in a new bottle because it resembles past technologies, such as Second Life (Dailey, 2021; Sparks, 2021). Many business leaders such as Elon Musk (Chief Executive Officer, of Tesla) and Reggie Fils-Aim (Former Chief Operating Officer, of Nintendo America) opined that Metaverse is more of a marketing buzzword than a practical concept (Dailey, 2021; Ellis & Chang, 2022). While many people conceive Metaverse as an elusive idea, Mark Zuckerberg from Meta lauded Metaverse to be *"the next chapter for the Internet"* (Newton, 2021). Raja Koduri from Intel also foresees that Metaverse will be the next major computing platform after the Internet and mobile (Intel, 2021).

The World Economic Forum (2022) acknowledged that tourism is one of the key areas that can benefit from Metaverse. Gursoy et al. (2022) postulate that consumer behaviour in Metaverse will be different because consumers can access more and broader virtual resources. By providing users with immersive experiences before travel and augmented content when they are physically at the destination (Yovcheva, Buhalis, Gatzidis, & van Elzakker, 2014), Metaverse is envisioned to enhance travellers' real experience (Buhalis et al., 2022). It will be disruptive because it empowers travellers to access virtual resources and digital environments when they are away from the destination. This allows them to pre-visit tourist attractions and facilities to assess their desirability and suitability. Metaverse is expected to enhance their experience when they are physically at the destination as they will be better prepared (Dwivedi et al., 2022; Koo et al., 2022). Metaverse allows travellers to use immersion to sample tourism destinations and organisations virtually before they arrive (Buhalis et al., 2022). Metaverse tours are built on existing virtual tours that use 360-degree or 3D media modality technologies. They allow avatar embodiment as well as psychological and physiological immersion through facilitating synchronous interaction with other agents and objects in a virtual destination (Chen & Yao, 2022; Tsai, 2022).

Whilst physically at the destinations, Metaverse empowers access to virtual resources to enhance customer experience and destination interpretation. For example, visitors use Extended Reality (XR) gadgets to experience an ancient ceremony in an archaeological temple or a volcano eruption (Rauschnabel, 2022). Being able to use XR whilst at the destination revolutionize engagement and also support the personalisation and contextualisation of immersive and media-rich content (Rauschnabel et al., 2022). Gursoy et al. (2022) suggest that Metaverse affects the staging of tourism experiences and consumer behaviour, leading to developments in marketing and operations strategies. Metaverse is also expected to motivate more travel and tourism activity. People who experience destinations and tourism activities virtually tend to be motivated to visit physically. After the visit, Metaverse supports users to engage with places they have already been, share User Generated Content (UGC) in immersive platforms and stay in contact with people they have met, motivating repeat visits and loyalty.

This study aims to conceptualize Metaverse in tourism and to build its foundations leading to a future research agenda. The paper reviews Metaverse-related publications and elucidates how Metaverse revolutionizes tourism experiences whilst examining the pertinent disruption in tourism management and marketing. It also provides tourism practitioners with the solid foundational knowledge to devise appropriate practices for embracing this technology in their businesses and future developments. As Metaverse is in its infancy the study focuses on visualising the opportunities. There are very limited scientific publications about Metaverse across disciplines and all were considered in this study. The authors gathered all scholarly works about Metaverse from ScienceDirect, EBSCOHost and Emerald during the period November 2021–December 2022. The authors also used Google Alerts to solicit new Metaverse-related content. An in-depth analysis was performed, drawing on the synthesis of content from prior scholarly works, articles from news media and industry reports. Once resources were retrieved,

authors perused, analysed and synthesised the content of publications. The individual syntheses made by authors were cross-compared. Several meetings were held to discuss how the syntheses should be arranged and presented until a consensus was reached.

2. Metaverse: concepts, definitions, and dimensions

As a portmanteau of "meta" (meaning "beyond" in Greek) and "universe", Metaverse is a term coined by Neal Stephenson in his 1992 science fiction novel *Snow Crash*. According to the illustration in that novel, Metaverse is an all-encompassing virtual world that exists in parallel to the physical world. This is more accurately reflected in the term "digital twin". By adding an augmentation layer to the physical world and combining virtual and physical universes into a seamlessly connected one, Metaverse emerges as a lifelike immersive virtual world. This is where people can seamlessly traverse for working and socialising, using gadgets that can support immersive technologies, such as MR/VR headsets and smart glasses (Zhang & Ye, 2021). Dwivedi et al. (2022) explain that *"immersive and interactive multimedia style online games have been available for a number of years, allowing users to experience social interaction within a virtual world using VR headsets and avatars."*

Though Metaverse was coined in 1992, there appears to be no agreement on its universal definition. Davis et al. (2009, p. 91) defined Metaverse as *"an immersive three-dimensional virtual world in which people interact as avatars with each other and with software agents, using the metaphor of the real world but without its physical limitations."* Buhalis and Karatay (2022) defined Metaverse as a seamless convergence of digital and physical universes that use ambient intelligence to enhance physical spaces, products and services. Using the virtual universe, namely OASIS, featured in the film Ready Player One as an example, Sparks (2021, p.18) states that Metaverse can solely be considered as *"a shared online space that incorporates three-dimensional graphics, either on a screen or in virtual reality."* Moy and Gadgil (2022, p. 3) from J.P. Morgan define Metaverse as *"a seamless convergence of our physical and digital lives, creating a unified, virtual community where we can work, play, relax, transact and socialize."* Damar (2021) defined metaverse as a *"3D virtual shared world where all activities can be carried out with the help of augmented and virtual reality services" describing the metaverse as "the layer between you and reality."* Most Metaverse definitions explain it as a virtual world, that simulates the real world, providing a space for interacting with other users in an immersive environment (Dwivedi et al., 2022). Although some people posit that Metaverse refers to the virtual universe only, existing definitions mostly conceive Metaverse as a confluence of virtual and physical universes. Hence, Metaverse is radically different from past technologies in three dimensions.

Functionality: Metaverse takes advantage of an immersive virtual world, where people can work and socialize with other users, using avatars, MR/VR headsets and other compatible gadgets. Unlike virtual worlds or VR gaming platforms, which often provide confined functions and social interaction for users, Metaverse can allow users to freely communicate and socialize with others in a pseudo face-to-face setting. Just like what Mark Zuckerberg presented at Meta's (2021) annual conference, users can freely attend meetings, reply to emails, attend concerts and shop. Metaverse, therefore, mirrors real life in a virtual world. Metaverse is not a standalone technology, as various ICTs work seamlessly together in the convergent universe (see Fig. 1). Instead, Metaverse can amalgamate a range of existing ICTs, enabling users to operate them simultaneously (Dwivedi et al., 2022).

Interoperability: Second Life, a three-dimensional virtual world founded by Linden Lab back in 2003, is often considered as the closest iteration of Metaverse. This is because Second Life allowed users to outfit avatars, build/buy mansions, and attend conferences/concerts. While Second Life and Metaverse are ostensibly similar, the former is a finite virtual world operating independently. Akin to living in a walled garden, users of Second Life could only traverse and socialize with other users of the same virtual world (Chow, 2021). Contrary to Second Life, Metaverse provides an interoperable environment for users to network and socialize. Since users' accounts/profiles are platform-agnostic, they

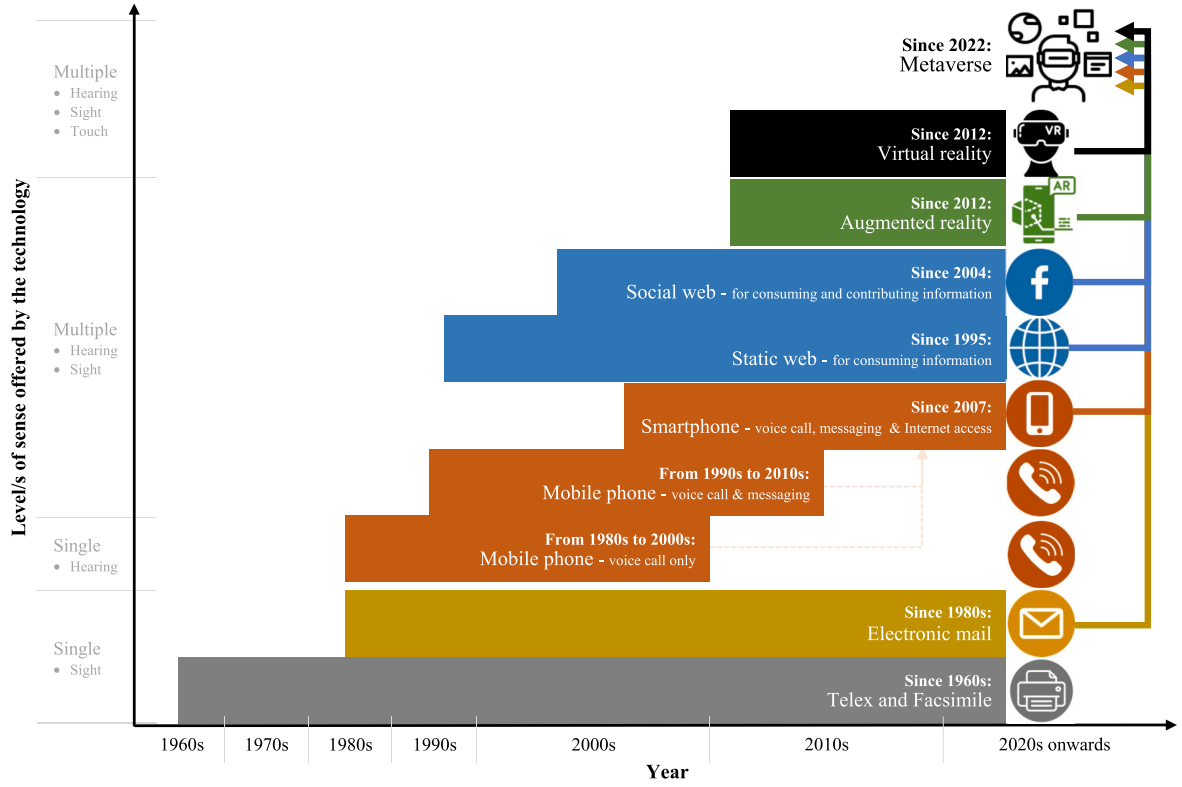

Fig. 1. Evolution of information and communication technologies.

can traverse and network with other users across different virtual worlds (e.g., Horizon World, Sandbox and Roblox). That creates unprecedented marketing opportunities (Dwivedi et al., 2023).

Immersiveness: The levels of sense offered by Second Life and Metaverse are also profoundly different. When Second Life was introduced, users could hardly acquire the sense of touch and immersion in the virtual world, due to the absence of compatible hardware (i.e., MR/VR headset). Users could at best enjoy the senses of sight and hearing, over the two-dimensional flat screen of computers in Second Life, while the sense of touch was not in play (Feigenson & Spiesel, 2009). With full-spectrum MR/VR headsets, tactile-responsive haptic gloves and sensory clothing, Metaverse empowers immersion for users to watch the scene, hear the sound and give the sense of touch, whilst interacting with others (Pero, 2022). Metaverse also enables users to immerse into the virtual world by providing them with haptic cues and multi-sensory reference points. Since Metaverse can help create a strong sense of presence and embodiment for users, the vividness of imagination can be enhanced. Hence, Metaverse is expected to be more efficacious in imagination inducement and fantasy creation.

Many international firms have already acknowledged the business potential of Metaverse and started investing in this space. For example, J.P. Morgan established its first bank branch in the Metaverse and started servicing customers in February 2022 (Shevlin, 2022). Luxury brands, such as Gucci and Ralph Lauren, also developed virtual stalls for selling digital clothes in Roblox (Wong, 2022). Besides those firms, hotel groups such as CitizenM and EV Hotel Corporation start developing virtual hotels in Sandbox to engage with like-minded hotel customers (Sheper & Speros, 2022). Restaurant chains, such as McDonalds, have already filed applications to the US Patent and Trademark Office and indicated their interest in opening virtual shops in the Metaverse (Inc., 2022). SITA, the leading airline industry provider, already develops Metaverse solutions and predicts that "By 2030, metaverse operations will be commonplace at leading airports, playing a vital role in optimizing processes, avoiding disruption, and facilitating intuitive, immersive control of intelligent airports. Metaverse training courses for operational staff will ensure an in-situ experience in an immersive and realistic simulated environment. VR and AR will be used for auxiliary and off-site working processes, engaging workforces remotely in an efficient and stimulating format." (SITA, 2022). Given these investments, Metaverse is expected to be the next major disruptive technology in the coming decades.

3. Metaverse disruptions to tourists' behaviour and experience

The advent of the Metaverse magnifies the social connections among consumers, other consumers (or so-called peers), and suppliers in the tourism industry ecosystem (Tsai, 2022). Collaboration among these three parties is also facilitated in the Metaverse co-creation space (Fig. 2). Travel planning is one of the areas that is disrupted dramatically, as Metaverse provides tools to stimulate travel inspiration and to support decision-making in digital twins. Visual UGC published by past travellers, on social media, has long been recognised as useful information for prospective travellers to inspire their travel dreams or ideas (Meier et al., 2020). Photos and videos can convey intangible experiences from past travellers to viewers. However, the dearth of haptic cues in those stimuli may lead to failure in eliciting viewers' mental imagery and sense of presence (Alyahya & McLean, 2022). Tourism products and experiences are difficult to be evaluated. Due to their intangible nature, tourists often collect UGC from different sources to experience and compare possible options, whilst avoiding making poor purchase

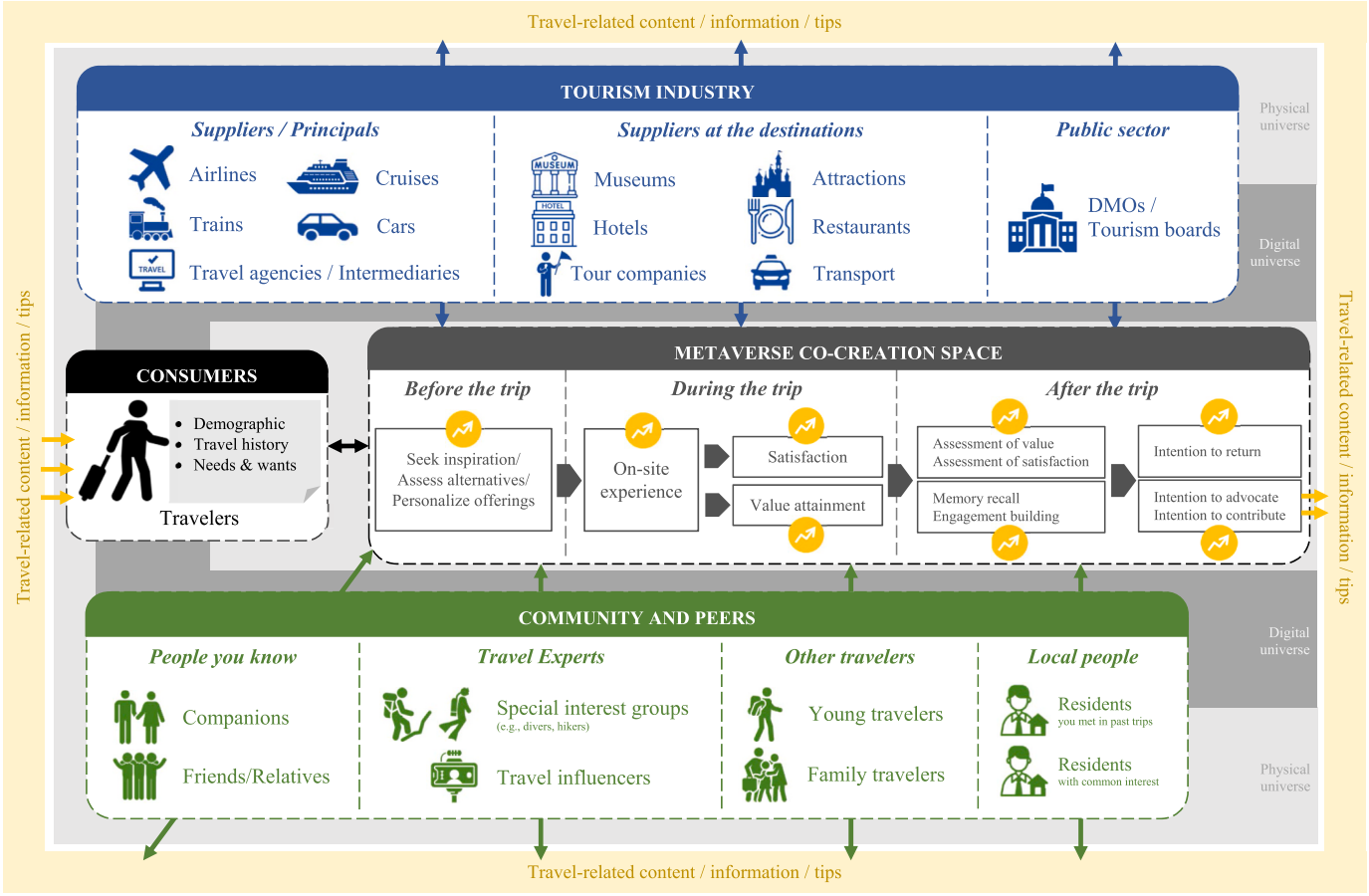

Fig. 2. Metaverse tourism ecosystem.

decisions. UGC such as textual reviews and numeric ratings have provided useful references for tourists to assess the alternatives. These however may not be representative of the general consensus opinions due to the under-reporting problem or subjective interpretation (Koh et al., 2010).

The timeliness of UGC is another concern. Travel-related UGC is mostly asynchronous as content is reviewed after the trip of the content generator. The conditions of the reviewed destination, hotel, attraction or restaurant may be different since the content was published. Prospective travellers struggle to acquire representative and timely information for optimizing their trip planning. Viewers can only seek travel inspiration if past travellers have shared their visual content and stories. The viewers' role is relatively passive because they can only wait and wish someone would generously share the content. Often the content is located in different applications and platforms and it is not always easily searchable or accessible.

Before travelling, Metaverse supports digital twins and other interface facilities so consumers have the opportunity to explore alternatives in an immersive environment (Dwivedi et al., 2022). Hence, Metaverse offers the opportunity to prospective travellers to experience destinations and facilities virtually. Site visits in the physical world can be closely re-created in the virtual world. This is similar to how Google digitally recreated historic sites and exhibits in its Arts & Culture project. Using immersive technologies (e.g., VR headset, sensory clothing) users can experience tourism destinations and products through immersive videos or virtual tours available in Metaverse. Metaverse tours use technologies to enable psychological and physiological immersion (Chen & Yao, 2022; Tsai, 2022). Experimenting and assessing travel alternatives immersively can facilitate experiential consumption, such as sky-diving. Navigating through a digital twin, which can replicate a destination or a tourist, hospitality or cultural heritage facility, empowers users to select which is the most suitable for their needs and preferences. Hence, users can vividly sense past travellers' intangible experiences and immerse themselves in past travellers' journeys. They can equally experience marketing content from tourism destinations and organisations (Dwivedi et al., 2023). The immersion and high vividness should enable viewers to facilitate sense-making (Deng et al., 2019).

Metaverse enables tourists to use an immersive environment to pre-experience hotels'/restaurants' service-scape and acquire lifelike visitation experiences prior to purchasing travel (Flavián et al., 2021). This would allow tourists to proactively find content from different parties, acquire insider information, personalise their experience and understand the status quo of their desired places. By empowering tourists to acquire a realistic preview and pre-experience different alternatives, Metaverse can effectively help tourists to reduce their travel anxiety and therefore can revolutionize media-induced travel inspiration. Tourists can solicit immersive information from people they know (e.g., friends/relatives) and other travellers (e.g., travel influencers) who have been to the chosen destinations (Fan et al., 2022). They can also connect with local residents or experts in the destinations they plan to visit or tourism authorities and organisations, such as tourism boards, hotels, attractions, guides or incoming agents and engage in conversations using immersive media.

Using Metaverse to customise travel offerings provides a higher level of autonomy and involvement in value cocreation (Turner et al., 2020). Travellers can customise their experience by giving a series of verbal commands to voice assistants and by navigating their engagement and interaction (Morrison, 2022). Tourism suppliers can leverage their digital stores in the virtual world to promote their offerings and tailor-make value for individuals. Tourists are therefore empowered to enjoy highly-personalized and involved immersive experiences. If the process and outcome of this co-design experience are satisfactory, tourists can obtain a higher level of intrinsic enjoyment and overall satisfaction (Turner et al., 2020).

During travelling and whilst on-site, Metaverse can augment the traveller experience. Tourists enjoy both face-to-face and online social contact when travelling (Fan et al., 2019). Metaverse assists tourists in acquiring augmented textual or/and audio-visual information when they arrive at the destination or cultural heritage and historical places. This is similar to the way in which AR is applied in museums and attractions (Buhalis & Karatay, 2022; Fenu & Pittarello, 2018). Taking Macao's Ruins of Saint Paul's as an example, if a tourist who arrives at that attraction wants to know its original layout and how the fire in the year 1838 destroyed the building, he/she can harness the MR headset to "experience" a near realistic timeline of that period. Photorealistic rendering and 3D mapping of heritage sites and historic locations can help with the renovation, and create a record in the case of disaster. They also give the opportunity to visitors to experience destinations virtually across the centuries. Through empowering on-site tourists to travel backwards and forwards in time, Metaverse provides the bridge between physical and virtual for seamless experiences. Hence, users can visit cultural heritage sites, natural attractions, landmarks and artefacts to effectively go on the "time machine". They can experience how something was in the past or participate in virtual ceremonies in ancient times.

Metaverse effectively supports users to become active participants or virtual actors in the context they choose to be. In restaurant settings, AR and Metaverse can add edutainment elements into food tasting, when tourists attempt unknown dishes. Tourists not only taste the food but also enrich their knowledge about their selected dishes, by displaying ingredients, cooking methods, production process and edible value of the dishes on the screen of their viewing device (Rejeb et al., 2021). They can also immerse themselves in the cooking processes and experience the entire value chain. In the destination context, Metaverse can help users to appreciate destinations and resources by experimenting with different forms of deterioration owing to over-tourism and climate change (Bec et al., 2021). Therefore, Metaverse is expected to help advance the on-site visitation experience to the next level.

After travelling Metaverse can be used for recalling experiences, documenting and sharing UGC, expanding knowledge and engaging with others with similar experiences. Users are able to "re-live" past experiences and shared content and resources with their close social circle. They can also share content with anybody who may be interested in the destination, with immersive media-rich reviews. For example, someone who has visited Acropolis in Athens can share their own content. They can also enjoy a virtual visit to an Ancient Greece ceremony in the temple. This can be shared with their social circle or with other interested parties. Metaverse can lead to memory recalls and increase the intention to return to the destination for both users and also others that experience immersive content. Engagement with tourism material can increase the intention to advocate tourism destinations and organisations as well as to engage with local resources leading to transformative experiences. Go and Kang (2023) suggest that "producing licensed and profitable metaverse tourism products and experiences could increase profitability for tourism destinations and should be developed in accordance with the UNWTO Sustainable Development Goals (SDGs)".

Will Metaverse substitute or stimulate physical travel? This is a question frequently asked about VR and now about Metaverse. The COVID-19 outbreak situation forced severe travel restrictions. The world witnessed many physical functions that entail travel such as conferences, business meetings, and exhibitions to be "replaced" by virtual meetings/travels. Equally many had to use virtual means to connect with loved ones and maintain family and friend relationships. On the leisure travel front, virtual escapes were employed by people watching travel films, live streams from destinations and documentaries. As soon as restrictions were lifted, essential business travel recovered faster than leisure travel, as people realised the importance of physical presence. Nevertheless, people also realised the value and benefits of hybrid environments for convenience, sustainability and cost control. Technology cannot make virtual travel fully replace real travel. Metaverse stimulates more physical travel, as technologies become more advanced and entice

travellers.

However, Metaverse may also provide a feasible form of some travel replacement and supplementary, encouraging people to use virtual and physical travel on different occasions. Disabled people with particular impairments may be empowered to virtual travel experiences (Rubio-Escuderos et al., 2021). Metaverse can also empower those who are unable to experience destinations and resources for a range of reasons. It supports disadvantaged groups with economic, physical or/and social constraints to experience virtual travel (Schiopu et al., 2022; World Economic Forum, 2022). For example, business or government executives, as well as renowned scholars, who have extremely busy work schedules can take advantage of virtual travel and participate in multiple activities, across different locations time-effectively. Enterprises also can meet and discuss collaboration plans over the Metaverse. This can reduce travel expenses, increase efficiency, reduce carbon emissions and improve sustainability. Increasingly, hybrid environments will be used for a range of professional and leisure contexts and tourism will not escape this global trend (Pero, 2022).

4. Metaverse disruptions to tourism management and marketing

Metaverse offers an immersive, dynamic and innovative digital platform for showcasing tourism destinations, attractions, events and hospitality services. From the tourism suppliers' standpoint, Metaverse provides a powerful avenue to promote products and services through immersive engagement. It supports organisations to enrich their knowledge about prospective consumers' needs, wants and preferences. Tourism destinations and service marketers can harness this innovative technology to showcase their attractiveness in the virtual universe. Metaverse evolves rapidly and *"offer firms new opportunities for extensive brand engagement and potential for direct sales at scale"* (Dwivedi et al., 2023). Consumers can also co-create products, services and experiences with businesses in the virtual world. Metaverse offers the opportunity for around-the-clock, digital and physical service provision supporting the customer experience. Buhalis (2020) stresses that smart and highly competitive businesses shall harness *"interconnectivity and interoperability of integrated technologies to re-engineer processes and data in order to produce innovative services, products and procedures ensuring stakeholder value maximisation."* Metaverse, therefore, emerges as the new competitive battleground for tourism destinations and organisations.

Destinations can re-create their digital twins and attractions in the virtual space and augment information about the history and attractiveness (Bec et al., 2021). Using photorealistic rendering to create immersive virtual experiences can induce prospective travellers' interest in visiting real destinations and purchasing tourism products and services. Immersive storytelling stimulates engagement and produces edutainment. Besides promoting well-known attractions, destination marketers can also use Metaverse for sustainability; by introducing attractions with low visitation flows to prospective tourists, and decongesting honeypots (O'Regan et al., 2022). Destination Marketing Organisations can also replicate international brands, such as Ralph Lauren, Hermès and Nike, and establish digital shops for selling digital travel products (e.g., digital attraction tickets and tours) for people before arriving as well as promote products and services at the destination (Dwivedi et al., 2023). Hotel firms can conduct meta-advertising and lease digital billboards of their Metaverse properties to other companies for placing digital advertisements. Hotel firms can publicise their brands and increase their brand awareness in the virtual space whilst offering virtual tours and personalisation (Buhalis et al., 2023, eMarketer, 2021; Hollensen et al., 2022). Taking advantage of immersion, they can organise virtual tours and experiences, whilst engaging in real-time conversations with concierge or sales executives on the platform.

Metaverse empowers the co-creation of immersive virtual event experiences. The COVID-19 pandemic outbreak gave a hard hit to the MICE sector in particular. Physical events, concerts, conferences and exhibitions were cancelled due to restricted mobility. Many events organising companies managed to change their events into a hybrid (fully or partially) virtual format. This allowed audiences in remote locations to join virtually, without physical travel or presence. While tools, such as Zoom and GoToMeetings, can facilitate real-time information exchange, the low sense of embodiment offered made virtual attendance incomparable to on-site ones (Cui & Mousas, 2021). Metaverse is immersive in its nature. Hence, it empowers users to watch the scene and hear the sound but also gives the sense of engaging, interacting and touching in the digital world. Metaverse can therefore help create an unprecedentedly strong sense of embodiment for users, through immersive virtual events and experiences. Baidu successfully utilised its developed Metaverse platform "XiRang" for hosting its annual developer conference (SCMP, 2021). The NBA (2021) has been making some games available on Horizon Venues, letting VR-headset users watch basketball games at the courtside. Drawing on these real-life examples, leveraging Metaverse as an event venue is indeed a viable idea.

Metaverse can be used for the development of facilities and service prototypes. Developing virtual facilities, attractions, activities and destinations is faster, cheaper and more flexible, than constructing physical facilities. Destinations can leverage Metaverse to develop attraction prototypes, invite people to gain lifelike experiences, using their MR/VR devices, and solicit their feedback for further improvement. Many aspects are easily adjustable, so tourism organisations can test several iterations virtually before deciding what the preferred option to be constructed is (Rauschnabel et al., 2022). Through employing Metaverse to involve and acquire input from prospective travellers, this proactive collaboration is expected to help identify more consumer-centric design and ultimately lead to value co-creation.

Metaverse supports market intelligence and facilitates research and development. Similar to website browsing, travel blog writing and travel photo uploading, users leave digital footprints when entering the Metaverse and interacting with others. These big data can enrich tourism suppliers' knowledge about who their customers are and what they need. Tourism suppliers can proactively use Metaverse to engage in conversation, convert sales, and transform the data pertinent to their customers into business insights. Attribution can identify touchpoints and evaluate different methods to improve conversion (Buhalis & Volchek, 2021). These insights empower suppliers to provide consumers with the right product in the right place at the right time (Stylos et al., 2021). Simulations of tourism behaviour and preferences can also explain travel routes, paths and patterns.

6. Challenges and threats emerging through Metaverse for Tourism Management and Marketing

This research defines and visualises value co-creation through Metaverse and the potential opportunities and benefits emerging. However, Metaverse also brings a range of challenges and threats that can potentially lead to value co-destruction for several tourism stakeholders in the ecosystem. Analysts fear that Metaverse may fuel confusion about what is real and what is not and will blur reality. That leads to a decline in critical thinking and imagination jeopardising the ability of users to reflect on their experiences. Many of these challenges are related to the development of successful innovation in uncharted waters. This uncertainty can be compared to the starting of any disruptive innovation, such as the Internet, mobile phones, smart and ambient infostructure, and smart tourism, in the last 25 years (Buhalis, 2020). Challenges can be classified into technological, economic, consumer experience and ethical and legal challenges.

Technological challenges emerge since Metaverse is still largely conceptual, rather than operational. Platforms are gradually being developed and some organisations take infant steps in exploring their virtual presence. There is no blueprint or best practice examples and platforms and solutions are expensive and risky (Dwivedi et al., 2022, 2023). Tourism destinations and organisations need to take the leap of faith, work with innovators from different industries and develop their

virtual presence and digital twin. This process is a frontier-land investment and requires creativity and ingenuity, sufficient funds and an appetite for risk. The gamification of the tourism ecosystem (Xu and Buhalis, 2021; Xu et al., 2017, 2016) is the only possible compass on this journey as gaming is the only industry that has reached this level of virtuality. Hence tourism organisations should also invest in platform-related development and user acquisition costs to attract individuals.

This leads to economic and consumer experience challenges. Tourism destinations and organisations around the world often lack the economic and technological resources to invest in these developments. This may disadvantage peripheral and impoverished regions and businesses from accessing cutting-edge platforms. Many users may also find getting into the Metaverse challenging, due to the cost of equipment (e.g., VR/MR headset, sensory clothing). Meta's newly introduced MR headset (namely Meta Quest Pro) costs as high as USD1,500. This creates obstacles for users without high levels of desire and clear purposes to give it a try (Pitt, 2022). Hence individuals and businesses have to plan an initial investment to join the Metaverse experience. Such an initial investment may amplify inequality in the real world, where under-representative groups cannot enjoy the benefits of new technology due to financial challenges. The high acquisition equipment cost may even amplify the problem of the digital divide since many organisations and potential users will be excluded due to financial constraints. "Even for those who can afford the high cost of acquiring those requisite gadgets, they should not underestimate the possibility of getting motion sickness when fully immersing into virtual spaces for a long time (Pratt, 2022)." Some groups of individuals can have challenges engaging in the immersive experience.

Ethical and legal challenges also emerge in virtual environments, as they may harbour illegal, immoral or unethical behaviour, and required appropriate legislation and policing. This is particularly complex in tourism since users make cross borders and applicable laws may be location-based. Harassment, aggressive behaviour, cyberstalking, death threats and assaults of any kind are often observed in virtual environments where people hide behind their virtual personas and adopt behaviours that would not follow in their physical presence. Fraud and cybercrime, money laundering, terrorism, gambling, drug abuse, prostitution pornography, and child abuse are also crimes and law enforcement challenges in the Metaverse (Qin et al., 2022). The potential bullying and harassment behaviours in the virtual universe are another critical challenge. In May 2022, several users of Horizon World reported their avatars were raped or sexually harassed (Soon, 2002). Metaverse may also lead to addictive behaviours. Compared to traditional Internet experience, Metaverse can blur the boundary between the physical and virtual environment and offers illusive experiences that users cannot easily distinguish. More addictive behaviours may be observed if users try to use Metaverse as an escape. Excessive participation in digital activities and playing virtual games may lead to addiction and abuse. The World Health Organisation added "gaming disorder" to the 2018 version of its medical reference book, the International Classification of Diseases.

Businesses and platforms need to adopt comprehensive precautionary measures and protective measures to mitigate potential negative impacts. Meta, for example, added a function called Personal Boundary for users to have more control over their Metaverse experience. Hence, intellectual property and infringement of copyrighted content need to be addressed in the virtual universe to protect tourism brands and destinations. Metaverse cannot be free of privacy concerns and security issues. Individuals and organisations need to address privacy and security risks. For example, do virtual identities in Metaverse relate to the users' real identity? Can businesses and platforms be allowed to hold and save the massive amount of information generated in the extensive interactions in Metaverse? Who will be liable for the privacy and security issues, if more than one business, organisation, and platform is involved in a user's Metaverse experience?

Leadership is required to address these challenges towards using the new technological innovations as a tool for value cocreation rather than value codestruction. Every technological breakthrough, such as the Internet, mobile phones, and smart tourism, brought disruption in the marketplace and introduced new challenges. Despite that, the anticipated Metaverse benefits propel the next ICT revolution that innovative tourism destinations and organisations need to plan ahead to gain competitive advantages. Therefore, Metaverse strategies should be developed to identify innovative processes and resources each organisation should initiate. With a proper estimation of the cost and benefit of the Metaverse strategy, the leadership team can decide the best-fit strategy and tactical management, either being a pioneer or follower, for their organisation.

7. Research agenda: building blocks for metaverse tourism

A comprehensive research agenda needs to be developed to address consumers' trip planning and suppliers' management practices in the Metaverse tourism era. Similar to other ICTs (e.g., Internet, mobiles, smart infrastructure and robots), the development of Metaverse in the tourism and hospitality contexts induces new innovations for both consumers and suppliers. Many areas are yet to be clearly understood and many questions remain unanswered. Understanding Metaverse and designing useable and useful platforms, processes, and offerings can improve value co-creation for all stakeholders. The proposed research agenda should stimulate further investigation, as illustrated in Table 1. Metaverse tourism can only be fully capitalized when the following building blocks, illustrated in Fig. 3, are fully investigated.

Networking infrastructure is an essential building block, as low-speed Internet networks represent a major roadblock. Advances in technology empower networking technologies and infrastructure. The introduction of fifth-generation (5G) mobile telecommunication networks provides high-speed, high-volume and real-time data transmission. 5G mobile networks support ultra-high data download speed, as well as low latency and massive scale of machine-type communication (Taleb et al., 2021). The significant improvements in performance, scalability and efficiency minimise the delays in capturing user

Table 1
Metaverse tourism future research.

Research Domains/Research Questions
Consumers' trip planning
#1 - What motivates and demotivates consumers to embrace Metaverse in trip planning?
#2 - How do consumers screen, select and process the big data solicited from Metaverse throughout the trip-planning process?
#3 - Previewing or Pre-experiencing? Comparing the impacts of different sensory cues on prospective buyers' decision making
#4 - Can Metaverse reduce the information asymmetry between tourism consumers and tourism suppliers?
#5 - Can Metaverse enhance the formation of immersive travel experiences and transformative travel experiences?
#6 - Will Metaverse magnify consumers' information overload?
#7 - Will the vividness of digital avatars affect viewers' trust towards the content shared by the avatar owners?
#8 - Will Metaverse create new form/s of virtual travel (e.g., time travel)?
Suppliers' management practices
#1 - Would existing marketing strategies still be applicable in the Metaverse?
#2 - Would Metaverse make the achievement of customer satisfaction become harder?
#3 - What motivates and demotivates tourism businesses to embrace Metaverse in marketing and management?
#4 - How do suppliers balance the cost and benefit of entering Metaverse marketing and management?
#5 - How do suppliers measure the return on investment in Metaverse?
#6 - How can suppliers invite consumers to co-create their tourism experience?
#7 - How can suppliers leverage Metaverse to increase the edutainment value of travelling?
#8 - Can Metaverse build competitive advantages for suppliers to win the competition?

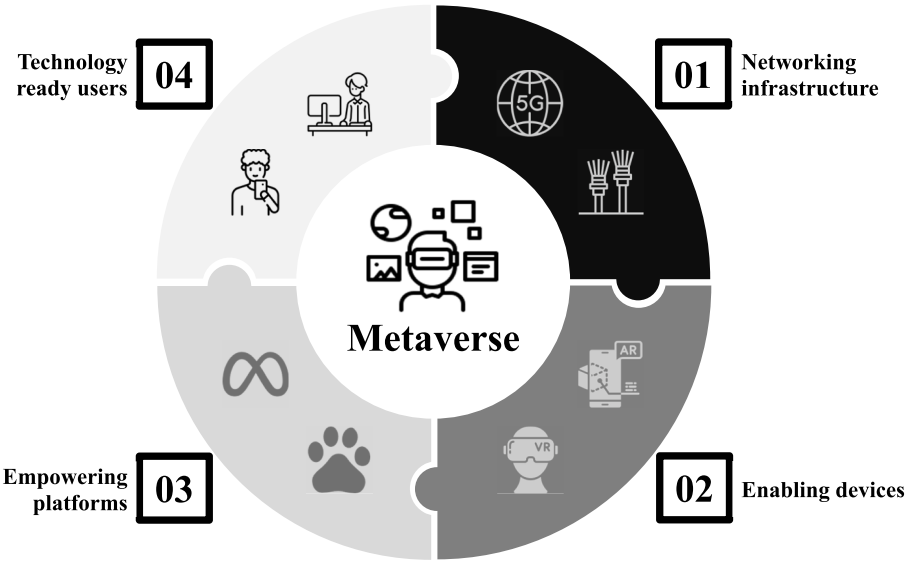

Fig. 3. Building blocks of Metaverse tourism.

movement and transmitting data between users. Real-time telepresence can be empowered when high-speed broadband and 5G mobile networks are used (Buhalis et al., 2019). Travellers can communicate with tourism professionals in Metaverse and ask for real-time enquiries. On-the-go travellers may also access the Metaverse and acquire instant recommendations from other Metaverse users.

Enabling devices, including MR/VR headsets, haptics and environment rendering devices, constitute another building block of Metaverse. Users' behaviour or behavioural intention is highly influenced by the availability and affordability of devices that can support their actions (Jadil et al., 2021). Intel (2021) echoes that allowing multiple people to enjoy real-time interaction in virtual environments requires a lot of devices to both capture real-world objects and transmit the data. If the enabling devices are not available and affordable to users, Metaverse cannot progress. VR technologies have proliferated as affordable VR headsets became pervasive. For example, Meta released the second edition of its VR headset (Oculus Quest 2) in late 2020 and they sold nearly five million units in 2021. MR, another immersive technology which can project digital information in the physical world or/and display items with no material availability, has also become sufficiently advanced. Microsoft released the second edition of their MR headset (HoloLens 2) in 2019 and sold about 150,000 units in 2020. Many other technology companies, including Sony and HTC, also released their MR devices in the 2022 Consumer Electronic Shows. Apart from these immersive devices, emerging smartphones with high-ended microprocessors, native applications and sensors are becoming increasingly compatible with AR technology. Smartphones can enable destination marketers to acquire contextual data pertinent to travellers via sensors embedded in their smartphones. These collected data would empower marketers to provide hyper-personalized recommendations, nowness service and ultimately to delight travellers (Buhalis et al., 2019). Affordable and easily useable MR technologies are therefore critical to allow users Metaverse access.

Empowering platforms (or virtual worlds) affect the success of Metaverse. Besides having competent networking infrastructure and enabling devices, the development of competent and device-agnostic platforms is the cornerstone for the Metaverse development. When Second Life was introduced in 2003, its platform did not support complicated avatar design and functions. Developers' skills and experience in simulating environments were lacking. Hence, many users did not return to the platform due to their low fidelity and usefulness (Chow, 2021). When Second Life entered the market, a limited number of equivalent virtual worlds were available and they were all operating independently as silos. Since those virtual worlds were disconnected, users could not travel across different virtual worlds, using a unified identity. This prevented users from socialising and collaborating with others whilst obstructing information search and cross-collaboration. The interface was not user-friendly, lacked immersion and the graphics were rather basic. There was also insufficient commercial interest for investors, as few people were using it, and therefore Second Life failed to generate an attractive e-commerce proposition. The development of Metaverse, 20 years later, takes advantage not only of advanced technological achievements but also the development of e-commerce and digitization of all aspects of life in the post-COVID era. With the rapid progression in hardware (e.g., graphic processing unit) and software (e.g., graphic designing skills), the fidelity of emerging virtual worlds has improved significantly. For example, Meta also introduced a high-fidelity virtual world namely "Horizon World" for people to work and entertain, regardless of their physical locations. The Chinese search engine giant Baidu recently revealed their high-fidelity Metaverse platform namely "XiRang". Pero (2022) illustrates that some Metaverse platform developers engaged video game makers to reproduce real-world scenes in the virtual world (e.g., Microsoft acquired Activision Blizzard). The Open Metaverse Interoperability Group (https://omigroup.org) has also been formulated to create interconnected and interoperable environments so that users can easily move from one to another using the same account/identity.

Technology Ready Users are the driving force of Metaverse. ICTs and particularly social worlds and virtual platforms can only exploit their full potential when many people are willing to use them. The willingness and readiness of consumers in using Metaverse as a mainstream platform for engaging with tourism destinations and organisations, researching and purchasing tourism products and co-creating value with other users is another key building block. Equally the readiness of tourism destinations and organisations to welcome and serve virtual visitors on Metaverse platforms and offer both a good experience and sufficient value are critical. When Second Life was introduced, the vast majority of people were not ready to use it, owing to their low technology readiness, low technology illiteracy as well as the little value proposition brought by the platform and the suppliers. In the emerging digitalized world, digital engagement on virtual platforms will be central to almost every dimension of our life. The outbreak of COVID-19 has rapidly accelerated the acceptance of new technologies and technology-enabled services. The pandemic has generated many first-time online shoppers as well as forced people to perform many personal and professional functions virtually. The digital literacy of the elderly also

improved significantly after the pandemic outbreak (Martínez-Alcalá et al., 2021). The development of gamification in tourism, the proliferation of mobile gamers and the use of serious games for a number of both leisure and professional tasks (Xu & Buhalis, 2021; Xu et al., 2016, 2017) created a sufficient market for Metaverse to build on. This will be particularly the case for younger consumers who are digital natives (Buhalis, López, & Martinez-Gonzalez, 2020).

8. Conclusions

The introduction of Metaverse offers plenty of excitement and a great opportunity for innovation and imagination for both tourism consumers and organisations. Blending the physical and virtual worlds and enabling travellers to operate on both, seamlessly, creates great opportunities and challenges for the tourism industry. Even though still in its infancy, Metaverse is emerging as a disruptive future trend that impacts the competitiveness of tourism destinations and organisations. Since global citizens adopt advanced virtual services, they are expected to become more familiar towards digital services, technologies, goods and even the entire digital economy. To the degree that is affordable, accessible, useable and offers good experience and value, Metaverse is likely to be accepted by tech-ready and tech-competent users. They will be able to immerse themselves in different Metaverse environments and engage in virtual tourism activities and experiences, prior to evaluating available options and making purchasing decisions. Future tourism Metaverse platforms will accommodate complicated requirements, designs and interactions. They can facilitate engagement with tourism destinations and organisations as well as with consumers and local residents, elevating user immersion and overall experience. Metaverse is expected to stimulate interest and awareness leading to more physical trips. It can also substitute travel, when users are unable to travel, due to personal circumstances or environmental contexts. This study, therefore, defines and conceptualizes the Metaverse in the tourism ecosystem, explaining its role at different trip stages. The study stimulates further research towards supporting and empowering blended tourism experiences in the physical and virtual worlds in the forthcoming Metaverse era. It also explores disruptions to tourists' behaviour and experience whilst investigating impacts on tourism management and marketing. A range of challenges and threats emerging through Metaverse for Tourism Management and Marketing are identified before proposing a research agenda based on the building blocks of Metaverse.

Credit roles

BUHALIS Conceptualization; Formal analysis; Investigation; Methodology; Visualization; Roles/Writing - original draft; Writing - review & editing, LEUNG Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Visualization; Roles/Writing - original draft; LIN Formal analysis; Investigation; Visualization; Roles/Writing - original draft; Writing - review & editing, Metaverse as a Disruptive Technology Revolutionising, Tourism Management and Marketing.

9. Impact statement

Metaverse is expected to provoke considerable disruptions to tourism and revolutionize both tourists' trip planning behaviour and tourism suppliers' management practices in the coming decades. Through reviewing prior scholarly works, articles from news media, and industry reports from professional organisations, this paper elucidates how Metaverse can revolutionize tourism experience formation and transforming tourism management. Besides defining and conceptualizing Metaverse in tourism, this study also explores the foundations of the disruptions that Metaverse is bringing to tourism organisations and destinations and identifies managerial actions for tourism practitioners. It provides a framework to explain metaverse disruptions in the tourism ecosystem and identifies managerial and marketing actions for tourism practitioners. The study outlines research directions so that the tourism industry and destinations take full advantage of the Metaverse capabilities. Being one of the first comprehensive studies discussing the application and potentiality of Metaverse in tourism, this study is expected to enrich readers' knowledge on this topic and provide inspiration and stimulation for future researcher.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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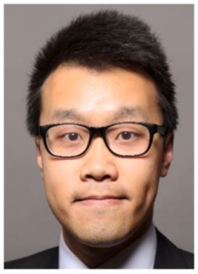

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