Computers in Human Behavior 151 (2024) 108039

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Metaverse for service industries: Future applications, opportunities, challenges and research directions

Timothy Jung [a,b,*], Justin Cho [a], Dai-In Danny Han [c,d], Sun Joo (Grace) Ahn [e], Mansi Gupta [f], Gopal Das [g], Cindy Yoonjoung Heo [h], Sandra Maria Correia Loureiro [i], Marianna Sigala [j], Mariapina Trunfio [k], Alexandra Taylor [a], M. Claudia tom Dieck [a]

[a] Faculty of Business and Law, Manchester Metropolitan University, Manchester, UK
[b] School of Management, Kyung Hee University, Seoul, South Korea
[c] Research Centre Future of Food, Zuyd University of Applied Sciences, Maastricht, Netherlands
[d] Food Evolution Research Laboratory, School of Tourism and Hospitality, College of Business and Economics, University of Johannesburg, South Africa
[e] Grady College of Journalism and Mass Communication, Department of Advertising & Public Relations, University of Georgia, Athens, GA, USA
[f] Lal Bahadur Institute of Management, Dwarka, New Delhi, 110075, India
[g] Indian Institute of Management Bangalore, Bangalore, 560076, India
[h] EHL Hospitality Business School, HES-SO/University of Applied Sciences and Arts Western Switzerland, Lausanne, Switzerland
[i] Iscte-Instituto Universitário de Lisboa and Business Research Unit (BRU-IUL), Lisbon, Portugal
[j] Newcastle Business School, University of Newcastle, Australia
[k] Department of Management and Quantitative Studies, University of Naples Parthenope, Naples, Italy

ARTICLE INFO

Handling Editor: Paul Kirschner

Keywords:
Service industries
Metaverse
Opportunities
Challenges
Research agenda

ABSTRACT

Although the metaverse is still in the early stages of development and implementation, it has the potential to revolutionize the way how businesses can interact with customers through both the virtual and real world. In particular, service industries are already exploring the opportunity to utilize the metaverse to provide more immersive, interactive and engaging customer experiences. However, the holistic overview of the future applications, opportunities, and challenges of a metaverse in the context of service industries from academic and expert perspectives is limited. By employing a multi-perspective approach, this study looks into these unexplored aspects of the metaverse in the context of service industries through informed and multifaceted narratives by leading academics and experts from cross-disciplinary backgrounds from media and communication, education, hospitality, financial services, retail, tourism and healthcare. The main opportunities identified include the development of new experiences, the introduction of novel inter-world interactions, and new business-consumer relations within the metaverse. The key challenges covered include current technological boundaries, limitations of the experiences in the metaverse, health issues, and data privacy, security, and legal issues. The paper concludes with formulating future research agendas and presenting contributions to literature and implications for practice.

1. Introduction

Since Facebook's bold announcement in 2021 to reinvent their company with an intent to pioneer the future of the metaverse and Apple's recent announcement of their spatial computing headset Vision Pro, many, businesses and consumers alike, have been curious to witness how this new phenomenon will unfold. Originally used in the novel "Snow Crash" published in 1992 by Neal Stephenson, the term metaverse is now commonly used in academia and professional practice. The literature has made various attempts to define the capacity of the novel phenomenon. Some general definitions describe the metaverse as the next iteration of the internet that leverages new technologies such as mixed reality, blockchain, and avatars to allow users to interact with and between physical and virtual environments (Dwivedi et al., 2022).

* Corresponding author. Faculty of Business and Law, Manchester Metropolitan University, Manchester, UK.
E-mail addresses: t.jung@mmu.ac.uk (T. Jung), justin.cho@mmu.ac.uk (J. Cho), danny.han@zuyd.nl (D.-I.D. Han), sjahn@uga.edu (S.J.(G. Ahn), mansi_phd18@iift.edu (M. Gupta), gopal.das@iimb.ac.in (G. Das), cindy.heo@ehl.ch (C.Y. Heo), sandramloureiro@netcabo.pt (S.M.C. Loureiro), m.sigala@aegean.gr (M. Sigala), mariapina.trunfio@uniparthenope.it (M. Trunfio), Alexandra.taylor5@stu.mmu.ac.uk (A. Taylor), c.tom-dieck@mmu.ac.uk (M.C. tom Dieck).

https://doi.org/10.1016/j.chb.2023.108039
Received 24 June 2023; Received in revised form 26 October 2023; Accepted 8 November 2023
Available online 12 November 2023
0747-5632/© 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Focusing more on the business and management field, Cho, tom Dieck, and Jung (2023) identify three main characteristics of the metaverse: the blending of physical and virtual spaces using various immersive and emerging technologies, social interaction between virtual users and entities, and the trade of virtual goods and services. Despite its infancy in both development and research, the metaverse is already on its way to becoming a disruptive opportunity for businesses (Koohang et al., 2023).

The proliferation of early technologies has shifted the focus of the service industry (Giang Barrera & Shah, 2023). Consumers have now adapted to digital consumption and studies have shown that online channels are even preferred over traditional channels of business-consumer interaction (Elmasry et al., 2022; Shah & Murthi, 2021). With the emergence of the metaverse, interest in its potential to further revolutionize the service industry has soared, evidenced by the numerous studies investigating its opportunities (Ahn, Kim, & Kim, 2022; Cho et al., 2023; Dwivedi et al., 2022; Koohang et al., 2023).

With the co-evolution of technologies, the metaverse creates numerous new channels of interaction between businesses and consumers, making the opportunities of the metaverse to enhance the service industry boundless (Dwivedi et al., 2022; Cho et al., 2023; Giang Barrera & Shah, 2023). Wedel, Bigné, and Zhang (2020) identify three areas in which virtual and augmented reality is already changing the marketing industry: communications/advertising, retail, and consumption experience. For example, outdoor augmented reality ads can be used to increase interactivity and brand exposure, and virtual reality can be used to create virtual stores and retail spaces that can be customised for various purposes or personalized for individual consumers (Wedel et al., 2020). Studies such as Kim, Lee, and Jung (2020) and Tussyadiah, Wang, Jung, and tom Dieck (2018) discuss the impacts of virtual reality on business-consumer interactions in the tourism context, identifying key areas of change such as consumer behaviour and experience. Not only can virtual reality be used to create new tourism experiences that allow consumers to travel virtually to destinations, but they can also add to existing physical tourism experiences by providing a much greater level of immersion and enjoyment than what existing technologies are capable of (Kim et al., 2020; Tussyadiah et al., 2018). Novel interface devices such as haptics can deepen user sensorial perceptions to create more engaging experiences, enriching existing digital business-consumer interactions (Flavian, Ibanez-Sanchez, & Orús, 2019; Lee et al., 2021). Giang Barrera and Shah (2023) provide a comprehensive overview of these novel consumer experiences in the metaverse focusing on three dimensions: environmental fidelity, immersiveness, and sociability.

Indeed, this increased interest is not without reason; some of the key drivers of adopting metaverse technologies in the service industry include increased presence through immersion, increased engagement and enjoyment, and increased user satisfaction (Jung, Chung, & Leue, 2015; Kim et al., 2020; Tussyadiah et al., 2018; Wedel et al., 2020). In these ways, the introduction of the metaverse has furthered the service industry from utilising simple digital interactions and consumption towards implementing richer and more immersive consumer experiences.

On the other hand, there also exist significant challenges that must be accounted for, such as current issues with metaverse infrastructure and data privacy (Ball et al., 2022; Petrigna & Musumeci, 2022). In this light, although there have been various studies that provide initial insight into the potential impacts of the novel phenomenon, a holistic overview of the various considerations that businesses must account for when engaging in the metaverse specifically in the service industries is needed (see Appendix for indicative studies on the metaverse in the service industry). This will allow businesses in service industries to approach metaverse implications with a much more nuanced and informed understanding.

This study addresses current gaps in research on future applications, opportunities and challenges from a holistic perspective (Foerster, 2003) by inviting and collating the contributions from a number of experts in the various service industry sectors. This study will benefit both academia and professional practice by providing insights to realise the potential benefits of the metaverse through the identification of meaningful applications of the metaverse. We provide a discourse of opportunities and challenges when service industries are expanding into the metaverse. This research contributes to the contextual understanding of the implication of the metaverse in the service sector and evolves into drawing a future research agenda in the service industries.

The remaining sections are presented in the following sequence: Section 2 includes the contributions provided by experts from different service industries. The contributions individually are brief but exhaustive in explanation. Based on the understanding derived from Section 2, Section 3 discusses future directions of research on metaverse in service industries. Consolidating from contributions, Section 4 offers concluding remarks.

2. Multiple perspectives from leading experts in the service industry

This study follows the approach by Foerster (2003) and subsequent multiple expert contributor-focused studies (Dwivedi et al., 2022, 2023; Koohang et al., 2023) and explores a number of diverse perspectives on the metaverse in the context of the service industry. The individual contributions provided by the experts are based on their own perspectives covering the opportunities and key challenges when adopting and embracing metaverse infrastructures. Table 1 presents the full list of experts and the titles of their contributors.

In the remaining part of this section, the perspectives of the experts in seven service industries are presented largely in unabridged form. Each topic contains future applications of the metaverse, opportunities, challenges and future research direction written by invited authors.

2.1. Media and communication industry: mediated communication in the metaverse – Sun Joo (Grace) Ahn

2.1.1. Future application of the metaverse

The rapid advancement of media technologies has been a consistent source of change and innovation in recent decades for media and communication industries and related fields of research. With many Big Tech companies heralding the arrival of the metaverse, immersive media platforms (e.g., virtual reality, augmented reality) are likely to become much more commonplace than they have ever been. The academic discourse on the metaverse has often focused on the technology itself but integrating the elements of the metaverse into our everyday experiences of social interactions and media content consumption may require paradigm-shifting changes in how we conceive mediated communication (Ahn et al., 2022; Dwivedi et al., 2022; Giang Barrera & Shah, 2023).

Table 1
Individual contributions.

Contribution Title	Author(s)
Introduction, Discussion and Implications	Timothy Jung, Justin Cho and Dai-In Danny Han
Contribution 2.1: Media and Communication Industry: Mediated Communication in the metaverse	Sun Joo (Grace) Ahn
Contribution 2.2: Metaverse in Education: Boon or a Bane	Mansi Gupta and Gopal Das
Contribution 2.3: Metaverse in Hospitality	Dai-In Danny Han
Contribution 2.4: Metaverse for Financial Industries.	Cindy Yoonjoung Heo
Contribution 2.5: Metaverse in Retail Industry	Sandra Loureiro
Contribution 2.6: Reshaping Tourism through the Metaverse(s)	Marianna Sigala and Mariapina Trunfio
Contribution 2.7: Metaverse in Healthcare	Alexandra Taylor, M. Claudia tom Dieck and Timothy Jung

The colloquial understanding of space can be conceptually divided into one of the physical structures (space) and one of the social interactions and rituals that are formed in the space, imbuing it with meaning (place) (Dourish, 2006; Fitzpatrick, Kaplan, & Mansfield, 1996). For example, when a family moves into a new house, it may initially feel like little more than dry walls around a wooden frame. However, once the family begins to build rituals and memories inside the structure, it becomes a *home* and family members form emotional attachments to what was once just a structure. Similarly, virtual spaces will need to become virtual places for sustained use of the metaverse, wherein users form lasting relationships with other users and emotional connections from social interactions. Of the myriad opportunities and challenges that may arise with this transformation, the following issues may be more immediately applicable to the social interactions taking place within the virtual spaces and places created in the metaverse and the users' mediated experiences.

2.1.2. Opportunities

Presence, or the feeling of "being there" in the mediated environment (Biocca, 1997; Lombard & Ditton, 1997; Wirth et al., 2007), has been discussed as one of the core concepts related to user experiences in the metaverse. Emerging media psychology research indicates that just two weeks of gameplay in a video game can generate a sense of place, wherein players felt that the virtual backdrop of the video game became imbued with memory and they formed emotional connections with the place through their interactions within the game environment (Bowman, Banks, & Rittenour, 2020). As media content consumption evolves from 2D to 3D, virtual spaces in the metaverse—the media environment in which content consumption occurs—are anticipated to become an integral part of the media experience (Ahn et al., 2022).

The fact that mediated experiences can engender a sense of place through repeated virtual interactions implies the opportunity for shared media experiences in different metaverse spaces to augment physical spaces. For example, even after much of the COVID-19 pandemic restrictions had been lifted, concerts, theme park events, and movies in virtual spaces remained popular. Contrary to concerns that these spaces may be replacing physical ones, studies indicated that virtual experiences at a coveted destination can actually encourage a desire to visit the physical location in person (Kim, Shinaprayoon, & Ahn, 2021). Therefore, constructing a sense of place through media experiences in virtual spaces may serve as an opportunity to promote physical spaces.

2.1.3. Challenges

With the increased uptake of metaverse technologies, the demand for virtual spaces may surge and, with it, infrastructural problems (Ball et al., 2022; Xu et al., 2022). Virtual spaces are construed to be limitless and borderless in the metaverse, but users will require services that provide access and maintenance to the virtual spaces that are created. Consider the plethora of deserted virtual spaces of the past; for example, MOOs, *MySpace*, and the deserted islands of *Animal Crossing*. The sustainability of virtual spaces is likely to be one of the key questions in the metaverse when users can create and discard these spaces at whim; consider the number of web pages and blogs that have now become defunct. Perhaps the bigger challenge of the metaverse is the sustainability necessary to establish social routines and cultural meaning for the conversion from transient virtual spaces to more persistent virtual *places* to occur.

Relatedly, in most discussions of presence, virtual environments that generate high presence, depicted as the sense of non-mediation, have been considered the gold standard (Lombard & Ditton, 1997). However, conceptualizing enjoyment in the context of entertainment media is not as straightforward as it may seem. Perhaps counter to intuition, content that leads to negative emotions can induce feelings of enjoyment (Vorderer, Klimmt, & Ritterfeld, 2004) and gratification (Oliver & Bartsch, 2010). For example, individuals can feel *eudaimonic* enjoyment after watching media content about tragic events if it provides them with the opportunity to reflect on the meaning and value of their own lives. This mechanism is different from feeling direct enjoyment from consuming negatively valenced content. Individual preferences and personality traits can influence such media content selection (Hoffner & Levine, 2009) and outcomes of exposure to media content (Valkenburg & Peter, 2013).

With continued technological advancement, which allows audiences to consume more immersive and interactive media content (e.g., IMAX 3D), audience responses to mediated content may shift in the metaverse. Audiences seek perceived realism and authenticity in media but may not enjoy breaking the "fourth wall" with content that induces intense emotions (e.g., violence, horror). Given that experiencing violent content mediated through immersive virtual reality is sufficiently realistic to be effective for exposure therapy designed to treat patients with PTSD (Rizzo et al., 2017), the realism of negative media content in the metaverse may be excessively intense and overwhelming for audiences to reflect on and enjoy.

2.1.4. Research directions

Systematic inquiry into the process and underlying psychosocial mechanisms of how virtual spaces evolve into virtual places, and the boundary conditions of enjoyment for emotionally intense media content in the metaverse hold critical theoretical and practical implications for media and communication researchers. The following are some suggested research agenda for consideration:

RQ1. What are the types of social and communication activities that can(not) convert a virtual space into virtual place?

RQ2. What are the duration and frequency of visits required for a virtual space to become a virtual place?

RQ3. At which point does presence start to have a negative impact on media experiences in virtual environments?

RQ4. (A) How long does the impact of emotionally intense media experiences in the metaverse last and (B) how does it influence thoughts and behaviours in the physical world?

As media industries make the steady shift to incorporate interactive and immersive technologies, how service providers serve audiences and evaluate performance is likely to undergo some fundamental changes (Ahn et al., 2022; Dong & Lee, 2022). Researchers will need to stay abreast of these developments to provide critical and timely data to promote evidence-based decisions during this transition. The proposed research questions are designed to facilitate the initial stages of research, but scholars should understand that new inquiries may become necessary as media technologies continue to evolve over time.

2.2. Metaverse in education: Boon or a Bane – Mansi Gupta and Gopal Das

2.2.1. Future application of metaverse in education

Imagine students discussing the solar system with their classmates and teacher while perched on top of a 50-storey building. Now, the teacher does not use a PowerPoint presentation; instead, she turns the entire sky into a chalkboard, moves Saturn toward the students, and begins to talk about the gases that surround it. With metaverse, such an immersive experience is achievable. The rise of the metaverse will impact service industries, specifically education, in fundamental ways, from how students and teachers adopt the metaverse to their well-being. Given that metaverse is emerging, early research will help both practitioners and academicians to apply it appropriately. This study intends to examine the existing status quo of the application of metaverse in education and henceforth suggest future research fronts.

Over the past ten years, both the pace of technological progress and the use of new technologies in educational settings have rapidly accelerated. The potential for technology in education has been

fundamentally altered by the convergence of processing, communication, visual and multimedia capabilities, downsizing, and speed. As a result of these advancements, it is now feasible to build and use sophisticated, interconnected technologies that can significantly alleviate some of the fundamental issues with education. For instance, there are a variety of smartphone applications like Massive Open Online Courses (MOOCs) that have transformed the student's learning and outcome.

Transcending times have taken classroom learning to the next level. The metaverse is one of the technologies with the most promising future. Metaverse can accommodate all sorts of educational experiences including classroom lectures, training, field visits, industry exposure, evaluation and even homework and group studies.

In 2006, Kemp and Livingstone explored (Kemp and Livingstone, 2006) how to link the metaverse through the virtual environment "Second Life" with the education system to improve the learning process. Collins (2008) asserted that the metaverse may be the next location where people get together and socialise, necessitating its proactive use for teaching and learning. González Crespo, Escobar, Joyanes Aguilar, Velazco, and Castillo Sanz (2013). examined the use of OpenSim in educational virtual environments and the sharing of knowledge through free lessons in the metaverse. Reyes (2020) designed a metaverse for teaching mathematics using augmented reality and mobile learning. The results demonstrated that using metaverse to teach mathematics has a positive impact on students' knowledge creation. Furthermore, Park and Kim (2022) identified ways to engage students in the metaverse through educational tools like survival, maze, puzzles, and an escape room.

Surely, the metaverse looks like a world full of opportunities where students and teachers can act and communicate without any constraints. The following section discusses the same at length.

2.2.2. Opportunities for metaverse in education

Metaverse is a new way to learn, connect and interact in an unprecedented immersive landscape that has several educational applications. One benefit of the metaverse is that it allows students to attend lessons remotely with features that are similar to or even superior to those found in a traditional classroom. The Covid-19 epidemic provided an opportunity for everyone to overcome physical obstacles and to participate in classes and other extracurricular activities via virtual mode. Student-teacher interactions were eased by tools like Zoom and Microsoft Teams. Through technological breakthroughs like the metaverse, these have been advanced even further. Using virtual reality (VR) headsets, students may experience their college life virtually which will enable them to discover, explore, and connect similar to those found in a traditional classroom. For instance, in the virtual environment of the metaverse, students may delve into different learning platforms such as podcasts, visit libraries, and labs, interact with instructors and mentors, and socialise with their classmates.

These technological discoveries promise to genuinely democratise education. For instance, the forthcoming Kenya-KAIST virtual campus, which will be operational towards the end of 2023, would allow the university to broaden its reach and enable students from all areas of the world to study together on cutting-edge subjects without having to leave their native countries.

Moreover, it will improve accessibility for students with constraints. People with limitations and impairments may have greater access to social and educational opportunities thanks to the metaverse. For instance, an immersive setting enables young adults with disabilities, autism, and even financial limits to get over their obstacles and engage in educational learning that is similar to that found in the actual world in the metaverse. According to UNICEF, 90% of disabled children in underdeveloped countries do not attend school.[1] Through VR applications, people may hone skills and socialise in a secure setting without experiencing mobility issues or overwhelming or worrisome feelings. The Starlight Foundation, for instance, employs VR technology to permit paediatric patients to "leave" the hospital premises and enter a different environment. They can enjoy experiences that transcend physical boundaries thanks to VR headsets. Additionally, the metaverse has the ability to facilitate learning by bringing together individuals from diverse socioeconomic backgrounds and geographically distant areas in a more efficient and time-bound manner.

2.2.3. Challenges for metaverse in education

Over the years irrespective of the technological advancements, the power of one-to-one discussions and conceptualization of ideas have not withered. According to Hrastinski (2019) classroom-based face-to-face learning is a more integrated and thoughtful experience in comparison to online teaching. Avatars, computerised representations of people used in the metaverse, allow people to perform and communicate with one another in real time. (Miao, Kozlenkova, Wang, Xie, & Palmatier, 2022). All their actions and communication happen through avatars. Education is one sector that fosters open and face-to-face presentation of opinions and ideas. It allows the instructor to mould the discussions depending on the real-time feedback of the students in the form of body language and facial expressions. This inability to self-represent can hamper the real essence of classroom discussions.

Physical and mental health may take a back seat in this immersive landscape. Researchers have started to identify the detrimental effects of metaverse on mental, physical, and social health. According to Thoits (2010), present fast-paced lifestyle can lead to rising mental health difficulties as well as decreased physical activity, which increases the incidence of obesity and other physical health issues, all of which increase the urge to escape these realities. According to research,19.7% suffered from anxiety disorder due to remote learning.[2] Metaverse claims to provide students with a real-life educational experience while they are seated in one spot through VR headsets, which poses an immense risk to their physical health.

Additionally, users of headsets may have uncomfortable emotions including confusion, headaches, eye strain, and nausea (TheDon2016, 2017). Likewise, prior studies have also noted the fast-increasing addiction to online gaming and social media as a specialised sort of escapism, raising concerns about the effects on public health (Andreassen et al., 2016). Promoting metaverse in education could mean several hours of exposure for the students and instructor, that can lead to several health issues, warranting intervention for future researchers.

2.2.4. Future research direction

Though the metaverse claims to transcend the virtual world and the way different sectors are currently operating, the use of the metaverse in the field of education is marginally discussed. This new reality poses some questions, warranting the intervention of future researchers. The section below discusses some of the research questions, warranting the intervention of future researchers.

There could be a metaverse existential crisis in education. It asserts to offer educational experiences outside of traditional classrooms, but experts have claimed that there is no substitute for a physical learning ecology (Hrastinski, 2019). Future scholars should get examine and investigate if the use of the metaverse in education is conceivable.

RQ1. Will there be a difference between students' level of engagement (in terms of identification, absorption, enthusiasm, attention and interaction (So, King, and Sparks (2014)) in metaverse vis-a-vis physical classrooms?

RQ2. Will enhanced engagement lead to better learning outcomes for example better recall or improved retention among students?

[1] https://www.customguide.com/word/how-to-add-footnotes-in-word.

[2] https://www.cidrap.umn.edu/covid-19/pandemic-online-learning-stressed-college-students-teens.

RQ3. Will metaverse improve the educational reach and weaken the educational disparity?

RQ4. Is metaverse a messiah for people with financial or physical constraints?

RQ5. Will the static world of the metaverse deteriorate the physical, mental and social health of students?

RQ6. How self-presentation through avatars in the classroom or education landscape will impact user behaviour in terms of perception, evaluation, and outcome?

RQ7. Will avatars justify personalized classroom learning?

RQ8. Is it incompatible for students and instructors to be represented by avatars given that identity is "a product of the tale that [they] make about [themselves]" (Battersby, 2006, p. 27)?

RQ9. Do virtual beings prevent student-teacher interactions from developing the kind of synergy that requires emotional contagion processes (Hennig-Thurau, Groth, Paul, & Gremler, 2006)?

RQ10. Is metaverse adaptation influenced by individual variables such as the personality of students and teachers?

RQ11. How to overcome the limitations of metaverse adaptation in the education sector, if any?

This research discussed the potential opportunities and challenges of a metaverse in education. Accordingly, this research delineates that rather than fervently presenting metaverse as the breakthrough that will transform the way we accomplish educational work and activities, academics should carefully monitor and critically analyse the progress of this technology. For everyone to benefit fully from the meta-reality, it will need to be regulated and made safe. As of now, it is a fascinating yet challenging futuristic idea.

2.3. Metaverse in hospitality – Dai-In Danny Han

2.3.1. Current state of and future applications of metaverse in hospitality

In the post-pandemic era, it is a valuable moment for the hospitality industry, one of the biggest hit industries by the pandemic, to take stock of how it operates and re-evaluate its role in society. According to (Eliasson, 2022), it is unlikely that physical travel after the lockdown will see lasting reductions. However, the past few years also provided an opportunity to rethink services and encounters that can be replicated and enhanced in the digital space and expand the meaning of hospitality and service to customers. Hospitality was argued to be by nature a human-centered industry in which the human touch is vital (Solnet et al., 2019). It seems plausible that there has been much debate on the role of technology in the service encounter in this industry, as it arguably creates a barrier to human connection. However, the pandemic has demonstrated that technological solutions can provide new possibilities to the industry. There are ample applications of XR technologies that aim to enhance marketing activities, such as the use of virtual tours in VR in the sales process of Anheuser-Busch's Budweiser St. Louis brewery (Encore Research, 2019). In a similar manner, Marriott showcased its teleportation cabins to let potential guests experience Marriott hotels around the world in VR in the awareness and consideration phase of the customer journey (HospitalityOn, 2022). The Best Western Hotel on the other hand collaborated with Disney to let customers interact with augmented characters to enhance customer engagement with the brand (Revfine, 2022). More recently, hospitality businesses have started to explore non-fungible tokens (NFTs) to tap into metaverse hospitality marketing. For instance, Marriott Hotels created its own digital art NFT which can be traded on the blockchain (Ledger Insights, 2021). Similarly, Budweiser has created 1936 unique digital beer cans that are already being traded on the second-hand market (Redman, 2021).

2.3.2. New opportunities to relive hospitality encounters

While hospitality businesses are stepping in to explore branded NFTs, hospitality encounters have by nature been perishable, highly affecting the pricing of hospitality products. Elevating hospitality encounters through metaverse possibilities provides opportunities for storing memorable experiences through digital artifacts that can be shared with others. This could potentially enable us to relive hospitality encounters as they have unfolded being able to share in much detail how certain encounters were perceived. Not only is this affecting the phenomenon of word-of-mouth among consumers, but this possibility could provide us with much insight into understanding how services need to be designed to achieve certain memorable outcomes. While current NFTs are traded for their face value, digital artifacts that are able to store experiences have much to offer in sentimental value. However, further research is needed on the possibilities of NFTs in their role as memorabilia and whether such personal NFTs could become subject to trade. Research is needed on consumers' desire to purchase someone else's experience to be relived through the metaverse. The role of hospitality businesses in consumer experiences has been increasingly blurred in the experience economy and is expected to remain unclear through metaverse applications, as more regulations are needed to determine the extent to which hospitality encounters can be staged and ownership rights of digital artifacts in metaverse scenarios.

2.3.3. Challenges in the advancement of metaverse in hospitality

While some early initiatives explored some of the possibilities of the metaverse in the hospitality industry, these are few in-between and isolated endeavors. Moving forward, we need to embrace new opportunities of metaverse applications for guests and hospitality businesses but also encourage growth and diversification of the hospitality industry in the digital realm. The biggest challenge to date might be caused by the current infancy stage of metaverse applications. The capacity of the metaverse has not yet been defined and it remains vague how it will implicate social interactions and hospitality encounters between people and organizations. Applications to date have only scratched the surface of how new dynamics enabled through metaverse infrastructure can affect and revolutionize human connections. In the hospitality industry, metaverse possibilities could reshape major parts of the industry from reservation processes to new forms of hospitality experiences. As new advancements in related technologies are emerging rapidly, more use cases become a possibility in the interaction with guests before and during a hotel stay (e.g. digital keys) to the automated management of inventory in the back-of-house area. It remains questionable whether metaverse applications will allow for new types of hospitality services to be offered and whether they will be able to replicate, replace or form new types of connections between humans and organizations.

2.3.4. Future directions: Expansive and inclusive hospitality experiences

There is a great array of opportunities that digital technologies related to the metaverse such as AR and VR provide that evolve around the reinterpretation and evolution of consumer experiences. A recent report by McKinsey and Company (2022) concluded that virtual events and gatherings are already among the applications that currently show the highest demand. Current technological advancements in this space offer a glimpse of how these technologies have the capacity to generate new types of immersive experiences such as attending concerts at destinations that would otherwise be physically unreachable (Tassi, 2023). Such advancements are not only widening our current array of possibilities for hospitality experiences but are highly lucrative for inclusive hospitality. New metaverse applications in the hospitality industry have the potential to bring forth a paradigm shift from exclusivity to providing access to all layers of society many of which have long been neglected due to (physical) restrictions to consume certain hospitality experiences. Some aspects will include a virtual recreation of known physical hospitality encounters such as in the case of chatbots, which consumers are willing to adopt considering their usefulness (Pillai &

Sivathanu, 2020). Others may involve new types of experiences that have thus far not been possible to experience in the physical world. New types of experiences are expected to be fuelled further through transaction networks on the blockchain, which is increasingly applied in the consumer market (Accesswire, 2021). Continuous expansion of metaverse infrastructure that blends the physical and virtual realms could enable future technologies such as self-driving taxis to become active participants in society. Technological developments continuously demand further research in understanding the mechanisms of new technologies in their application. However, to provide direction for such future scenarios, consumer research is needed that expands our understanding of possibilities for new types of hospitality experiences and consumer demand for such experiences. We propose the following research questions to address and exploit some of the upcoming opportunities that we anticipate to give direction to expansive and inclusive hospitality experiences:

RQ1. What is the effect of an expansive metaverse infrastructure on segments in the consumer market?

RQ2. What are the antecedents to create metaverse hospitality experiences?

RQ3. Which business models facilitate metaverse hospitality experiences?

RQ4. What is the consumer response to metaverse hospitality experiences?

It is not yet clear whether any new hospitality experiences will be reserved for a niche market and how they need to be designed and offered to allow for accessibility to a wide consumer market. It is crucial to explore the implications of metaverse applications that have the potential to enable the staging and consumption of the same hospitality experience to a larger population of consumers independent of time and space. Being able to recreate hospitality experiences in the metaverse in exactly the same way will have an influence on how such experiences are shared and enjoyed among people over time.

2.4. Metaverse for financial industries – Cindy Yoonjoung Heo

2.4.1. Future application of metaverse

The financial service industry has been one of the business sectors that follows and actively adopts new technology. Financial services in the virtual world are not new, but the advent of metaverse offerings induced the launch of dedicated virtual tokens for transactions in metaverse platforms that form the metaverse financial market (Belk, Humayun, & Brouard, 2022). Koohang et al. (2023) addressed that financial transactions, metaverse entertainment, and the ownership of virtual assets are the key opportunities for financial service businesses in the metaverse. As the service consumption and investment options in the metaverse grow, the need for metaverse platforms to process these financial transactions will increase.

Financial service businesses already show a growing interest in using metaverse for their services. Some companies started to open virtual branches in the metaverse platform where their clients can buy financial products or offer customer service to their existing customers. Last year, JP Morgan established its virtual Onyx Lounge in Decentraland, because they found the investment potential of a virtual real estate market such as credit, mortgages, and rental agreements (Marr, 2022). Indeed, metaverse mortgages are being issued to purchase virtual property in Decentraland by TerraZero Technologies (Rosen, 2022). Swiss digital assets bank Sygnum is opening a new branch in the metaverse to connect with more clients looking for blockchain-based financial services (Allen, 2022). On the other hand, HSBC purchased land in the Sandbox early last year to engage with sports communities and e-sports enthusiasts (Wee & Nicole, 2022). The metaverse can be used as a route for the financial service industry to communicate with new segments and demographics, especially today's tech-savvy Gen Z.

2.4.2. Opportunities

The emergence of the metaverse has brought a new dynamism to the business landscape of the financial service industry. Metaverse has been developing into a potentially destructive chance for financial service businesses not only to engage with customers but also to offer new financial services. The initial business opportunity is related to payment based on decentralized finance (DeFi) applications and leveraging blockchain technology. In addition, the financial service industry can provide personalized services and a more human touch in the metaverse through a virtual financial advisor. Metaverse is not just a gaming or communicating platform but becomes a virtual space for commercial transactions and real estate.

There is an opportunity for financial service businesses to allow users to connect or create their accounts in the metaverse to existing payment apps so that they can store and manage crypto and virtual digital assets such as NFTs. The interaction between physical and virtual assets will further create new economies and the metaverse would provide an opportunity for financial service industries to develop new products for the virtual world. Therefore, for financial service industries, the metaverse will soon be unavoidable.

2.4.3. Challenges

Although the metaverse presents growth potential for the financial service industry that embraces it, several open issues, both from a user and a business perspective, should be properly managed. The latest expansion of the metaverse was made possible due to the advancement of various digital technology, the technology for financial services in the metaverse still has a long way to go. Data security and privacy remains critical issue in creating user trust as financial transactions must be safe and secure. Although the technology used in the metaverse provides considerable improvements in operational costs and saves the time conventionally required, it is disrupting the way many traditional financial service businesses operate. Because of the existing technology structure that financial service businesses already have in place as well as the uncertainty of the extra value created by the investment in the metaverse, the adoption of the metaverse into their business model has been slow.

There are also a range of legal issues concerning the metaverse. From a business perspective, the absence of a regulatory framework bounding financial services in the metaverse will be challenging to operate and may affect firms' participation. An additional challenge for the financial service industry is the price volatility of the cryptocurrency and NFT market as their trades are susceptible to market manipulation and fraud (Koohang, et al., 2023). While some scholars started to investigate the various factors influencing NFT valuation (e.g., Lucey, Vigne, Yarovaya, & Wang, 2022; Wang, 2022; Yousaf & Yarovaya, 2022), further research is needed on this topic to reduce systematic risk and to enforce appropriate rules and regulations. The compatibility and standardization of the metaverses is another important issue. The transferability between the metaverses developed by different firms and the compatibility between the metaverse and the real world need to be established.

2.4.4. Research directions

Although the metaverse is a relatively recent addition to academic literature, several scholars started to explore different aspects of metaverse for financial service industries. For example, Papagiannidis, Bourlakis, and Vafopoulos (2008) presented two case studies of banks in the metaverse and discussed marketing opportunities and repercussions. Zainurin, Haji Masri, Besar, and Anshari (2023) attempted to define metaverse banking by synthesizing the current literature and discussing the growth opportunity. Similarly, Anggara, Davie, Margani, Aristyana, and Aulia (2022) discussed whether commercial banks will be able to penetrate its relevance in the metaverse's financial ecosystem. Meanwhile, Ghosh, Alfaro-Cortés, Gámez, and García (2023) are interested in

the dependence of the metaverse financial market on external factors and try to understand how media buzz's role in travel uncertainty and Russia-Ukraine military conflict rhetoric affect the metaverse financial market.

However, academic research on the metaverse for the financial service industry is still in the incipient stage. Previous literature confirms the critical role of perceived security, perceived risk, and trust on user's willingness to adopt virtual financial services such as mobile and internet banking (e.g., Damghanian, Zarei, & Kojuri, 2016; Hanafizadeh, Keating, & Khedmatgozar, 2014; Yousafzai, Pallister, & Foxall, 2009). However, there could be several unique matters to explore further when it comes to financial services in the metaverse such as digital identification. Some claim that the metaverse would enhance customer experience by allowing clients to explore their interests in the metaverse at home, but such effect is not fully tested yet. Here are several research topics that future scholars can explore.

RQ1. What are the determinants of users' perceived security and trust in financial services in the metaverse?

RQ2. How do transferability and compatibility factors influence users' intentions to engage with financial services in the metaverse?"

RQ3. What are the primary individual and contextual factors associated with individuals' resistance to using the metaverse for financial services?

RQ4. What are the key motivations for keeping and trading virtual digital assets?

RQ5. Can customer experience in virtual branches and customer engagement through a virtual agent in the metaverse be improved compared to those in the physical branch and through other types of virtual financial services (e.g., mobile banking)?

2.5. Metaverse in retail industry – Sandra Loureiro

2.5.1. Future application of metaverse in the retail industry

Metaverse is a huge opportunity for retail to develop new immersive experiences and promote and sell products. Yet, the opportunity does not come without a challenge: retail needs to adapt to the fast development of technologies, such as XR, in the different steps of consumption. Thus, virtual reality (VR) can be employed in the metaverse to communicate the mission and identity of the brands, creating empathy, and providing information about the brands through the different senses. Virtual try-on technology and analytical artificial intelligence (AI) (Huang & Rust, 2021), embedded in the metaverse can help the potential consumer to make decisions and encourage them to actually purchase.

In the metaverse environment, the layout, color scheme, design, and music background (Roschk, Loureiro, & Breitsohl, 2017) can be personalized to each customer. An empathic AI can act as a frontline employee adviser, by understanding style, design, and emotions and interacting emotionally with customers. This adviser can also operate in the co-creation process of the retail brands, not only providing insightful information to more analytical AI but also participating in focus groups and other ways to develop the co-creation of new products. Finally, intuitive combined with empathic AI can help managers to think creatively (Sternberg, 2005) proposing new ways to advertise the products and retail brands in an integrative way in the omnichannel.

2.5.2. Opportunities

Metaverse for retailing brands and managers is a window of opportunities and a channel that can create mutual interest and behaviors among managers and diverse customers (Bilro & Loureiro, 2020). Therefore, the metaverse can bring opportunities to create a virtual world and develop retail business, while establishing different real-time relationships everywhere at multiple levels, that is, customer–customer and customer–retail brands in the metaverse environment. With the metaverse, retailers have the relevant opportunity to create a virtual world where the virtual and the physical converse. The environment can have features where customers can feel that they are in a physical setting with others that seem to be completely different (e.g., avatars, AI agents) and that it is only possible in a world where the laws of physics are taken to the extreme (e.g., for example, customers flying over the warehouse, defy the force of gravity). We can, thus, highlight the following opportunities: (1) to develop the retail business in a new channel, (2) to establish new relationships with the customer–customer and customer–retail brands in the metaverse environment, (3) to be a channel that can be used at any time and any place for both customers and retail, (4) to create a virtual world where the virtual and the physical worlds converge.

2.5.3. Challenges

The new environments of the metaverse in the retail industry can challenge creatives to design new unknown scenarios and experiences which will require new ways of communicating products/brands (e.g., screens with advertisements that appear and disappear as customers visit or prepare to visit the store). Therefore, we can point out challenges: (1) in creating new atmospheric cues, (2) in proposing omnichannel strategies, (3) in designing new experiences, (4) in proposing new communication strategies, (5) and difficulty in creating a clear and integrated strategy with the other channels due to the still early stage of development of the metaverse.

2.5.4. Research directions

Future research needs to be developed in three main directions: retail brand culture, relational and societal processes, and retail communication. The first focuses on the internal hierarchical structure of the retail brand. Future research should be concerned with understanding the brand culture (considering rituals, artifacts, values, and norms) in an immersive and virtual environment where it is possible to create a new reality. The possibility of having an AI advanced agent leading the brand – or at least in charge of implementing the strategy and promoting the brand by creating the advertising schema – should be discussed and analyzed.

RQ1. What will shift the brand culture in the metaverse environment? What will be the rituals, values, or artifacts of a retail brand in the metaverse?

RQ2. What will be the leadership styles in an environment with AI and avatars?

As for the relational and societal processes, future studies should consider all kinds of relationships and interactions among avatars and AI agents in the metaverse. Here academics should bring to the arena all kinds of theories and approaches in a close relationship (e.g., Bowlby, 1979; Weiss, 1988), such as attachment theory, interdependency theory, theories of attraction, or extended self (Belk, 1988).

RQ3. How to combine XR and AI technologies in the service retail landscape of the metaverse?

RQ4. What kind of relationships can be established among humans and non-humans (avatars, AI agents) in the metaverse?

RQ5. In the environment of the metaverse, what laws and roles should be established? What about data protection?

Finally, for retail communication, researchers should study how the metaverse can replace traditional advertising and how marketing communication will be in such environments.

RQ6. How will GII interact with retail brands? Will they consider gradually incorporating AI with intuitive and empathic skills? Will GII establish laws to protect AI against slave labor?

RQ7. Can metaverse replace traditional advertising (e.g., outdoors, traditional social media)?

RQ8. How metaverse environments can boost marketing communication?

RQ9. Avatar with AI can be a meta-influencer?

RQ10. What will be the relationship between humans and AI in the new product development process?

2.6. Reshaping tourism through the metaverse(s) – Marianna Sigala and Mariapina Trunfio

2.6.1. Future application of the metaverse in tourism

The metaverse is not any more science fiction but the new industry reality of tourism.

According to McKinsey (2022), 35% of travel companies have a strategic metaverse plan, while virtual tourism experiences are one of the most highly sought experiences by metaverse users. Similarly, tourism destinations of all levels – e.g. attractions (National Museum of Korea), cities (Seoul and Dubai), countries (Tuvalu), theme parks (Disney), and natural parks (Ellingson National Forest) – are exploiting metaverses opportunities to propose immersive and interactive experiences. They already have or plan to have their digital twin and conduct many destination management and marketing activities in the metaverse world.

Metaverse technologies are envisioned to revolutionize the way we experience and practice tourism as a social practice as well as the way tourism is provided, managed and promoted as a business and economic activity. They create immersive and persistent environments that enable users to live interactive, collaborative, scalable and ubiquitous experiences with continuity of data, such as identity, history, possessions, objects, communications and payments.

Literature in metaverse tourism has started to boom (e.g. Koo, Kwon, Chung, & Kim, 2022; Buhalis, Lin, & Leung, 2022; Gursoy, Malodia, & Dhir, 2022; Sigala in Dwivedi et al., 2023), but it is still in its infancy and tends to be very descriptive heavily focusing on current immersive technologies (AR, VR, EX) and consolidated paradigms. Preliminary research in metaverse tourism has examined how the metaverse influences tourism experiences by using existing approaches and frameworks. For example, Gursoy et al. (2022) advocated studying metaverse experiences based on their functional or hedonic dimension (types of experiences values) or the level of their interactivity. Sigala (in Dwivedi et al., 2022) proposed opportunities for creating and supporting tourism experiences along the customer journey i.e. before, during and after the trip. In replicating past research, Koo et al. (2022) identified various examples of metaverse tourism scenarios based on a model developed in the generic literature, e.g. metaverse tourism environments related to mirror worlds, virtual worlds, lifelogging and augmented reality.

However, as technological advances and human creativity continuously and dynamically form the metaverse, most of its applications and implications in society and the economy are still unknown and impossible to foresee (Ball, 2021). Nevertheless, there is an urgency to identify how it frames and enables opportunities in tourism, what challenges these applications entail, and what directions and questions tourism research should investigate to contribute to this important but fluid phenomenon.

2.6.2. Opportunities

Metaverses, as multi-technological spaces, challenge practitioners to exploit new business opportunities and academics to frame unexplored research routes. Although the metaverse has been presented as a cutting-edge exploitation of consolidated immersive technologies (VR, AR and XR), other metaverse technologies present huge applications and transformative potential for the future of tourism.

Avatars, holograms, digital twins, cryptocurrencies and NFTs create opportunities and challenges for all tourism stakeholders. Tourists, tourism firms, tourism destinations and other tourism stakeholders (e.g. influencers, artists and events performers) navigate in metaverse platforms through their avatars, experiencing several forms of tourism and entertainment and interacting with other avatars/users. In customising their avatars (e.g. physical appearance), users usually try to (re)-create their real or ideal-self, while technologies (e.g. machine learning and computer vision) are advancing to enable avatars to also mimic and resemble the body language and movements of their human representatives.

Tourism stakeholders and destinations create digital twins of their tourism resources, assets and infrastructures, such as cities, heritage sites, airports/ports, museums, festivals and events. Digital twins provide numerous opportunities to develop, offer and promote metaverse experiences of virtual events and places. Destinations can enable visitors to experience a place and an event before travelling to it, allow people with disabilities to experience places to which they cannot travel, empower real visitors to experience and see things at destinations that they are not able to see (e.g. how a destination was and looked like in the past, historical events taken place in augmented reality at a heritage site). Tourism attractions and destinations can develop collectables of these digital twins in the form of NFTs and sell or give them as souvenirs of their tourism experience or tailor-made innovative products. Metaverse tourists being owners of these NFTs may be able to use them to decorate their metaverse homes and clothes and/or resell them to make money.

The opportunities of digital twins are not limited to tourism marketing, but they can revolutionalize and transform all business operations and practices across the whole value chain. Analytically, digital twins can be used for the design and pilot testing (product innovation-design stage), the management and the sustainability of tourism resources, assets and infrastructure. For example, festivals can use digital twins to design and test their festivalscape design for ensuring safety and experience quality, while sports events and cities use digital twins to monitor and manage traffic, visitors' flows, use of energy and other resources in real-time. Digital twins of heritage sites can also contribute to digital heritage preservation and facilitate accessible tourism.

2.6.3. Challenges

Technological advances like the Internet of Place (shared virtual experiences) and Internet of Ownership (verifiable digital identities) create multi-technological spaces that have never been investigated before (Accenture, 2022). Although metaverse opportunities have been recognised, there is still limited discussion in the tourism literature about the metaverse challenges and future research directions. How metaverse can shape and form future scenarios, which may redefine and transform tourism as a social practice, and economic activity for human well-being, still remain the main challenge.

Exploiting metaverse opportunities in tourism calls for going beyond the simple replication of metaverse scenarios of other industries and settings, and for considering the particularities of tourism as an experience and multi-facet industry. Tourism research should also develop a creative and innovative interpretative lens of metaverse technologies and set challenges that inspire other industries.

Research in metaverse tourism should be leading and shaping - not only following - the metaverse trends by creating a new and unchartered world that is not possible to frame today with our current knowledge and experience about the internet and/or other immersive technologies. This means that the current theoretical concepts and approaches may not be sufficient to interpret metaverses as social spaces, which in turn challenges scholars to debunk consolidated paradigms and define new

research directions for exploring tourism experiences, sustainability and stakeholder well-being within metaverse settings.

2.6.4. Research directions

Advances in the metaverse investigation proposed a multi-layered and multidisciplinary framework, which considers (Dwivedi et al., 2022): enabling technologies; features; and scenarios. Future research in metaverse tourism can clarify and unravel the characteristics, functions and roles of the multi-technology environment for experience design in the service environment as well as possible research scenarios contributing to human and community well-being.

Reshaping tourism through the metaverse also means that future research should expand to examine how the metaverse can be used and afford potential scenarios to monitor and manage business operations (and not only marketing) along the whole value chain at both a micro-level (e.g. tourism firm) but also macro-level (e.g. destination or tourism ecosystem).

Metaverse-enabling technologies create the unexplored service environment of the metaverse-scape, which reshapes tourism experiences and calls for new research directions. Framing and analysing the metaverse-scape represents an intriguing research area involving innovation and creativity in tourism experience design. Research can cover several areas of investigation, including virtual environment (e.g. layout, alternative spatial solutions, symbols, aesthetics, contents, digital storytelling, atmospheres), multisensory interaction with other avatars, sense of presence and flow state. Several questions can open new avenues for research.

RQ1. How do metaverses reshape tourism experiences?

RQ2. How to design metaverse-scape and what is its role in tourism experiences?

RQ3. What does quality of service interactions mean in metaverse tourism settings?

RQ4. Can metaverse multisensory experience become an experience per se, debunking the consolidated consumer journey (pre, during and post-experience)?

RQ5. What is the role of metaverse in making tourism experiences accessible for all, e.g. people with disabilities?

Moreover, research needs to investigate the value co-creation as well as the value co-destruction (Sigala, 2018) possibilities and impacts of the various interactions between the metaverse-scape, the avatars and other digital agents representing various entities (such as tourists, brand ambassadors, destination managers and heroes). For example, negative effects such as digital sickness, technostress, security and privacy violations, dehumanisation and depersonalisation of tourist experiences are only some of the potential impacts of metaverse experiences significantly affecting the digital well-being of its users. Several questions can drive future research.

RQ6. How do co-creation and co-destruction take place in metaverses? And which technologies enable them?

RQ7. How do we enhance digital engagement in metaverses creating social, psychological or even spiritual immersion? And, related, what makes people feel close to each other within the metaverse?

RQ8. What is the role of avatars in mediating, supporting and/or enriching tourists' experiences? For example, how does it feel not knowing what is happening in the metaverse while not being there or knowing that your avatar is experiencing what you should be experiencing? How do you feel and what does it mean for an avatar to walk through your avatar? Is that sexual harassment or not?

RQ9. How do we prevent the technological negative effects (digital sickness, technostress, security, etc.) of tourism experiences in metaverses?

Besides, NFTs and digital twins change the concept of (psychological/physical) ownership, possession, consumption as well as economic trade of tourism resources, which in turn create numerous challenges in terms of IP, and copyright issues. Subsequently, future research should look beyond the business applications of such technologies and also investigate the legal, ethical and marketing challenges created by NFTs, such as the fragmentation of ownership and IP rights of tourism resources and assets.

Although research in digital well-being has started (Stankov & Gretzel, 2020, 2021), we still know nothing about it within the metaverse and phygital settings. To achieve this, tourism metaverse research would need to develop and test new theoretical constructs, approaches, theories and mindsets that will be able to capture how metaverse spaces can enable and influence the design, delivery and management of effective, sustainable and meaningful metaverse tourism experiences and human well-being. Metaverse tourism is a continuously shaped and determined phenomenon that is driven not only by technological advances but also by legal, ethical, psychological and many other human and institutional factors. Hence, the complex socio-technical nature of metaverse tourism requires heavy inter- and multidisciplinary research. It entails many implications and challenges, which can guide future research.

RQ10. How will destinations reframe their brand identity, sustainability, sense of place and community role in the metaverse environment?

RQ11. How tourism firms and destinations can design and manage avatars that represent the values, image and personalities of their brands?

RQ12. What biodata and big data tourism firms and destinations can collect and analyse from metaverse users to better understand and meet the needs, behaviours and expectations of their tourists?

Apart from business challenges, metaverse tourism also creates ethical questions and dilemmas.

RQ13. Can destinations re-create and make alive (through an avatar or holograph) a dead person such as a member of staff, or a destination celebrity/hero, to promote the destination and offer metaverse tourism experiences? And, who is the owner of the avatar and its data, when its human representation passes away, and can/should tourism firms use the former?

Metaverse tourism is facilitated and inhibited by technological advances and the adoption and diffusion rate of these technologies within the tourism industry and stakeholders. Technology adoption may create huge inequalities and disparities and so, metaverse tourism research should also critically investigate and address issues, such as factors influencing technology adoption by tourism stakeholders; how to address the digital divide in metaverse tourism; and how to ensure a better representation of tourism stakeholders in the metaverse.

Tourism research also needs new methodologies and metrics to unravel and measure the dimensions and multi-dimensional impact of metaverse tourism experiences on the (physical, economic, mental, socio-cultural, and psychological) well-being of all tourism stakeholders.

2.7. Healthcare and XR – Alexandra Taylor, M. Claudia tom Dieck and Timothy Jung

Globally, healthcare sectors are facing challenges remnant of Covid-19, regarding the indefinite disruption to the provision and management of medical services. For the United Kingdom specifically, these implications are enhanced by the outcomes of Brexit and a current economic downturn (Fahy et al., 2022; Propper, Stoye, & Zarankos, 2020) resulting in increased healthcare costs, staff shortages, waitlists, and exacerbated health inequalities (Anderson & Mossialos, 2022; Bansal,

Rajgopal, Chamola, Xiong, & Niyato, 2022). Thus, this necessitates the need for modern solutions which incorporate developing technologies, such as the metaverse, to transform the healthcare industry by adapting their operational capacities within the metaverse (Bansal et al., 2022; Dwivedi et al., 2022).

The presence of physical and digital reality within the metaverse provides an array of opportunities to integrate healthcare services and technology (Mystakidis, 2022). Including applications which utilize extended reality (XR): virtual reality (VR) and augmented reality (AR), in addition to digital twins (DTs) and artificial intelligence (AI) (Song & Qin, 2022).

2.7.1. Future application of metaverse

XR is deemed to assist not only in patient care but also in surgical practices and in the education and training of professionals (Lee, 2022). XR has been combined with traditional treatments and therapies of a variety of health conditions (Petrigna & Musumeci, 2022; Song & Qin, 2022); including post-traumatic stress disorder (Kothgassner et al., 2019), anxiety and fear conditions, as well as pain management (Maples-Keller, Bunnell, Kim, & Rothbaum, 2017). The integration of XR technology and therapies is deemed equally effective as traditional solutions, and offer a customisable, cost-effective alternative that enhances patient compliance, accessibility, and convenience (Petrigna & Musumeci, 2022). Moreover, VR can provide 3D simulations of reality-based conditions which can then be assessed and analyzed by multiple professionals at one time; to facilitate pre-operative decisions and to determine surgical location (Lee, 2022; Petrigna & Musumeci, 2022).

In the education of healthcare professionals, AI, AR and VR technologies generate virtual rooms which mimic face-to-face classrooms (Dwivedi et al., 2022; Petrigna & Musumeci, 2022). The increasing realism of these virtual rooms allows students to interact with others, irrespective of their location, health, or economic status (Bansal et al., 2022). This improved engagement has the potential to overcome the loss of student enthusiasm and quality of education reported post-pandemic (Bansal et al., 2022). Alternatively, DTs provide virtualised simulations of real, physical objects which use machine learning to help with accurate decision-making and the prediction and prevention of risk (Far & Rad, 2022). Operating in a healthcare setting, DTs will allow patients to acquire immediate updates about their health aiding in the detection and possible prevention of disease; utilising input from health records, sensory data and risk factors (Song & Qin, 2022). The use of DTs will therefore eliminate the need for regular real-world appointments, reducing the wait times and pressures currently impacting the healthcare industry. Furthermore, Wang et al. (2022) argued for DTs' ability to enhance services in healthcare, however, practicality is threatened by their infancy within the domain and their requisite for accurate and frequent data inputs (Song & Qin, 2022).

2.7.2. Opportunities

With these technologies in mind, the virtualisation of healthcare within the metaverse will transform the industry by bridging the gap between patients and doctors (Bansal et al., 2022); returning autonomy to patients and equalling their increasing standards of health (Song & Qin, 2022). The metaverse can facilitate the provision of treatments and clinical technologies by offering virtualised clinics aimed at improving traditional face-to-face appointments (Bansal et al., 2022). Virtual spaces additionally overcome location and physical restraints whilst offering access to multiple expertise at one time (Bansal et al., 2022). Thus, delivering time and cost-effective services individualised to the patient and eliminating the need for ubiquitous multi-speciality hospitals (Bansal et al., 2022).

The metaverse can offer safe and anonymous environments for patients to share details comfortably with a professional of their choosing (Petrigna & Musumeci, 2022). Whilst also considering increased accessibility and autonomy, the metaverse can help eradicate health inequalities and create space for intersectionality (Holman et al., 2021) Moreover, the advantages of the metaverse will help reduce pressures built from long wait times and limited staff and thus work towards efficient healthcare.

2.7.3. Challenges

The practicality of healthcare within the metaverse is currently limited due to concerns regarding data management (Petrigna & Musumeci, 2022). These anxieties surfaced during discussions of the collection, storage, and use of large amounts of data linked to employees, operations, and patients (Musamih et al., 2022). To overcome this, organizations are required to deliver data management solutions that follow data protection laws (Musamih et al., 2022).

Moreover, XR equipment is not only costly to develop and purchase, but it also fails to factor into account the differing needs of patients (Lukava, Zuleima, & Barbareschi, 2022; Yaden, Eichstaedt, & Medaglia, 2018). Thus, allowing for the potential discrimination of certain demographics and contributing to the digital divide (Lukava et al., 2022; Riches, Azevedo, Bird, Pisani, & Valmaggia, 2021; Usmani, Sharath, & Mehendale, 2022). This necessitates digital equity which challenges the current socio-economic and ableist systems (Song & Qin, 2022).

Ongoing developments of the metaverse mean that it is readily able to harbour large populations, however due to its novelty, the long-term effects on these populations are mostly unknown (Bansal et al., 2022; Dwivedi et al., 2022). For instance, the metaverse is assumed to cause addictive behaviours which increase sedentary lifestyles and worsen mental health (Dutilleux & Chang, 2022). In turn, this adds to the pressures felt by current healthcare systems by increasing public demand for services.

2.7.4. Research directions

Overall, this contribution discusses the potential applications of the metaverse in facilitating the healthcare industry, whilst also considering its challenges and future agendas. Considering the XR Healthcare sector, we propose four main research directions and questions that should be addressed in future research:

RQ1. How can we standardise the metaverse and its collection, storage, and use of patient data to increase the feasibility of XR usage within the healthcare sector?

RQ2. What rules and regulations are needed to mitigate the long-term social effects related to the implementation of healthcare services into the metaverse?

RQ3. How can the metaverse contribute to efficient alternatives to traditional healthcare services through the development of convincing use cases and business models?

RQ4. How will the Metaverse facilitate medical expert training and education?

3. Discussion and implications

3.1. Discussion

In this section, we identify and synthesize the main themes that emerged from the contributions of this work.

3.1.1. Summary of opportunities of metaverse in service industries

3.1.1.1. New business-consumer relations within metaverse. The first opportunity identified in this multidisciplinary discourse is the significance of new business-consumer relations within the metaverse. Mainly discussed in Sections 2.1, 2.4, 2.5, and 2.6, this theme can also be divided into 2 sub-themes: new economy and new business-consumer interactions.

As stated in Section 2.4, the co-evolution of decentralized finance technologies that leverage blockchain technology is likely to lead to the creation of a new digital economy. Based on technologies such as cryptocurrencies and NFTs, new business opportunities will arise within the metaverse. For example, Section 2.6 discusses the possibility of creating NFTs of tourism destinations to sell as a product or to use them as souvenirs of the consumers' tourism experiences. Section 2.4 describes the importance of new payment methods within the metaverse and their potential to create new financial services that can be offered by businesses. Much like the creation of virtual assets like NFTs, businesses can also develop new products that are exclusive to the virtual world (Section 2.4).

In conjunction with the new metaverse economy, new methods of interaction between businesses and consumers are likely to arise. By using newly developed channels, businesses can foster innovative ways of engaging with consumers in a variety of contexts. As Section 2.5 states, the development of other technologies such as AI can provide more accurate and effective methods of marketing and value co-creation in the metaverse, which can lead to greater levels of customer retention (Kumar, Dixit, Javalgi, & Dass, 2016). This may fundamentally change the relationship between the brand and the consumer in the virtual context.

3.1.1.2. Introduction of novel inter-world interactions. The second opportunity to warrant discussion is the introduction of novel interactions between physical and virtual worlds. Again, this is broken down into 4 further sub-themes: removal of geographical barriers, increased accessibility, enhancement of the physical world, and compatibility between worlds.

With the increased emphasis on the creation of novel experiences in virtual worlds, the removal of geographical boundaries has increased in importance. In the education context, students can attend lessons remotely and participate in a much more immersive and realistic manner (Section 2.2). In the retail context, consumers can access and interact with businesses through various novel channels created through the metaverse (Section 2.5). For the tourism industry, the metaverse can empower consumers to profoundly experience destinations or events from anywhere, at any time (Section 2.6). In healthcare, patients can access effective healthcare services in virtual spaces that overcome various geographical, temporal, and resource-related constraints (Section 2.7). The introduction of online environments and immersive technologies has already prompted investigative research into the impact of online spaces and its removal of geographical boundaries in various contexts. In light of the metaverse and the increased quality of experiences it can facilitate, this becomes increasingly significant.

Concurrent with the removal of geographical boundaries, accessibility to the digital world is naturally increased with an expected effect on key societal issues. People with physical limitations or impairments who experience difficulties accessing certain physical spaces are given greater access to experiences and opportunities in various contexts, including but not limited to education, tourism, and healthcare (Sections 2.2, 2.6, 2.7). As Section 2.2 discusses, the metaverse has the potential to provide better opportunities to access education, bringing together people from diverse socioeconomic backgrounds which can lead to increased democratization of education. Section 2.7 comments on the empowerment of patients with increased autonomy in their access to healthcare services, identifying the metaverse's potential to reduce health inequalities (Holman et al., 2021).

The contributions provide further insight into the relationship between the existing physical world and its space-bound phenomena and the novel virtual world with associated phenomena that the metaverse will create. In several contexts, the metaverse can enhance existing phenomena that are present in the physical world. For example, Section 2.1 provides evidence of how media experiences in the metaverse can augment physical spaces and events, encouraging people's desires to visit the physical location itself (Kim et al., 2021). In the educational context, the metaverse can provide online virtual learning with features that are equal or superior to traditional classroom features, greatly enhancing the learning experience (Section 2.2). Section 2.6 identifies the potential of the metaverse in providing additional information at destinations such as how the destination looked in the past, and Section 2.7 identifies numerous ways in which healthcare services can be positively impacted, such as the reduction of waiting times caused by limited staff through the provision of virtual appointments (Bansal et al., 2022) and the development of safe and anonymous environments for patients to disclose sensitive details with a professional (Petrigna & Musumeci, 2022).

There is also evidence to suggest that the implementation of metaverse services and phenomena can be compatible with services and phenomena in the existing physical world. Section 2.1 discusses prior concerns that virtual spaces might replace physical spaces, but concludes that research indicates that virtual experiences can enhance and supplement physical experiences (Kim et al., 2021). Section 2.4 also highlights how existing payment options provided by financial service businesses can be connected or integrated with payment options in the metaverse.

3.1.1.3. Development of novel experiences. The third, and perhaps most obvious, opportunity identified is the creation of new experiences as mentioned in sections 2.1, 2.3, 2.4, 2.5, and 2.7. This can be broken down further into 3 sub-themes: the development of meaningful experiences, shared experiences, and personalized experiences.

Firstly, the development of the metaverse has resulted in an increased interest in its potential to deliver meaningful and memorable experiences that are embedded with value. Even before the introduction of the metaverse, factors such as memorability and value have been closely linked to the quality of an experience (Bastiaansen et al., 2019). Section 2.1 discusses the importance of having a sense of presence during an experience and the potential of the metaverse to deliver such feelings (Wirth et al., 2007). Having an increased sense of presence within an environment during an experience can greatly increase the memorability of the experience itself through the creation of emotional bonds (Bowman et al., 2020). Indeed, in the hospitality industry, research has closely and extensively investigated the relationship between emotion and memory within an experience (Bastiaansen et al., 2019). The potential of the metaverse to deliver memorable outcomes through the provision of experiences embedded with sentimental value is discussed further in Section 2.3.

Secondly, the social and collaborative nature of the metaverse is likely to result in the creation of shared experiences as discussed in Section 2.3. Digital artifacts can be used to store memorable experiences which can then be re-lived by others. With the metaverse, people are no longer limited to one-time individual experiences but can replicate or share their experiences with others. This has wider business implications as this can also lead to increased word-of-mouth marketing. The recent announcement of Apple's Vision Pro device highlights the opportunity to capture memories in 3D to allow for immersive reliving of experiences (Apple, 2023). As recording such events requires the wearing of the headset, the potential disruption of recording unfolding events remains unclear.

Thirdly, the embedding of other emerging technologies within the metaverse can lead to the personalization of experiences as discussed in Sections 2.4 and 2.5. In various business contexts, the personalization of consumer experiences already plays a big role in the success of the marketing and sales strategies of businesses. With enabling technologies such as artificial intelligence, together with the increased sense of presence and memorability created through the metaverse, businesses can now provide experiences that are highly tailored to the individual. For example, the current use of chatbots can be further extended to the development of virtual financial advisor avatars, providing a more

human experience (Section 2.4). Furthermore, the empathic qualities of future AI can be leveraged to provide specific and personalized suggestions by understanding the consumer's needs and preferences, resulting in a more memorable and effective experience overall with potential in various sectors such as retail as well as healthcare (Sections 2.5 and 2.7).

3.1.2. Summary of challenges of metaverse in service industries

3.1.2.1. Limitations of the experiences in the metaverse. Although the creation of novel experiences in the metaverses is one of its main opportunities, potential limitations of such experiences were paradoxically also identified as a key challenge. These limitations can be divided into 2 sub-themes: difficulties with creating an enhanced experience, and limitations of experience parameters.

Section 2.1 identifies some of the challenges with designing a sustainable metaverse infrastructure that can meet the demands of consumers (Ball et al., 2022). Although there are a multitude of opportunities to design and create new and innovative experiences that can engage users, these experiences are difficult to design and offer as meaningful encounters. Not only are there a plethora of considerations that businesses must take into account such as how to optimally use new omnichannel and communication strategies, but businesses will also have to investigate a suitable way to incorporate the sense of presence and value that is discussed above. As mentioned in Section 2.1, it is difficult to uniformly conceptualize emotions such as enjoyment, and individual preferences can influence outcomes greatly (Valkenburg & Peter, 2013). Extensive research into the design and effect of metaverse environments will have to be conducted in various service industry contexts.

On top of this, we anticipate the use of any metaverse application to limit the capacity of an experience in some contexts. As discussed in Section 2.2, in educational contexts, body language and facial expressions are key in the communication between student and teacher, and the use of avatars may hamper the ability of students to self-represent themselves, hindering the learning experience overall (Hrastinski, 2019). There is some ongoing doubt about whether the metaverse will be able to replicate or replace any emotionally engaging experiences in the physical world.

3.1.2.2. Current technological boundaries. Perhaps the greatest challenge of the metaverse in service industries (and quite a significant one at that!) comes from the fact that metaverse applications are still in their infancy. This is illustrated in the contributions above. Section 2.3 highlights that this is indeed one of the biggest challenges of anticipating future implications of the metaverse. Its capacity has not yet been defined, and without a proper metaverse application in existence, it is difficult to design experiences or business strategies to make use of its opportunities. Several technical limitations with the development of hardware are evident. Concurrently, with the development of various interpretations of metaverse by different companies currently underway, as mentioned in Section 2.4, it will be important to ensure that there remains an element of compatibility and standardization across applications in order to maximize its potential.

Due to the infancy of metaverse applications, another significant challenge is the lack of research surrounding its capabilities. Firstly, it is difficult to know whether existing theoretical concepts and constructs used in the literature for each industry will be applicable to one format of the metaverse, meaning that even when a proper metaverse application has been developed, research progress is bound to be slow (Section 2.5). Furthermore, the lack of research creates uncertainty that hinders investment by businesses into metaverse aspects, which respectively leads to further hindrance of its development (Section 2.4).

In addition to the lack of research, another challenge to the development and expansion of the metaverse is the cost of the technology. As mentioned in Section 2.7, the cost of XR equipment and XR content development is significant, and without proper justification for investment, it will be difficult for businesses to keenly implement the novel technology. The most recently announced Vision Pro by Apple is expected to market at USD 3500, a price point reserved for early adopters and developers in the field rather than the mass consumer market.

3.1.2.3. Health issues. Various studies have raised concerns regarding the negative impacts that engaging with the metaverse may have on health. These can be both physical and mental, and especially due to the lack of research on the metaverse as mentioned above, it remains difficult to predict any potential long-term effects that may arise (Dwivedi et al., 2022).

Adverse effects on physical health have already been widely investigated in the literature on immersive technologies with symptoms including nausea, headaches, eye strain, and digital sickness (Chang, Kim, & Yoo, 2020). Sections 2.2 and 2.6 express similar concerns in this regard. In terms of mental health, research indicates that the metaverse can potentially cause addictive behaviors (Dutilleux & Chang, 2022). Section 2.2 states that previous studies found that students suffered from anxiety due to online learning, and reported a rapidly increasing addiction to online gaming and media as a form of escapism (Andreassen et al., 2016). Due to the amplified immersive nature of the metaverse, it is anticipated that these symptoms will be exacerbated.

3.1.2.4. Data privacy, security, and legal issues. Possibly due to the infancy of metaverse applications, there remains a lot of uncertainty surrounding the legal and security concerns of the metaverse. The following two sub-themes are discussed in this respect: lack of a legal framework and data privacy and security issues.

As Section 2.4 states, there is currently no regulatory legal framework to guide the implementation and activities within the metaverse. From a business perspective, it is difficult for organizations to design business opportunities without knowing the boundaries of the law which could hinder business investment (Section 2.4). Furthermore, with the prevalent concerns regarding the potential negative impacts on physical and mental health, legal guidance and regulation are urgently needed.

Several data privacy issues are still highly debated, especially in contexts where data is highly confidential. Sections 2.4 and 2.7 on finance and healthcare confirm this concern, stating that the security of any data collected in the metaverse is key to maintaining consumer trust (Petrigna & Musumeci, 2022). In the financial service context, the volatility of the price of cryptocurrencies and NFTs and their potential for market manipulation could result in a decrease in trust from users and businesses in adopting new financial models (Koohang et al., 2023).

3.2. Implications

In this section, we synthesize metaverse trends discussed in this article and present key research propositions. Drawing from Wedel et al.'s (2020) framework on consumer marketing research for VR/AR, a framework (Fig. 1.) is proposed to summarize our findings. We then discuss the theoretical and practical contributions of this paper.

3.2.1. Research propositions

3.2.1.1. New B2C relationships. With the development of a new digital economy and new channels of interaction between businesses and consumers, businesses must act quickly to adapt to the changing B2C environment. As mentioned in Section 3.1.1, these new developments can equip businesses with novel ways of providing services and engaging with consumers. However, in order to do so effectively, businesses must conduct thorough research.

With regards to the metaverse economy, as mentioned in section 2.4,

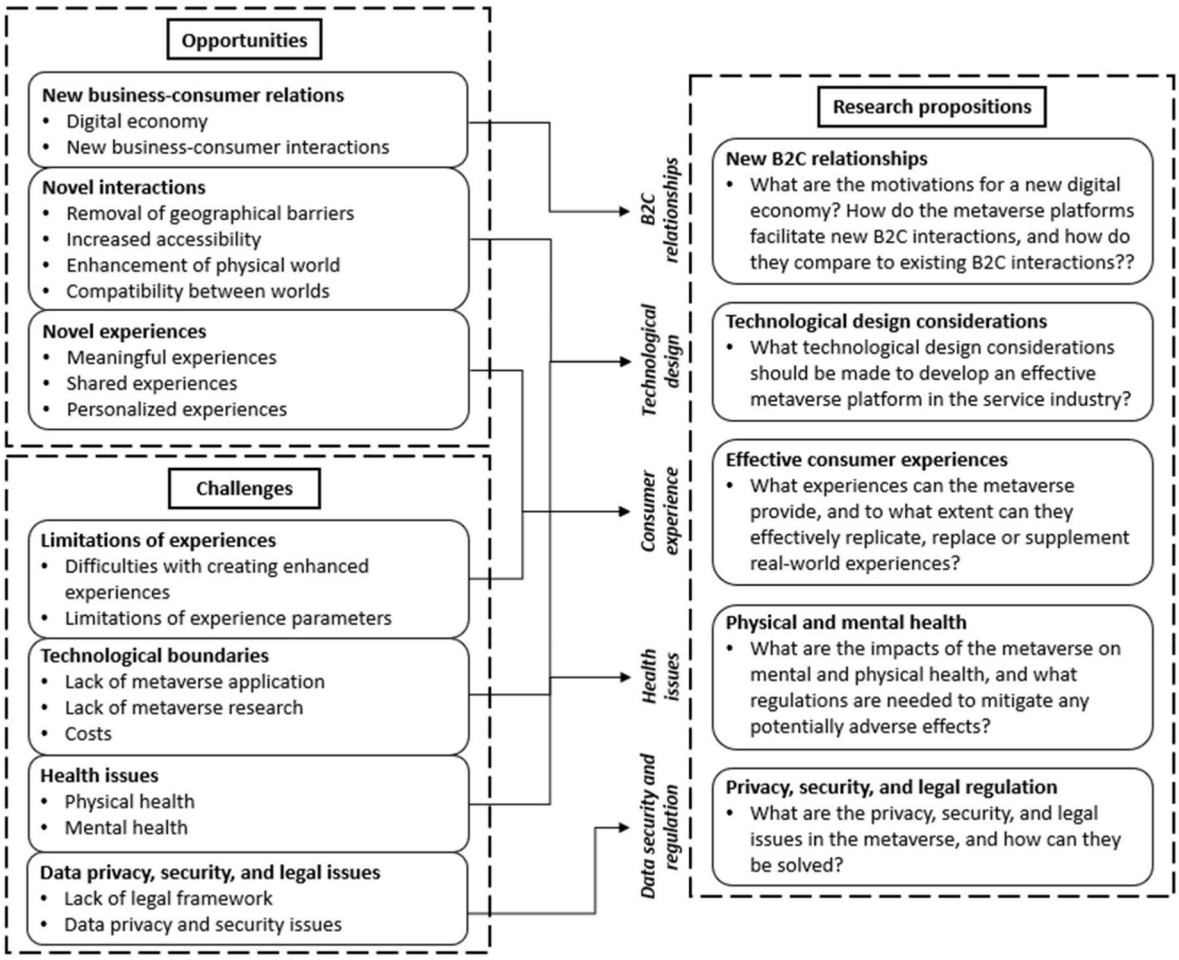

Fig. 1. Framework of metaverse opportunities, challenges, and research propositions in the service industry.

businesses should identify the key motivations for the use of virtual digital assets for both businesses and consumers, as well as investigate and compare the effectiveness of metaverse-facilitated financial services and services provided by traditional means.

Section 2.5 mentions the role of other supporting technologies such as AI and avatars, and their potential contribution to the relationships between businesses and consumers. Businesses should further investigate how they can make use of these technologies to support their metaverse business strategies. Again, it is important to understand how the use of these technologies compares to traditional methods of B2C interaction. In the context of tourism, Section 2.6 discusses the potential of metaverse platforms to change existing business standards with regard to measures such as quality of service. Furthermore, it is vital that businesses are able to adapt and transfer their current business strategies to the metaverse setting.

Therefore, the following research questions are proposed:

> What are the motivations for a new digital economy? How do the metaverse platforms facilitate new B2C interactions, and how do they compare to existing B2C interactions?

3.2.1.2. Technological design experiences. From the discussion in Section 3.1, it is clear that the shaping of new experiences in the metaverse will play a significant role in its optimal use. The main issue lies with the technological design of such experiences. The potential of novel experiences to engage consumers with meaningful, personalized, and shared experiences is immense, but this can only be achieved when the experience itself is designed adequately and completely. In order for businesses to design such experiences, they must take into account various context-specific considerations. In the media communications context (Section 2.1), this might concern the factors that help virtual *spaces* evolve into virtual *places*. In the education context (Section 2.2), an investigation into the role of avatars as a representation of students might be required. Following these parameters, businesses must understand the context-specific requirements in order to develop effective and context-relevant experiences in the metaverse. Furthermore, the costs associated with such designs must also be taken into consideration. Not only must the metaverse be designed well, but they must also be designed and developed cost-effectively.

In light of these requirements, the following key research question is proposed:

> What technological design considerations should be made to develop an effective metaverse platform in the service industry?

3.2.1.3. Effective consumer experiences. Following the discussion on technological design, it is important to consider *what type* of experiences businesses can provide in the metaverse, and to *what extent* these experiences are useful. For example, Section 2.2 discusses how the metaverse can be used to facilitate a more engaging form of virtual learning

that makes use of enhanced learning features whilst also increasing accessibility to educational opportunities. However, in light of the importance of effective communication through body language and facial expressions in learning contexts, possible limitations of using avatars as a form of communication and self-representation are highlighted. Businesses must investigate the contexts in which the metaverse can be used, and also the extent to which these experiences can be effective. This concern is also shown in the proposition of questions regarding the capacity of metaverse experiences to replicate or replace real-world experiences. For example, Section 2.2 prompts specifically whether the metaverse will be able to reproduce real-world education. Similarly, Section 2.5 calls for research on whether metaverse advertising can replace traditional advertising. This emphasis to compare metaverse experiences with real-world experiences are also evident in Sections 2.4, 2.6, and 2.7. We conclude that this topic is a cross-sectional issue and propose the following research question:

> What experiences can the metaverse provide, and to what extent can they effectively replicate, replace or supplement real-world experiences?

3.2.1.4. Physical and mental health. Fourthly, future research should investigate the impacts of the metaverse on physical and mental well-being. Section 2.2 comments extensively on the various mental and physical problems that have arisen due to the use of technology in education. This is also mentioned in Section 2.7, where it is highlighted that the long-term effects of the metaverse on mental and physical health are unknown. As Section 2.2 proposes, it may be useful to investigate whether the impact will vary depending on the age and stage of life of the user. Despite the effect of different user profiles, extensive research needs to be conducted to ensure that there are no significant problems with regard to the use of the metaverse, as this would negate any potential opportunity or benefit that it may bring.

The following question is proposed:

> What are the impacts of the metaverse on mental and physical health, and what regulations are needed to mitigate any potentially adverse effects?

3.2.1.5. Privacy, security, and legal regulation. Lastly, regulation of the metaverse to create a safe and secure environment is key to its successful implementation. Going beyond the obvious reasons for requiring a secure and well-regulated environment, user trust in technological experiences plays a significant role in their willingness to adopt any technology to engage in the metaverse. This is strongly illustrated in Sections 2.4 and 2.7, where the likelihood of adoption and success of the experience depends on the security of data management. Furthermore, from the perspective of businesses, a transparent and comprehensive legal framework will greatly facilitate to mitigate any uncertainty surrounding the financial regulation of the metaverse. The creation of such a framework could also contribute to encouraging further investment from businesses.

Therefore, we propose the following key research question:

> What are the privacy, security, and legal issues in the metaverse, and how can they be solved?

3.2.2. Contribution to the literature

There are a number of theoretical contributions to this perspective piece. First, this paper contributes to the growing body of literature on the metaverse by identifying promising opportunities when adopting the metaverse in the context of service industries. Our findings revealed that experts in the service industry point out several key opportunities such as the development of new experiences, the introduction of novel inter-world interactions, and new business-consumer relations within the metaverse. These are service industry-specific opportunities which could be explored in future studies.

Second, this study contributes to the body of knowledge by identifying key challenges of the metaverse when implemented in the service industries. The common challenges identified by service industry experts were technological limitations, limitations of the experiences in the metaverse, health issues, and data privacy, security, and legal issues. This confirms that there is a big gap between the customer expectations from the metaverse and what services businesses currently can offer via the metaverse platform in order to realise the real benefits of the metaverse in the service industry.

Finally, this study has contributed to the metaverse literature by developing research propositions through the analysis of the key trends and challenges of the metaverse discussed in this paper. Future studies on the metaverse in service industries should explore research questions on exploring key factors of designing more engaged and effective metaverse replacements or supplements for real-world experience. Further, some research questions on the impact of metaverse on physical and mental health as well as regulatory, privacy, security and ethical issues should be explored in future research. Finally, it is interesting to note that the business-to-business services discussion has not emerged from experts and this can be one of the areas of future metaverse research in the service industry.

3.2.3. Implications for practice

Based on the theoretical contributions, we summarize the resulting implications for professional practice in service industries. Our findings provide valuable insights for businesses operating in the service industry. It highlights opportunities for leveraging the metaverse, identifies challenges that need to be addressed, and suggests areas of focus that need to be further explored and understood to make informed decisions for enhancing the embedding and utilization of the metaverse in service industries. The findings of our paper help guide professionals to proactively embrace opportunities created by the metaverse, the implications on customer experiences and the importance of getting involved and staying relevant in an evolving digital landscape.

More specifically, our paper highlights promising opportunities that professionals in service industries can explore to navigate through the exponentially growing digital environment. As we expect the current growth rate of metaverse applications to continue to grow and increase in relevance for business practice and the daily lives of consumers, embracing new avenues for growth and innovation through the metaverse is paramount. Our paper outlines specific opportunities for creating new types of customer experiences and novel forms of interaction between businesses and consumers to capitalize on the potential benefits the metaverse infrastructure will provide. Furthermore, we provide a holistic overview of anticipated challenges and limitations that are evident to date and in the near future. Being aware of potential obstacles, including technological limitations, experience constraints, and data privacy concerns, provides professionals with crucial input to make informed decisions on issues that need to be overcome to successfully engage and adopt the metaverse in their service context. This paper highlights the rapid evolution of customer expectations in relation to the development of metaverse applications, which provokes professionals in service industries to adapt accordingly. However, we also point out that the metaverse offers new frontiers to immersive and engaging customer experiences, which introduce new virtual-physical parameters to the designing and staging of experiences. We posit that the metaverse opens new pathways to provide unique, meaningful, shared, and personal experiences that can more optimally align with customer desires towards increased satisfaction, loyalty, and differentiation of the experience and business. Finally, the contributions of this paper can help guide strategic decisions for professionals in service industries. We highly encourage using the insights outlined in this paper to assess the feasibility and potential impact of the adoption of the metaverse in specific service contexts. The findings of this paper should help

evaluate investment opportunities, provide input to generate new business models that capitalize on the metaverse in service industries and assist in prioritizing resources to leverage opportunities of the metaverse strategically and effectively.

4. Concluding remarks

The metaverse not only offers new opportunities for businesses in service industries but also brings potential benefits to customers. Although positive aspects of the metaverse such as new experience development, novel interactions and new business-consumer relations are highly praised, there are several challenges and obstacles to adopting and implementing the metaverse including technological boundaries and experiential limitations, health issues, data privacy, security, and legal issues for the realisation of true benefits of the metaverse for the businesses in the service industry. From a multidisciplinary perspective, this study provided valuable insights into the opportunities and challenges of adopting and implementing the metaverse from the perspective of multimedia and communication, education, hospitality, financial services, retail, tourism and healthcare. The paper concludes with formulating future research agendas and presenting contributions to literature and implications for professional practice.

Credit author statement

Timothy Jung, Justin Cho, Danny Han: Conceptualization, Project Administration, Review, Editing, Formal Analysis, Writing- Original draft preparation, Sun Joo (Grace) Ahn: Media and Communication Industry, Mansi Gupta and Das Gopal: Metaverse in Education, Danny Han: Metaverse in Hospitality, Cindy Yoonjung Heo: Metaverse for Financial Industries, Sandra Loureiro: Metaverse in Retail Industry, Marianna Sigala and Mariapina Trunfio: Reshaping Tourism through Metaverse, Alexandra Taylor, M. Claudia tom Dieck and Timothy Jung: Metaverse in Healthcare.

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.

Data availability

No data was used for the research described in the article.

Acknowledgement

This research was supported by the Eminent Scholar Program at Kyung Hee University in 2022.

Appendix. Indicative studies on the metaverse in the service industry

Industry	Study	Objectives	Methodology	Main conclusions
Media and Communication	Ahn et al. (2022), *Journal of Advertising*	To present a theoretical primer offering impetus for new directions in advertising theory and research in the metaverse.	Conceptual	The bifold triadic relationships framework sheds light on how advertising may work in the metaverse as relationships among consumer, media, and engagement behaviours.
Education	Hwang and Chien (2022), *CEAI*	To provide a clear role and application of metaverse for educational purpose.	Conceptual	Metaverse is providing a new perspective on educational technology. For learners, it will present fresh learning possibilities and environments that will overcome the limitations of time, space, or even dangers during the learning process. Further their research discussed the infrastructural and ethical issues encompassing the application of metaverse for educational purpose.
Hospitality	Orús, Ibanez-Sanchez, and Flavian (2021), *International Journal of Hospitality Management*	Analysing the effects of content type through different devices on consumer's XR hotel pre-experiences.	Lab experiment (2 × 2 between subjects factorial design)	Content with high factual realism (real higher than digital) enhances presence. Presence favours booking intentions through visual appeal and ease of imagination. Real contents with headsets is the best combination for empowering pre-experiences.
Financial services	Ooi, et al. (2023), *International Journal of Bank Marketing*	To discuss the potential impact of the metaverse on four vital domains: corporate banking, retail banking, banking employees, and public policy.	Conceptual	The invited contributors establish the connection between their key areas and the metaverse, pinpoint opportunities and challenges within those domains, and put forward future research agendas for consideration by stakeholders.
Retail	Yoo, Welden, Hewett, and Haenlein (2023), *Journal of Retailing*	To delineate a research agenda to expand our understanding of retailing in the metaverse	Comprehensive literature review	New conceptualization of the metaverse that contains four distinct dimensions: online collaboration, high consumer immersion, unique digital assets, and digital personas.
Tourism	Koo et al. (2022), *CIT*	To define "metaverse tourism ecosystem" as an immersive 3D virtual world where travellers interact socially with several stakeholders, seamlessly connect the virtual and real world and tangibilize services; To identify directions and suggest propositions for future research on metaverse tourism.	Conceptual	Metaverse core technologies enhance immersive experiences Metaverse creates a new era of investigation considering the tourist's multi-identification avatars/profiles Service tangible/visible elements in the metaverse shape expectations during the pre-travel experience Metaverse tourism offers opportunities for new business models of a creative economy.

(*continued on next page*)

(*continued*)

Industry	Study	Objectives	Methodology	Main conclusions
Healthcare	Bansal et al. (2022), *IEEE Access*	To promote discussion of healthcare within the Metaverse community. To demonstrate the value of technology and how this can benefit the healthcare industry. To propose future research agendas that ought to be addressed.	Comprehensive Survey	There is the potential for the Metaverse to not only improve but revolutionize the healthcare industry. Via the implementation of virtual worlds and digital twins in education and training, clinical treatment, and the upkeep of physical and mental wellbeing. However, transformation is not without its challenges. This includes but is not limited to hardware (access and ease of use), data security concerns, mental health concerns, and legal issues.

References

Accenture. (2022). *Travel into the metaverse. Accenture*. https://www.accenture.com/us-en/blogs/compass-travel-blog/travel-into-the-metaverse.

Accenture. (2021). *New blockchain taxi DRIFE helps drivers and riders reclaim power in broken ride-hailing industry. Accesswire*. https://www.accesswire.com/657764/New-blockchain-taxi-DRIFE-helps-drivers-and-riders-reclaim-power-in-broken-ride-hailing-industry.

Ahn, S. J., Kim, J., & Kim, J. (2022). The bifold triadic relationships framework: A theoretical primer for advertising research in the metaverse. *Journal of Advertising, 51*(5), 592–607. https://doi.org/10.1080/00913367.2022.2111729

Allen, M. (2022). *Swiss bank takes plunge into the metaverse*. Swissinfo. https://www.swissinfo.ch/eng/business/swiss-bank-takes-plunge-into-the-metaverse/47868446.

Anderson, M., & Mossialos, E. (2022). Are we heading for a two tier healthcare system in the UK? *BMJ, 376*, 592–607. https://doi.org/10.1080/00913367.2022.2111729

Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., et al. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors, 30*(2), 252–262. https://doi.org/10.1037/adb0000160

Anggara, M. R. H., Davie, M. R., Margani, M., Aristyana, M. A. D., & Aulia, M. (2022). The presence of commercial banks in metaverses' financial ecosystem: Opportunities and risks. *Journal of Central Banking Law and Institutions, 1*(3), 405–430. https://doi.org/10.21098/jcli.v1i3.28

Apple. (2023). *Apple vision Pro*. https://www.apple.com/apple-vision-pro/.

Ball, M. (2021). Framework for the metaverse. MatthewBall.vc https://www.matthewball.vc/all/forwardtothemetaverseprimer.

Ball, C., Novotny, E., Ahn, S. J., Hahn, L., Schmidt, M. D., L Rathbun, S., et al. (2022). Scaling the virtual fitness buddy ecosystem as a school-based physical activity intervention for children. *IEEE Computer Graphics and Applications, 42*(1), 105–115. https://doi.org/10.1109/MCG.2021.3130555

Bansal, G., Rajgopal, K., Chamola, V., Xiong, Z., & Niyato, D. (2022). Healthcare in metaverse: A survey on current metaverse applications in healthcare. *IEEE Access, 10*, 119914–119946. https://doi.org/10.1109/ACCESS.2022.3219845

Bastiaansen, M., Lub, X. D., Mitas, O., Jung, T., Ascencao, M. P., Han, D., et al. (2019). Emotions as core building blocks of an experience. *International Journal of Contemporary Hospitality Management, 31*(2), 651–668. https://doi.org/10.1108/IJCHM-11-2017-076

Battersby, J. L. (2006). Narrativity, self, and self-representation. *Narrative, 14*(1), 27–44. https://doi.org/10.1353/nar.2005.0024

Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research, 15*(2), 139–168. https://doi.org/10.1086/209154

Belk, R., Humayun, M., & Brouard, M. (2022). Money, possessions, and ownership in the metaverse: NFTs, cryptocurrencies, web3 and wild markets. *Journal of Business Research, 153*, 198–205. https://doi.org/10.1016/j.jbusres.2022.08.031

Bilro, R. G., & Loureiro, S. M. C. (2020). A consumer engagement systematic review: Synthesis and research agenda. *Spanish Journal of Marketing – ESIC, 24*(3), 283–307. https://doi.org/10.1108/SJME-01-2020-0021

Biocca, F. (1997). The cyborg's dilemma: Progressive embodiment in virtual environments [1]. *Journal of Computer-Mediated Communication, 3*(2). https://doi.org/10.1111/J.1083-6101.1997.TB00070.X

Bowlby, J. (1979). *The Making and breaking of affectional bonds*. London: Tavistock.

Bowman, N. D., Banks, J., & Rittenour, C. E. (2020). Country roads through 1s and 0s: Sense of place for and recollection of West Virginia following long-term engagement with Fallout 76. *Technology, Mind, and Behavior, 1*(1). https://doi.org/10.1037/TMB0000001

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), 1–16. https://doi.org/10.1108/IJCHM-05-2022-0631

Chang, E., Kim, H. T., & Yoo, B. (2020). Virtual reality sickness: A review of causes and measurements. *International Journal of Human-Computer Interaction, 36*(17), 1658–1682. https://doi.org/10.1080/10447318.2020.1778351

Cho, J., tom Dieck, M. C., & Jung, T. (2023). What is the metaverse? Challenges, opportunities, definition, and future research directions. In T. Jung, M. C. tom Dieck, & S. M. C. Loureiro (Eds.), *Extended reality and metaverse: Immersive technology in times of crisis* (pp. 3–26). https://doi.org/10.1007/978-3-031-25390-4_1

Collins, C. (2008). Looking to the future: Higher education in the metaverse. *Educause Review, 43*(5), 51–63.

Damghanian, H., Zarei, A., & Kojuri, M. A. S. (2016). Impact of perceived security on trust, perceived risk, and acceptance of online banking in Iran. *Journal of Internet Commerce, 15*(3), 214–238. https://doi.org/10.1080/15332861.2016.1191052

Dong, H., & Lee, J. S. A. (2022). The metaverse from a multimedia communications perspective. *IEEE MultiMedia, 29*(4), 123–127. https://doi.org/10.1109/MMUL.2022.3217627

Dourish, P. (2006). Re-space-ing place: 'place' and 'space' ten years on. In *Proceedings of the ACM conference on computer supported cooperative work* (pp. 299–308). CSCW. https://doi.org/10.1145/1180875.1180921.

Dutilleux, M., & Chang, K.-M. (2022). Metaverse – future addiction concerned for human-being. *International Multilingual Journal of Science and Technology, 7*(2), 4724–4732.

Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., … Wamba, S. 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*, Article 102542. https://doi.org/10.1016/j.ijinfomgt.2022.102542

Dwivedi, Y. K., Hughes, L., Wang, Y., Alalwan, A. A., Ahn, S. J., Balakrishnan, J., … Wirtz, J. (2023). Metaverse marketing: How the metaverse will shape the future of consumer research and practice. *Psychology and Marketing, 40*(4), 750–776. https://doi.org/10.1016/j.jbusres.2022.113420

Eliasson, J. (2022). Will we travel less after the pandemic? *Transportation Research Interdisciplinary Perspectives, 13*, Article 100509. https://doi.org/10.1016/j.trip.2021.100509

Elmasry, T., Hazan, E., Hamza, K., Kelly, G., Srivastava, S., Yee, L., et al. (2022). *Value creation in the metaverse: The real business of the virtual world*.

Encore Research. (2019). Designing transformative experiences using virtual reality at corporate events. Amazing examples of virtual reality in events. https://www.encore-anzpac.com/amazing-examples-of-virtual-reality-in-events.

Fahy, N., Hervey, T., Dayan, M., Flear, M., Galsworthy, M. J., Greer, S., et al. (2022). Impact on the NHS and health of the UK's trade and cooperation relationship with the EU, and beyond.'. *Health Economics, Policy and Law, 17*, 471–496. https://doi.org/10.1017/S1744133122000044

Far, S. B., & Rad, A. I. (2022). Applying digital twins in Metaverse: User interface, security and privacy challenges.'. *Journal of Metaverse, 2*(1), 8–16.

Fitzpatrick, G., Kaplan, S., & Mansfield, T. (1996). Physical spaces, virtual places and social work in the virtual worlds: A study. In *Proceedings of the 1996 ACM conference on computer supported cooperative work - CSCW '96*. https://doi.org/10.1145/240080

Flavian, C., Ibanez-Sanchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience. *Journal of Business Research, 100*, 547–560.

Foerster, H. (2003). On self-organizing systems and their environments. In *Understanding understanding*. New York, NY: Springer. https://doi.org/10.1007/0-387-21722-3_1.

Ghosh, I., Alfaro-Cortés, E., Gámez, M., & García, N. (2023). Do travel uncertainty and invasion rhetoric spur metaverse financial asset? – Gauging the role of media influence. *Finance Research Letters, 51*, Article 103434. https://doi.org/10.1016/j.frl.2022.103434

Giang Barrera, K., & Shah, D. (2023). Marketing in the metaverse: Conceptual understanding, framework, and research agenda. *Journal of Business Research, 155*, Article 113420. https://doi.org/10.1016/J.JBUSRES.2022.113420

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

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), 1–8. https://doi.org/10.1080/19368623.2022.2072504

Hanafizadeh, P., Keating, B. W., & Khedmatgozar, H. R. (2014). A systematic review of Internet banking adoption. *Telematics and Informatics, 31*(3), 492–510. https://doi.org/10.1016/j.tele.2013.04.003

Hennig-Thurau, T., Groth, M., Paul, M., & Gremler, D. D. (2006). Are all smiles created equal? How emotional contagion and emotional labor affect service relationships. *Journal of Marketing, 70*(3), 58–73. https://doi.org/10.1509/jmkg.70.3.058

Hoffner, C. A., & Levine, K. J. (2009). Enjoyment of mediated fright and violence: A meta-analysis. *Media Psychology, 7*(2), 207–237. https://doi.org/10.1207/S1532785XMEP0702_5

Holman, D., Salway, S., Bell, A., Beach, B., Adebajo, A., Ali, N., et al. (2021). Can intersectionality help with understanding and tackling health inequalities. *Health Research Policy and Systems, 19*(97). https://doi.org/10.1186/s12961-021-00742-w

HospitalityOn. (2022). *Marriott launches a virtual reality service*. Technologies. https://hospitality-on.com/en/technologies/marriott-launches-virtual-reality-service.

Hrastinski, S. (2019). What do we mean by blended learning? *TechTrends, 63*(5), 564–569. https://doi.org/10.1007/s11528-019-00375-5

Huang, M. H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science, 49*(1), 30–50. https://doi.org/10.1007/s11747-020-00749-9

Hwang, G. J., & Chien, S. Y. (2022). Definition, roles, and potential research issues of the metaverse in education: An artificial intelligence perspective. *Computers and Education: Artificial Intelligence, 3*, Article 100082. https://doi.org/10.1016/j.caeai.2022.100082

Insights, L. (2021). *Marriott launches NFT collection at contemporary art fair. Travel & mobility*. https://www.ledgerinsights.com/marriott-launches-nft-collection-at-contemporary-art-fair/.

Jung, T., Chung, N., & Leue, M. C. (2015). The determinants of recommendations to use augmented reality technologies - the case of a Korean theme park. *Tourism Management, 49*, 75–86.

Kemp, J., & Livingstone, D. (2006). Putting a second Life "Metaverse" skin on learning management systems. In *Proceedings of the second life education workshop at the second life community convention, 20*. University of Paisley.

Kim, M., Lee, C. K., & Jung, T. (2020). Exploring consumer behaviour in virtual reality tourism using an extended stimulus-organism-response model. *Journal of Travel Research, 59*, 69–89.

Kim, J., Shinaprayoon, T., & Ahn, S. J. (2021). Virtual tours encourage intentions to travel and willingness to pay via spatial presence, enjoyment, and destination image. *Advanced Engineering Informatics, 43*(1), 90–105. https://doi.org/10.1080/10641734.2021.1962441

Koohang, A., Nord, J., Ooi, K., Tan, G., Al-Emran, M., Aw, E., et al. (2023). Shaping the metaverse into reality: Multidisciplinary perspectives on opportunities, challenges, and future research. Advance online publication *Journal of Computer Information Systems* https://gala.gre.ac.uk/id/eprint/38382/3/38382_MOGAJI_Shaping_the_metaverse_into_reality_multidisciplinary_perspectives.pdf.

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

Kothgassner, O., Goreis, A., Kafka, J., Van Eickels, R., Plener, P., & Felnhofer, A. (2019). Virtual reality exposure therapy for posttraumatic stress disorder (PTSD): A meta-analysis. *European Journal of Psychotraumatology, 10*(1). https://doi.org/10.1080/20008198.2019.1654782

Kumar, V., Dixit, A., Javalgi, R. R. G., & Dass, M. (2016). Research framework, strategies, and applications of intelligent agent technologies (IATs) in marketing. *Journal of the Academy of Marketing Science, 44*(1), 24–45. https://doi.org/10.1007/s11747-015-0426-9

Lee, C. (2022). Application of metaverse service to healthcare industry: A strategic perspective.'. *International Journal of Environmental Research and Public Health, 19*(20). https://doi.org/10.3390/ijerph192013038

Lee, L., Braud, T., Zhou, P., Wang, L., Xu, D., Lin, Z., et al. (2021). *All one needs to know about metaverse: A complete survey on technological singularity. And research agenda.* arXiv preprint Virtual Ecosystem.

Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer-Mediated Communication, 3*. https://doi.org/10.1111/j.1083-6101.1997.tb00072.x

Lucey, B. M., Vigne, S. A., Yarovaya, L., & Wang, Y. (2022). The cryptocurrency uncertainty index. Advance online publication *Finance Research Letters, 45*, Article 102147 https://www.sciencedirect.com/science/article/pii/S1544612321002282?via%3Dihub.

Lukava, T., Zuleima, D. Z. M., & Barbareschi, G. (2022). Two sides of the same coin: Accessibility practices and neurodivergent user's experience of extended reality. *Journal of Enabling Technologies, 16*(2), 75–90. https://doi.org/10.1108/JET-03-2022-0025

Maples-Keller, J., Bunnell, B., Kim, S., & Rothbaum, B. (2017). The use of virtual reality technology in the treatment of anxiety and other psychiatric disorders. *Harvard Review of Psychiatry, 25*(3), 103–113. https://doi.org/10.1016/j.jbusres.2020.11.001

Marr, B. (2022). *Banking in the metaverse – the next frontier for financial services*. Forbes. https://www.forbes.com/sites/bernardmarr/2022/11/16/banking-in-the-metaverse–the-next-frontier-for-financial-services/?sh=1efc379222d1.

McKinsey. (2022). Marketing in the metaverse: An opportunity for innovation and experimentation. *McKinsey Quarterly*. May 24, 2022.

McKinsey, & Company. (2022). *Value creation in the metaverse*. McKinsey. https://www.mckinsey.com/business-functions/growth-marketing-and-sales/our-insights/value-creation-in-the-metaverse.

Miao, F., Kozlenkova, I. V., Wang, H., Xie, T., & Palmatier, R. W. (2022). An emerging theory of avatar marketing. *Journal of Marketing, 86*(1), 67–90. https://doi.org/10.1177/0022242921996646

Musamih, A., Yaqoob, I., Salah, K., Jayaramen, R., Al-hammadi, Y., Omar, M., et al. (2022). Metaverse in healthcare: Applications, challenges, and future directions. *IEEE Consumer Electronic Magazine, 9*, 9728–9743. https://doi.org/10.1109/MCE.2022.3223522

Mystakidis, S. (2022). Metaverse. *Encyclopedia, 2*(1), 486–497.

Oliver, M. B., & Bartsch, A. (2010). Appreciation as audience response: Exploring entertainment gratifications beyond hedonism. *Human Communication Research, 36*(1), 53–81. https://doi.org/10.1111/J.1468-2958.2009.01368.X

Ooi, K.-B., Tan, G. W.-H., Aw, E. C.-X., Cham, T.-H., Dwivedi, Y. K., Dwivedi, R., et al. (2023). Banking in the metaverse: A new frontier for financial institutions. *International Journal of Bank Marketing*. https://doi.org/10.1108/IJBM-03-2023-0168

Orús, C., Ibanez-Sanchez, S., & Flavian, C. (2021). Enhancing the customer experience with virtual and augmented reality: The impact of content and device type. *International Journal of Hospitality Management, 98*.

Papagiannidis, S., Bourlakis, M., & Vafopoulos, M. (2008). Banking in second life: Marketing opportunities and repercussions. *SSRN Electronic Journal*. https://doi.org/10.2139/SSRN.1887570

Park, S., & Kim, S. (2022). Identifying world types to deliver gameful experiences for sustainable learning in the metaverse. *Sustainability, 14*(3), 1361. https://doi.org/10.3390/su14031361

Petrigna, L., & Musumeci, G. (2022). The metaverse: A new challenge for the healthcare system: A scoping review.'. *Journal of Functional Morphology and Kinesiology, 7*(3). https://doi.org/10.3390/jfmk7030063

Pillai, R., & Sivathanu, B. (2020). Adoption of AI-based chatbots for hospitality and tourism. *International Journal of Contemporary Hospitality Management*, 10.1108/IJCHM-04-2020-0259.

Propper, C., Stoye, G., & Zarankos, B. (2020). The wider impacts of coronavirus pandemic on the NHS. *Fiscal Studies, 41*(2), 345–356. https://doi.org/10.1111/1475-5890.12227

Redman, J. (2021). *Budweiser launches 1,936 nft cans, bud-themed marketplace gets bogged down with traffic*. Bitcoin.com https://news.bitcoin.com/budweiser-launches-1936-nft-cans-bud-themed-marketplace-gets-bogged-down-with-traffic/.

Revfine. (2022). *How augmented reality is transforming the hospitality industry*. Revfine. https://www.revfine.com/augmented-reality-hospitality-industry/.

Reyes, C. E. G. (2020). Perception of high school students about using Metaverse in augmented reality learning experiences in mathematics. *Pixel-Bit, 58*, 143–159.

Riches, S., Azevedo, L., Bird, L., Pisani, S., & Valmaggia, L. (2021). Virtual reality relaxation for the general population: A systematic review. *Social Psychiatry and Psychiatric Epidemiology, 56*(June), 1707–1727. https://doi.org/10.1007/s00127-021-02110-z

Rizzo, A., Roy, M. J., Hartholt, A., Costanzo, M., Highland, K. B., Jovanovic, T., et al. (2017). Virtual reality applications for the assessment and treatment of PTSD. In *Handbook of military psychology: Clinical and organizational practice* (pp. 453–471). https://doi.org/10.1007/978-3-319-66192-6_27/COVER

Roschk, H., Loureiro, S. M. C., & Breitsohl, J. (2017). Calibrating 30 years of experimental research: A meta-analysis of the atmospheric effects of music, scent, and color. *Journal of Retailing, 93*(2), 228–240. https://doi.org/10.1016/j.jretai.2016.10.001

Rosen, P. (2022). *Metaverse mortgages are being issued to buy virtual land — and one of the first ever was just signed for a property in Decentraland*. Merkets Insider. https://markets.businessinsider.com/news/currencies/metaverse-mortgage-terrazero-decentraland-virtual-land-real-estate-crypto-finance-2022-2.

Shah, D., & Murthi, B. P. S. (2021). Marketing in a data-driven digital world: Implications for the role and scope of marketing. *Journal of Business Research, 125*, 772–779.

Sigala, M. (2018). New technologies in tourism: From multidisciplinary to anti-disciplinary advances and trajectories. *Tourism Management Perspectives, 25*, 151–155. https://doi.org/10.1016/j.tmp.2017.12.003

So, K. K. F., King, C., & Sparks, B. (2014). Customer engagement with tourism brands: Scale development and validation. *Journal of Hospitality & Tourism Research, 38*(3), 304–329. https://doi.org/10.1177/1096348012451456

Solnet, D., Subramony, M., Ford, R. C., Golubovskaya, M., Kang, H. J. A., & Hancer, M. (2019). Leveraging human touch in service interactions: Lessons from hospitality. *Journal of Service Management, 30*(3), 392–409. https://doi.org/10.1108/JOSM-12-2018-0380

Song, Y.-T., & Qin, J. (2022). Metaverse and personal healthcare. *Procedia Computer Science, 210*, 189–197. https://doi.org/10.1016/j.procs.2022.10.136

Stankov, U., & Gretzel, U. (2020). Tourism 4.0 technologies and tourist experiences: A human-centered design perspective. *Information Technology & Tourism, 22*(3), 477–488. https://doi.org/10.1007/s40558-020-00186-y

Stankov, U., & Gretzel, U. (2021). Digital well-being in the tourism domain: Mapping new roles and responsibilities. *Information Technology & Tourism, 23*, 5–17.

Sternberg, R. J. (2005). The theory of successful intelligence. *Interamerican Journal of Psychology, 39*(2), 189–202. https://doi.org/10.1037/1089-2680.3.4.292

Tassi, P. (2023). *The next 'fortnite' concert may be the kid laroi, coming later this month*. Forbes. https://www.forbes.com/sites/paultassi/2023/01/06/the-next-fortnite-concert-may-be-the-kid-laroi-coming-later-this-month/?sh=72e89e1e44db.

TheDon2016. (2017). Feeling physically and mentally tired after using VR? *Reddit*. www.reddit.com/r/PSVR/comments/5rfo7x/feeling_physically_and_mentally_tired_after_using.

Thoits, P. A. (2010). Stress and health: Major findings and policy implications. *Journal of Health and Social Behavior, 51*(1), S41–S53. https://doi.org/10.1177/0022146510383499. Suppl.

Tussyadiah, I. P., Wang, D., Jung, T. H., & tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism Management, 66*, 140–154.

Usmani, S. S., Sharath, M., & Mehendale, M. (2022). Future of mental health in the Metaverse. *General Psychiatry, 35*(4). https://doi.org/10.1136/gpsych-2022-100825

Valkenburg, P. M., & Peter, J. (2013). The differential susceptibility to media effects model. *Journal of Communication, 63*(2), 221–243. https://doi.org/10.1111/JCOM.12024

Vorderer, P., Klimmt, C., & Ritterfeld, U. (2004). Enjoyment: At the heart of media entertainment. *Communication Theory, 14*(4), 388–408. https://doi.org/10.1111/J.1468-2885.2004.TB00321.X

Wang, Y. (2022). Volatility spillovers across NFTs news attention and financial markets. Advance online publication *International Review of Financial Analysis, 83*, Article 102313. https://doi.org/10.1016/j.irfa.2022.102313.

Wang, G., Badal, A., Jia, X., Maltz, J. S., Mueller, K., Myers, K., et al. (2022). Development of metaverse for intelligent healthcare.'. *Nature Machine Intelligence, 4*, 922–929. https://doi.org/10.1038/s42256-022-00549-6

Wedel, M., Bigné, E., & Zhang, J. (2020). Virtual and augmented reality: Advancing research in consumer marketing. *International Journal of Research in Marketing, 37*(3), 443–465.

Wee, D., & Nicole, A. (2022). *HSBC to make metaverse debut with virtual gaming partnership*. Bloomberg. https://www.bloomberg.com/news/articles/2022-03-16/hsbc-to-make-metaverse-debut-with-virtual-gaming-partnership.

Weiss, R. S. (1988). Loss and recovery. *Journal of Social Issues, 44*(3), 37–52. https://doi.org/10.1111/j.1540-4560.1988.tb02075.x

Wirth, W., Hartmann, T., Böcking, S., Vorderer, P., Klimmt, C., Schramm, H., et al. (2007). A process model of the formation of spatial presence experiences. *Media Psychology, 9*(3), 493–525. https://doi.org/10.1080/15213260701283079

Xu, M., Ng, W. C., Lim, W. Y. B., Kang, J., Xiong, Z., Niyato, D., et al. (2022). A full dive into realizing the edge-enabled metaverse: Visions, enabling technologies, and challenges. *IEEE Communications Surveys & Tutorials*. https://doi.org/10.1109/COMST.2022.3221119, 1–1.

Yaden, D., Eichstaedt, J., & Medaglia, J. (2018). The future of technology in positive psychology: Methodological advances in the science of well-being. *Frontiers in Psychology, 18*(9). https://doi.org/10.3389/fpsyg.2018.00962

Yoo, K., Welden, R., Hewett, K., & Haenlein, M. (2023). The merchants of meta: A research agenda to understand the future of retailing in the metaverse. *Journal of Retailing, 99*(2), 173–192. https://doi.org/10.1016/j.jretai.2023.02.002

Yousaf, I., & Yarovaya, L. (2022). Herding behavior in conventional cryptocurrency market, non-fungible tokens, and DeFi assets. Advance online publication *Finance Research Letters, 50*, Article 103299. https://doi.org/10.1016/j.frl.2022.103299.

Yousafzai, S., Pallister, J., & Foxall, G. (2009). Multi-dimensional role of trust in Internet banking adoption. *Service Industries Journal, 29*(5), 591–605. https://doi.org/10.1080/02642060902719958

Zainurin, M. Z. L., Haji Masri, M., Besar, M. H. A., & Anshari, M. (2023). Towards an understanding of metaverse banking: A conceptual paper. Advance online publication *Journal of Financial Reporting & Accounting*. https://doi.org/10.1108/JFRA-12-2021-0487.