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Extended Reality and Metaverse

Immersive Technology in Times of Crisis

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ISSN 2198-7246 ISSN 2198-7254 (electronic)
Springer Proceedings in Business and Economics
ISBN 978-3-031-25389-8 ISBN 978-3-031-25390-4 (eBook)
https://doi.org/10.1007/978-3-031-25390-4

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Preface

The seventh International XR Conference was held in Lisbon, Portugal, in April 2022. It was a special experience as it allowed the XR community to gather for the first time in person after a three-year break. The COVID pandemic has highlighted the importance of technological advances, allowing people to continue meeting realistically online through virtual chats and meeting platforms, collaborate on projects and continue with online training and education. However, it has also highlighted the desire and need for real experiences and the importance of human–human interaction. This book will provide the reader with latest research on XR that emerged throughout the COVID pandemic and will be a valuable resource to gather the latest trends in AR, VR, MR and XR.

Timothy Jung
M. Claudia tom Dieck
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International XR Conference 2022

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Marketing, Retail and Storytelling

What is the Metaverse? Challenges, Opportunities, Definition, and Future Research Directions

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Abstract. Interest in the Metaverse has recently surged due to the transformational opportunities and experiences that it offers to customers and businesses across the globe. However, the extant literature on the Metaverse is inconsistent, with no existing literature synthesis or consensus among studies on the definition of the Metaverse. This study provides a scoping review of Metaverse research, identifying the trends, definitions, and characteristics of the Metaverse concept. After providing a review of Metaverse research in all subject areas, the study narrows its focus to the business and management field, providing a more detailed review of the trends, characteristics, opportunities, and challenges of the Metaverse in this specific context. The findings from the literature are used to propose the Metaverse Research Model which conceptualizes and problematizes the literature, providing insight into the key concepts related to the Metaverse and offering guidance in terms of future research directions.

Keywords: Metaverse · Definition · Future trends · Extended reality · Research agenda · Scoping review

1 Introduction

Since Facebook's announcement to change its name to "Meta" and the recent acquisition of Activision Blizzard by Microsoft, there has been an increased awareness and interest in the opportunities and characteristics of the Metaverse. But what actually is the Metaverse? This paper provides an introductory but comprehensive insight into the novel concept by exploring extant research and examining the evolution of the Metaverse throughout recent years.

The rise of digital technologies has brought about change in many ways (Loureiro et al. 2021). Choi and Kim (2017) express these changes through their study on museum exhibitions. Functionally, museums have shifted their focus from preserving physical objects towards adding educational and informational content to enhance the exhibition experience (Choi and Kim 2017). Spatially, museums have evolved beyond the physical space, and information on objects can be distributed online (Choi and Kim 2017; Yoo 2010). The impact of technology is also portrayed by Bourlakis et al. (2009) in their review of the evolution of retailing, with the expansion of retailing space bringing about

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T. Jung et al. (Eds.): XR 2022, SPBE, pp. 3–26, 2023.
https://doi.org/10.1007/978-3-031-25390-4_1

new opportunities. In this way, the proliferation of smart technologies and the internet has greatly impacted the way in which society functions, as well as the lifestyles of people (Agarwal and Lucas 2005; Li et al. 2001). Research has shown that students born after 1990 often prefer to use technology-facilitated forms of learning and that people are now much more accustomed to using technology in their everyday lives (Turner 2015; Park et al. 2021). Furthermore, COVID-19 has further encouraged the use of online forms of communication, sending many 'offline' aspects of society 'online' (Park et al. 2021).

Amidst these changes, the introduction of massive multiplayer online role-playing Games has resulted in the rapid development of virtual worlds – immersive virtual spaces in which users can interact with one another through the use of avatars (Bourlakis et al. 2009). These virtual worlds facilitate online communication and interaction that is much more immersive than traditional forms of multimedia – creating a digital world founded upon social interactions and digital information (Hadjistassou 2016; Papagiannidis et al. 2008).

With the increasing availability of smartphones and immersive technologies such as virtual and augmented reality (VR and AR), the border between the physical and virtual worlds has been blurred even further (Garrido-Inigo and Rodriguez-Moreno 2012; Agarwal and Lucas 2005). The combination of virtual worlds and 3D immersive technologies has introduced a new digital concept - what is now called the 'Metaverse'. The Metaverse is described as having ever-increasing potential for various uses (Malaby 2006). Studies have investigated the use of the Metaverse in areas beyond gaming, including education (Diaz 2020), retail (Bourlakis et al. 2009) project facilitation (Owens et al. 2011), and marketing (Ives and Junglas 2008). Although the concept of the Metaverse has been used in research for quite some time, its definition seems to have gradually changed over the years. In light of the recently booming interest in the Metaverse, there is a need to form a coherent and comprehensive definition upon which future research can be founded upon. Despite this, there has been very limited research on what the Metaverse actually means in the year 2022.

Therefore, this paper aims to provide a scoping review on the Metaverse by reviewing the relevant research that has been published to date. Scoping reviews have been extensively conducted within the medical (e.g. Courtin et al. 2017; Fusar-Poli et al. 2020) and education field (e.g. Brewer et al. 2019; Hariharasudan and Kot 2018; O'Flaherty and Phillips 2015). However, there has been limited use of scoping reviews within the business and management or management information systems context. According to Pham et al. (2014, p. 371), "a scoping review of a body of literature can be of particular use when the topic has not yet been extensively reviewed", strengthening the need to conduct scoping reviews around the area of metaverse to gain an initial understanding. Munn et al. (2018) emphasized in their study that scoping reviews are particularly appropriate to explore the general body of literature and clarify topics of relevance within a given topic. Consequently, the scoping review is the most appropriate approach to answer the following four research questions:

(1) What is the definition of the Metaverse?
(2) What research has been done so far in the area of the Metaverse?
(3) What are the opportunities and challenges associated with the use of the Metaverse?

(4) What are the future directions of the Metaverse?

This paper will firstly provide a descriptive analysis of the overall published studies related to the Metaverse, describing the various definitions used as well as the general trends seen in the research. The paper will then narrow its focus to the business and management field, discussing the potential challenges and future directions of the Metaverse. Lastly, a research model is proposed, outlining the current state of research, providing a working definition of the Metaverse, and recommending future research directions.

2 Methodology

In order to address the breadth of the research questions whilst also proposing the challenges and future directions of the Metaverse in business, this paper adopts a two-stage methodology. Firstly, this paper presents a scoping review of the overall literature on the Metaverse, covering all contexts, geographical locations, and types of publications. Secondly, the paper will dive deeper into the research published in the business and management field, providing an in-depth analysis on the potential challenges of the adoption of the Metaverse and the future directions of Metaverse research.

A scoping review is usually conducted to collect data and evaluate the state of research on a particular topic (Arksey and O'Malley 2005). More specifically, scoping reviews aim to provide a general insight into the research content of a broad and diverse database (Whittermore and Knafl 2005; Williams et al. 2017). These reviews are often conducted prior to more detailed systematic reviews, which are commonly used to provide much more focused analyses of thoroughly researched topics (Munn et al. 2018; Whittermore and Knafl 2005; Williams et al. 2017). Arksey and O'Malley (2005) explain that scoping reviews are often used to explore broad research questions on topics that have not yet been reviewed, and that seeing as the aim of these reviews is to provide an overview of a diverse collection of data, quality assessments are usually not conducted. Although systematic literature reviews provide rigorous, in-depth, and relevant analyses of research topics (Tranfield et al. 2003), the aims of the current paper, which focuses on providing a preliminary and foundational understanding of the research area, seemed to be better suited by scoping reviews than systematic literature reviews. Therefore, the five-stage process outlined by Levac et al. (2010) was used:

(1) Identifying the research questions
(2) Identifying the relevant studies
(3) Selecting the relevant studies
(4) Charting the data
(5) Collating, summarizing, and reporting the results.

2.1 Identifying the Research Questions

With the rapid proliferation of immersive technologies and their increasing availability across the globe, the world has now turned its focus towards a new technological development: the 'Metaverse'. Already, companies such as Facebook (now called "Meta") have made announcements that they are heavily investing into the Metaverse. However, there is currently very limited research on what the 'Metaverse' entails. Furthermore, the existing research on the Metaverse is diverse and scattered. In light of this, the authors have identified the need to review and synthesize the research that has been done so far, as well as discuss the future directions of Metaverse research and any challenges that may arise. Therefore, this paper proposes four research questions: 1) What is the definition of the Metaverse? 2) What research has been done so far? 3) What are the opportunities and challenges associated with the use of the Metaverse? 4) What are the future research directions of the Metaverse?

2.2 Identifying the Relevant Studies

In order to capture the breadth of Metaverse research, the search term 'Metaverse' was used to search two databases: Web of Science and Scopus. Any studies that included the word 'Metaverse' in their titles, abstracts, or keywords were included in the identification of studies. Due to the language restrictions of the authors, only papers published in English were gathered. In terms of year of publication, no limitations were used. Furthermore, seeing as research on the Metaverse is scarce, the authors agreed to include journal articles as well as conference papers in the search process.

2.3 Selecting the Relevant Studies

The aim of the current paper is to provide a general scoping review on the diverse Metaverse research that has been published to date. The study identification process yielded very few results in comparison to other topics. Therefore, the authors agreed that all studies found should be included in the final set of data. However, during the process of procuring the full texts of the studies, many conference papers could not be found as they had not been published online.

2.4 Charting the Data

Basic information on the studies identified were exported from the databases as CSV files and were recorded using Microsoft Excel. This provided data on the title, authors, abstract, keywords, and the name of the source. Additional data was also extracted and charted from the studies manually, after discussion amongst the authors. This data included the publication year, geographical location of study, type of publication, the context of each study, and the definitions given in relation to the Metaverse.

2.5 Collating, Summarizing, and Reporting the Results

The data charted via Microsoft Excel was used to collate and synthesise the descriptive data of the studies. A separate Excel sheet was made to collate each type of data. This information was used to provide an overview of the extant literature on the Metaverse, reporting on the general trends of the research.

3 Scoping review

3.1 Number of Articles

The initial keyword search yielded a total of 240 documents. 110 were journal articles and 130 were conference papers. A total of 57 documents were identified as duplicates and were excluded, leaving a total of 183 documents. Whilst searching for the full texts of the documents, a number of studies could not be found. The main reason for this was that many conference papers had not been published online. 55 documents could not be found, leaving a total of 128 documents. Seeing as no exclusion criteria were used according to the aims of the current paper, the final set of data consisted of 128 documents. Considering that a broad and inclusive search process was used, and that no exclusion criteria were applied, a final set of 128 documents is relatively small. This is to be expected, as the 'Metaverse' is a relatively new technological development. It is hoped that this review paper can serve as a basis for further research in this area.

3.2 Publications by Year

The first study within the dataset was published in 1995. The next study to be published was in 2002. From 2002 onwards, one study was published each year until 2007, when the number of studies published per year began to increase. From 2014, the number of studies published dropped and stayed quite low until 2018, when the number of published studies began to gradually rise again. There was a huge increase in studies in 2021 (n = 18), and five studies have already been published in the first month of 2022. With the recent interest in the Metaverse, it is likely that this trend of increasing publications will continue in 2022 and beyond. It is also worth noting that the publication patterns in Metaverse research have been quite erratic with various ups and downs in the past two decades. This may be explained by the lack of consensus on the constantly changing definition of 'Metaverse' (Fig. 1).

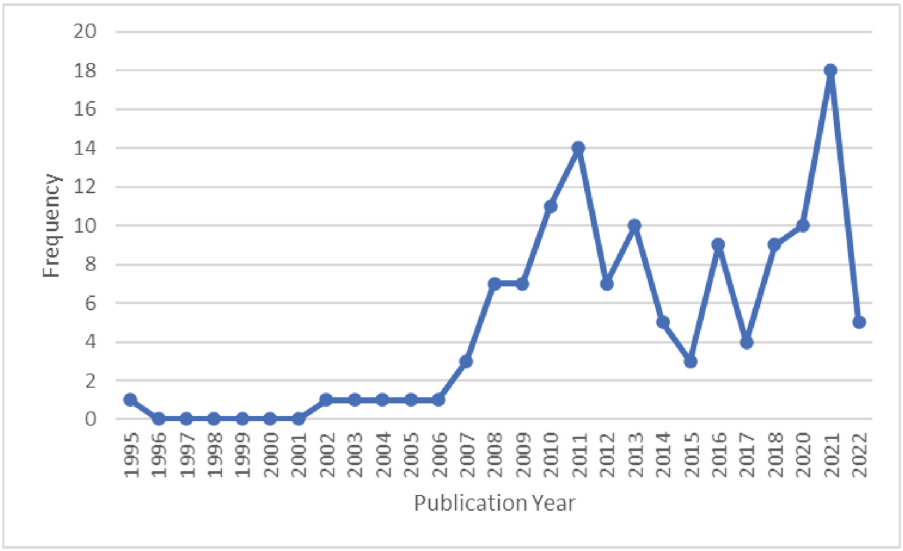

Fig. 1. Publications by year

3.3 Publication Types

Of the 128 documents, 60 were journal articles and 68 were conference papers. The relatively low number of published journal articles in the past two decades shows that this area of research is still in its very early stages. However, the encouraging number of conference papers and the recent increase in publications is indicative of its potential to grow. Over 25% of studies (n = 33) were published in the past 3 years (2020–2022).

3.4 Geography of Publications

Geographically, studies have been published across a total of 31 countries. Primarily, the majority of studies seem to be based in developed countries such as the US (n = 25), Japan (n = 13), South Korea (n = 12), and the UK (n = 11). This is to be expected as research on the Metaverse is highly dependent on technological advancements. Even amongst these four countries, it is interesting to note that whilst the majority of studies based in the UK were published between 2007 and 2010, the majority of studies based in South Korea were published between 2021 and 2022. The studies based in Japan have been published steadily between 2008 and 2020, whilst the studies based in the US have been published steadily from 1995 to 2021 (Figs. 2 and 3).

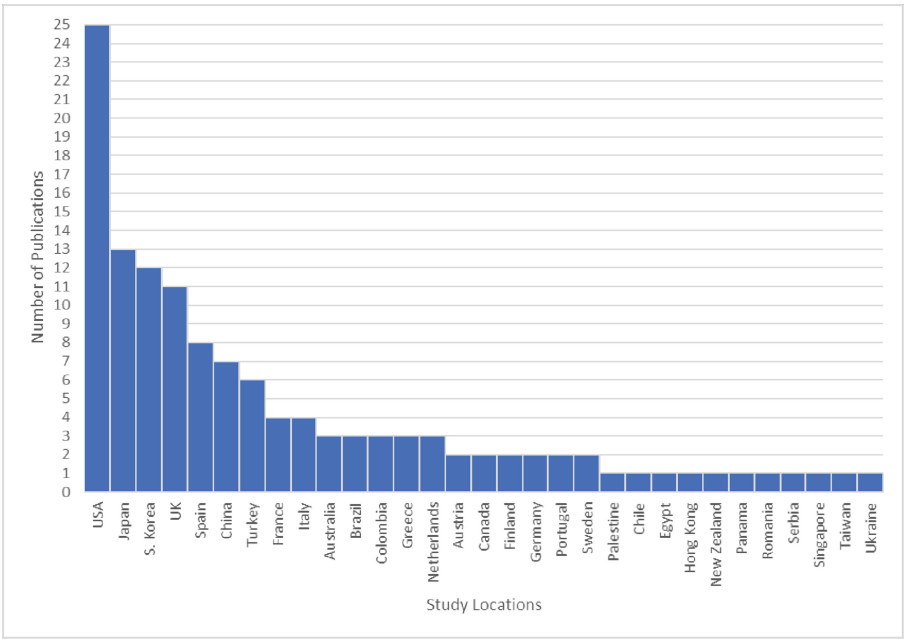

Fig. 2. Geography of studies

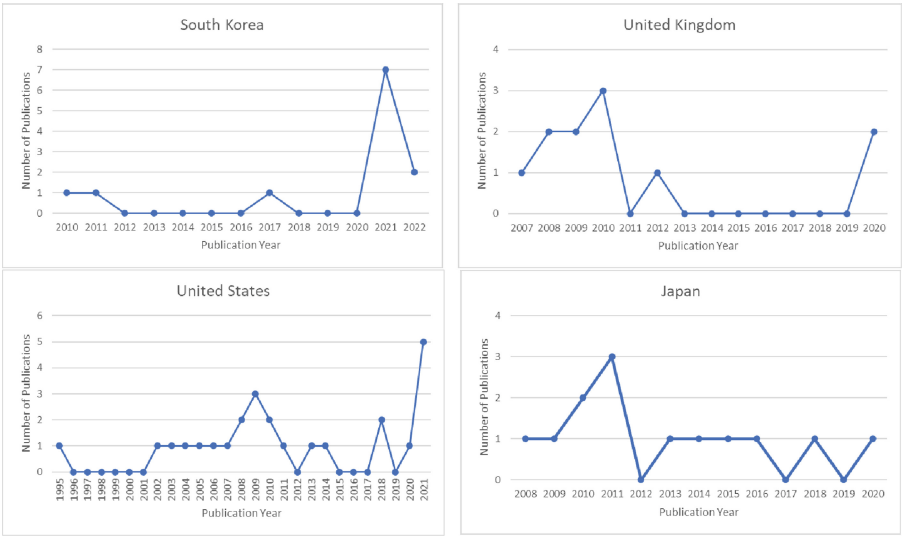

Fig. 3. Yearly publications by country

3.5 Contexts

A total of 21 different contexts were identified. The most common contexts were computer science (n = 29), education (n = 27), and information systems (n = 15). This is also to be expected, seeing as the development of the Metaverse began in the gaming sector (Bourlakis et al. 2009) and because the Metaverse itself is a technological development. It is interesting to note that the studies published in certain countries are often very focused on a certain type of context. For example, the three studies based in Brazil are all education studies. Studies in France seem to be focused on information systems, whilst studies in Spain seem to be focused on education and computer science. Looking at the studies published between 2021 and 2022, no specific context seems to be dominant in popularity. This is encouraging as it demonstrates that research on the Metaverse is expanding into many different contexts of research, which is indicative of its growth.

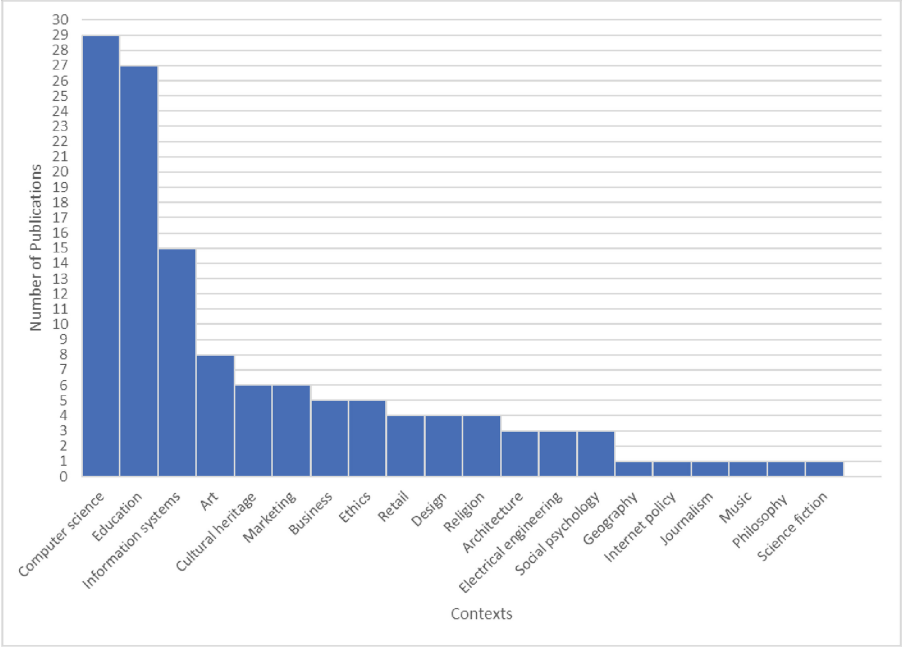

Fig. 4. Context of studies

3.6 Definitions

There does not yet seem to be a consensus on the definition of the Metaverse in the literature. Instead, the literature is split into two main schools of thought. Firstly, in the conference paper published in 1995, the word 'Metaverse' is used interchangeably with 'virtual world' (Parr and Rohaly 1995). In this way, many studies seem to use the term

'virtual world' to define the 'Metaverse'. Owens et al. (2011) states that the Metaverse is a 3D virtual world in which users are able to interact with one another and with the environment. Gadalla et al. (2013) defines the Metaverse as a computer-generated collaborative 3D virtual environment in which users can interact with one another through avatars. More recently, Diaz (2020) also used a similar definition, describing Metaverses as multi-user virtual environments in which the avatars embody the virtual identities of the users, often leading to the formation of virtual societies.

In contrast, some studies describe the Metaverse as something that goes beyond virtual worlds. Papagiannidis et al. (2008) compares the Metaverse to a 'VR-based internet', acting as a co-created virtual extension of our physical universe that embodies multiple real-world concepts such as economics, community, and leisure. Lee et al. (2011) and Choi and Kim (2017) refer to the Metaverse roadmap (Smart et al. 2007) which divides the Metaverse into four dimensions: augmented reality, life logging, mirror world, and virtual world. As seen in Fig. 5, on the spectrums of Augmentation vs Simulation and Intimate vs External, there exist four planes that make up the Metaverse. Augmentation refers to technologies that add a layer of digital information onto the existing physical environment, and Simulation refers to technologies that create simulations of the physical world (Smart et al. 2007). Intimate refers to technologies that focus on the users and their actions, and External refers to technologies that focus on the environment itself (Smart et al. 2007).

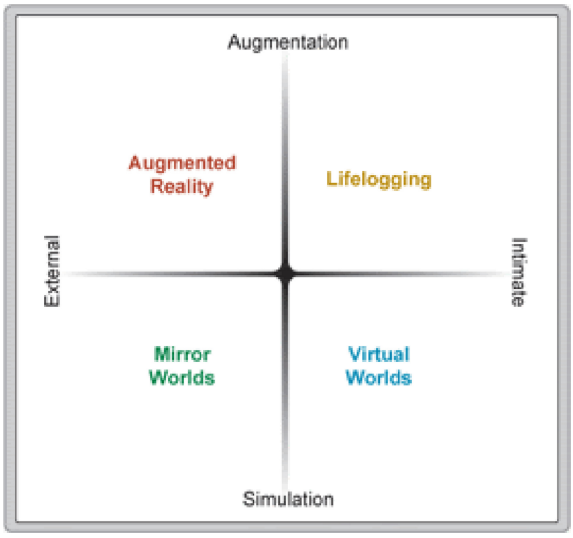

Fig. 5. The Metaverse roadmap

Within the Augmentation/External plane [augmented reality] of the Metaverse, technologies add enhanced and interactive digital information onto the external physical environment. Within the Augmentation/Intimate plane [life logging], technologies record the actions and everyday lives of the users. Within the Simulation/External plane [mirror world], data from external sources is used to create information-rich virtual reflections

of the physical world. Lastly, within the Simulation/Intimate plane [virtual world], the development of economic and social aspects of virtual worlds leads to the creation of virtual communities and identities.

Although there are two separate schools of thought on what the Metaverse entails, they are not necessarily mutually exclusive. Many aspects of the definitions overlap. For example, there is an agreement that the Metaverse is the blending of the physical and virtual worlds (Choi and Kim 2017; Owens et al. 2011; Falchuk et al. 2018), and that there is interaction between the user and the worlds, either through the use of avatars (Gadalla et al. 2013; Garrido-Inigo and Rodriguez-Moreno 2012) or augmented reality technology (Lee et al. 2011; Falchuk et al. 2018). Combining the key aspects of the definitions found in the literature, a working definition is proposed.

The word 'Metaverse' is a combination of the words "meta" [meaning beyond] and "universe" (Lee et al. 2011). In this sense, the purpose of the Metaverse is to take us beyond our current universe, either by the informational enhancement of our physical world or by the creation of completely new virtual worlds. The Metaverse is the blending of the physical and virtual worlds through the use of immersive and information technologies such as virtual reality, augmented reality, the internet, and artificial intelligence. Users are able to interact with one another and with the physical and virtual environments through the use of avatars or augmentation technologies, and the various interactions that take place within the Metaverse are portrayed by the four planes (augmented reality, life logging, mirror world, virtual world).

4 Business and Management Papers Scoping Review

Having presented a scoping review of the overall research on the Metaverse in all subject areas, the paper now narrows its focus to the business and management field. Specifically, papers in the business, marketing, retail, and cultural heritage were extracted from the original dataset (n = 129) and further data was collected in order to provide a more detailed analysis and to propose future research directions and challenges. A total of 22 business studies were identified. After discussion amongst the authors, it was agreed that the following additional data would be collected in order to address the research questions: theories, methodologies, contexts, applications, and themes related to the Metaverse. A summary of this additional data is presented in Table 1.

4.1 Publications by Year

The first study in the business and management field was published in 2008. Starting with 3 publications in 2008, the number of publications dropped slightly in 2009 and 2010. In 2011, the number of publications per year reached a peak of 5. The number of publications per year then began to follow a downwards trend and stayed quite low until 2019. Between 2019 and 2022, the number of publications has begun to follow an upwards trend, with a study on the Metaverse having already been published in the first month of 2022. Similar to the trends seen in the overall Metaverse research, business-related Metaverse research is also likely to continue to see an increase in growth (Fig. 6).

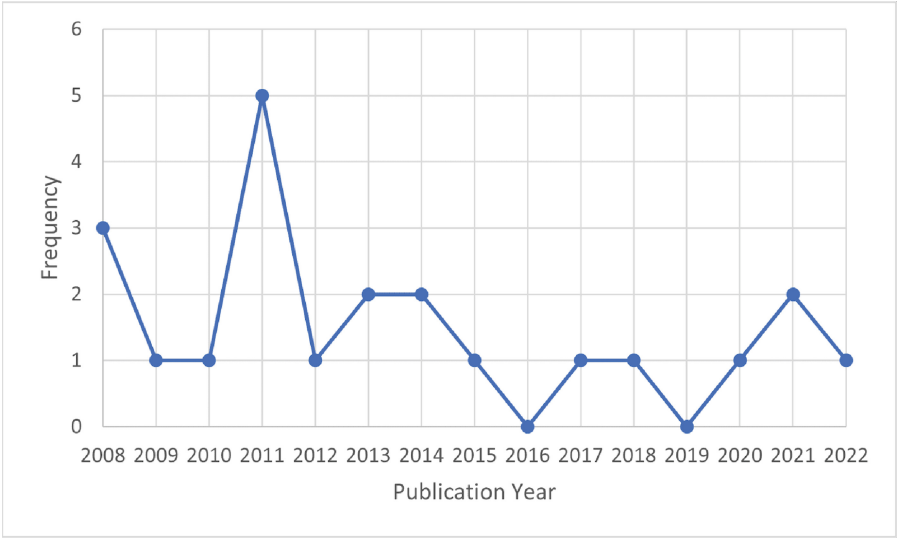

Fig. 6. Publications by year in the business field

4.2 Publication Types

Of the 22 business-related Metaverse studies identified, 14 were journal articles and 8 were conference papers. This portrays an interesting contrast with the overall collection of papers, where the distribution between journal articles and conference papers was quite even. The high number of journal articles indicates that the research on business-related Metaverse is overall quite rigorous.

4.3 Geography of Publications

The studies have been published across a total of 11 countries. In contrast to the geographical distribution of the overall data set, the business-related Metaverse papers seem to be more evenly distributed across the countries. The geography of studies is shown in Fig. 7 below.

4.4 Theory

In a study investigating the roles of telepresence and transportation in virtual marketing, Chen and Yao (2021) use narrative transportation theory. Prior to that, Gadalla et al. (2013) focused on disconfirmation theory to propose a framework that guides retailers in improving their service quality in Metaverse stores. In their study investigating the attitudes of people towards the use of communication technology in online businesses, Gajendra et al. (2012) explored the theory of intrinsic motivation and the theory of communication and social systems. In this way, studies employ theories that are relevant to their research aims. However, very few studies in the business field seem to use theory to design their research. Out of the 22 studies identified, only 3 studies ground their

Table 1. Scoping review of business and management articles in metaverse research

References	Theory	Methods	Context	Applications mentioned	Themes
Ando et al. 2013	None	Quantitative, 12	Cultural heritage	Second life	NA
Belei et al. 2011	Branding theory	Mixed, 154	Marketing	Second life	Interactive, Experiential, Enjoyment, Practical knowledge gain, Time consuming, Technical complexity
Bourlakis and Papagiannidis 2009	None	Theoretical	Retail	Second life	Interactive, Experiential, New space, Technological complexity, Time consuming, Costly
Chen and Yao 2021	Narrative transportation theory	Quantitative, 122	Marketing	VR application, 360 video	Memory, Cognitive attitude, Affective attitude, Behavioral intentions
Chodos and Stroulia 2008	None	Theoretical	Retail	Second life	Sense of presence, Interactive, Meaningfulness, Enjoyment, Usefulness, Perceived trust, Customer satisfaction
Choi and Kim 2017	None	Theoretical	Cultural heritage	VR application	NA
Gadalla et al. 2013	Disconfirmation theory	Qualitative, 31	Retail	Second life	Engagement, product information, responsiveness, enjoyment, ease of use, store credibility
Gajendra et al. 2012	Communication theory and social systems, theory of intrinsic motivation	Qualitative, 30	Retail	Second life	Interactive, Informative, Responsiveness, Collaboration, Communication, Participation
Hassouneh and Brengman 2015	None	Theoretical	Retail	Second life	Responsiveness
Huggett 2019	None	Theoretical	Cultural heritage	None	Enhanced spatial knowledge representation, Experiential, Sense of presence, Co-presence, Knowledge transfer

(*continued*)

Table 1. (*continued*)

References	Theory	Methods	Context	Applications mentioned	Themes
Jeong et al. 2022	None	Theoretical	Marketing	Metaverse application using digital twin technology	Innovative content, Brand awareness, Customer loyalty, Satisfaction, Enjoyment
Kappe and Steurer 2010	None	Theoretical	Marketing	Second life, OpenSimulator	NA
Lee et al. 2011	None	Secondary data	Marketing	Twitter, Google maps, Secondlife	Social interaction, Imitation, Innovation
McArthur et al. 2010	None	Theoretical	Business	Second life, World of Warcraft	Technological Complexity, User experience
Papagiannidis et al. 2008	None	Theoretical	Business	Second life	NA
Sarvary 2008	None	Theoretical	Business	Second life	NA
Shen et al. 2021	NA	Literature review	Marketing	None	Interconnectivity
Steurer 2011	None	Theoretical	Business	Second life, OpenSimulator	NA
Thawonmas and Shuda 2011	None	Theoretical	Cultural heritage	Second life	NA
Thawonmas and Fukumoto 2011	None	Theoretical	Cultural heritage	Second life	NA
Wei et al. 2014	None	Theoretical	Cultural heritage	OpenSimulator	Interactive
Zhou et al. 2018	None	Secondary data	Business	None	NA

research in theory. This may be explained by the fact that Metaverse research is still in its very early stages, as well as the fact that the definition of the Metaverse has been inconsistent within the literature. It is hoped that this paper will encourage the use of theory to design Metaverse applications and research in the future.

4.5 Methodology

The majority of studies seem to be theoretical papers (n = 14), with a few empirical papers (n = 5), papers that use secondary data (n = 2), and one literature review. Amongst the theoretical papers, there exists some variation in the type of theoretical contribution made. For example, Bourlakis et al. (2009) provides an overview of the development of retail, ranging from traditional retailing to Metaverse retailing. Other studies such as Chodos and Stroulia (2008) propose a system design for the use of realistic and 3D visualization tools to provide product information. Furthermore, some studies such as Papagiannidis et al. (2008) are centered around discussions of the opportunities, challenges, and ethical considerations of Metaverse research.

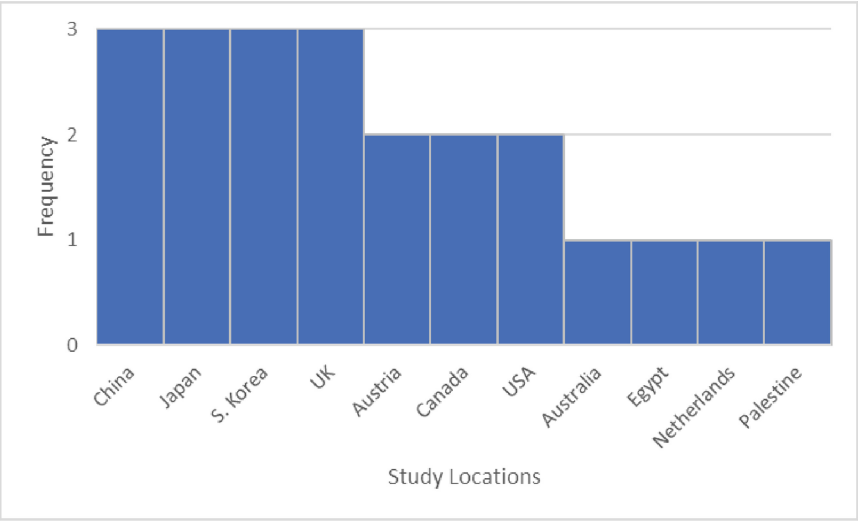

Fig. 7. Geography of studies in the business field

The methodologies used in empirical papers are also quite varied, with 2 quantitative studies, 2 qualitative studies, and 1 mixed methods study. In their quantitative study on inferring viewing habits of visitors at Metaverse museums, Ando et al. (2013) collect movement data to analyze visitor behaviors. On the other hand, Chen and Yao (2021) use questionnaires to measure the effect of telepresence and narration on consumers. In their qualitative investigation of factors that affect service quality in Metaverse stores, Gadalla et al. (2013) use focus groups and CIT (Critical Incident Technique). Gajendra et al. (2012), however, conduct interviews to explore the attitudes towards communication technologies in online businesses. Belei et al. (2011) employ a combination of both questionnaires and interviews to explore the impact of using Metaverses to teach marketing.

The large proportion of theoretical papers is indicative of Metaverse research being in its very early stages. Particularly, studies that propose practical system designs or frameworks for the implementation of the Metaverse take discussion papers one step further, encouraging empirical data collection and growth in research. The wide variation of methodologies used in empirical papers can be explained by the breadth of contexts and research aims that are covered, which also indicates that research in this area is growing.

4.6 Context

Although the papers in this part of the review are all from the business and management field, a number of different contexts were identified in the literature. The number of studies across the different contexts was quite even, with 5 business studies, 6 cultural heritage studies, 6 marketing studies, and 5 retail studies. The business studies seem to be quite generic, providing overviews of the opportunities, challenges, recommendations,

and discussions related to the Metaverse (McArthur et al. 2010; Papagiannidis et al. 2008; Sarvary 2008; Zhou et al. 2018). In contrast, the retail studies are more practical, providing empirical data based on consumer responses (Gajendra et al. 2012; Gadalla et al. 2013) and practical designs for the implementation of Metaverse technology (Hassouneh and Brengman 2015; Chodos and Stroulia 2008). Marketing studies are similar, using empirical or secondary data (Belei et al. 2011; Chen and Yao 2021; Lee et al. 2011) and proposing practical business models or designs. Lastly, studies in the context of cultural heritage consist of a mixture of empirical papers (Ando et al. 2013), system designs (Choi and Kim 2017; Thawonmas and Shuda 2011; Thawonmas and Fukumoto 2011), and discussion papers (Hugget 2019; Wei et al. 2014).

4.7 Applications

Data on the type of Metaverse applications used or mentioned in the studies was also collected. Second Life, a 3D virtual world platform that allows users to co-create content (Belei et al. 2011; Bourlakis et al. 2009), was by far the most commonly used or mentioned application (n = 16). Other applications used or mentioned include OpenSimulator (n = 3), World of Warcraft (n = 1), Twitter (n = 1), Google maps (n = 1), and custom-made VR applications (n = 3) and digital twins (n = 1). Many of the studies used or mentioned more than one type of Metaverse application. OpenSimulator can be described as an open source Second Life in the sense that it allows users to co-create their own virtual worlds much more freely (Wei et al. 2014), and World of Warcraft is a Massively Multiplayer Online Role Playing Game based in a virtual world that is widely known for its advanced virtual economy and trade of virtual goods (McArthur et al. 2010). Although Second Life is currently the most popular Metaverse application that is used, with the emergence of new players in the market such as Meta (Rauschnabel et al. 2022) and the increase in interest towards the Metaverse in general, it is expected that many more Metaverse applications will be developed in the near future.

4.8 Themes

Various themes related to the Metaverse were identified in the literature. Although these seem to vary greatly due to the breadth of the contexts and research aims of the studies, some general themes common to a wide range of studies can be found.

The most common theme that can be seen in the literature is interactivity/interaction. This theme encompasses both user-environment interaction as well as user-user interaction. Wei et al. (2014) uses OpenSimulator to add interactive objects to their virtual world, which was found to increase the immersion of users and the effectiveness of cultural transmission. Furthermore, Gajendra et al. (2012) found that platforms such as Second Life facilitate new methods of social interaction, collaboration, and communication, creating business opportunities for the virtual marketing and trade of products. This confirms the fact that interaction is a key aspect of the Metaverse, which is highlighted in the definition proposed in this paper.

Many studies also emphasize the experiential aspect of the Metaverse. Belei et al. (2011) investigates the use of Second Life to enrich their marketing curriculum, offering a more interactive and experiential education to narrow the gap between theory and

practice. In their overview of the technological progression of retail, Bourlakis et al. (2009) explain that consumers have become more experience-oriented, seeking novel and enhanced experiences that Metaverses can provide. Indeed, with the proliferation of fully immersive 3D technologies such as virtual and augmented reality, experience-oriented culture has caused many aspects of society to become more immersive, engaging, and enjoyable (Bourlakis et al. 2009; Jeong et al. 2022; Choi and Kim 2017; Belei et al. 2011).

In contrast to the interactive and experiential aspects of the Metaverse, a common barrier/limitation that studies reveal is the technological complexity of the Metaverse. McArthur et al. (2010) explain that although Metaverses can provide various advantages to businesses and educational institutions, the task of having to learn how to use the program interface can act as an entry barrier for many. Furthermore, Belei et al. (2011) state that although the proper use of Second Life can prove to be beneficial to the students' learning, technical difficulties caused by hardware limitations and the complexity of the application can take away the value that Second Life offers. Although hardware has advanced greatly over the past few years in terms of functionality, if the Metaverse is too complex to use or too difficult to implement into existing aspects of society, its adoption is likely to be significantly hindered.

5 Discussion and Conclusion

5.1 General Discussion

So, what exactly is the Metaverse? This is a question many businesses will ask themselves after Zuckerberg's announcement to reinvent Facebook's parent company. Zuckerberg has speculated that many new business opportunities will emerge over the next 10 years (Rauschnabel et al. 2022). This study is one of the first to conduct a comprehensive scoping review of Metaverse research, looking at publications from various disciplines in order to fully understand the new phenomenon. Following a thorough a review of the trends, various definitions, and characteristics of Metaverse research, we define the Metaverse as:

An augmented digital world that is blending physical and virtual spaces through the use of XR and artificial intelligence-based systems for users to interact, and/or trade virtual goods or services through cryptocurrencies (e.g. NFTs), with one another and other/virtual entities.

This definition provides a holistic understanding of the characteristics and opportunities of the Metaverse that can be applied in multiple contexts. There are a number of concepts within the definition:

(1) XR is hereby described as a term for any form of new reality (see Rauschnabel et al. 2022 for a full discussion).
(2) The evolution of the Metaverse towards interconnected, intelligent systems and networks allows for the trading of virtual products and services using non-fungible tokens (NFTs), a form of blockchain technology that can be used to attach financial value to specific virtual assets (Chohan and Paschen 2021).

(3) Other and virtual entities include, but are not exclusive to, virtual businesses, AI-controlled entities, and NPCs (non-playable characters) – which are already playing an important role in the virtual gaming context.

This discussion will narrow its focus onto the business context, aiming to evaluate, conceptualize and problematize the existing knowledge (c.f. Heinis et al. 2021). As shown in Fig. 4, there is still limited research within this particular discipline. It is mostly agreed that the Metaverse merges extended realities (XR) such as augmented, virtual, and mixed realities as well as videos into a digital space for online communities and societies to interact. Over time, Metaverse platforms have evolved from virtual extensions of individual users to self-sufficient virtual communities. This has allowed businesses to benefit greatly through the creation of real-world value from virtual products and services (Zhou et al. 2018). However, this does not happen without new challenges and legal issues. The concept of ownership appears to be particularly complex within the Metaverse (Zhou et al. 2018). Businesses that plan to create value through new digital innovations are highly dependent on platform providers. Furthermore, new advice and regulations on an international level are required to ensure that the tension between content creators and platform providers is minimized (Zhou et al. 2018).

Trading of virtual content and services is expected to be a lucrative business opportunity, and due to its infancy, there will be opportunities for existing businesses and new entrepreneurs to capitalize on the opportunities as already anticipated by Papagiannidis et al. in 2008. Also, Bourlakis et al. (2009) explored the use of Second Life as a virtual selling place for traditional retailers and found that the Metaverse raises new challenges and issues such as the potential need for competition commissions and international taxation strategies. Ethical considerations and social corporate responsibility were already highlighted as an important research area almost thirteen years ago, but recent experiences within the augmented and virtual reality research domain have shown that much still needs to be done with regards to establishing legal, social, and ethical guidelines (c.f. Harborth et al. 2021; Knack et al. 2019).

One of the earliest and best-known examples of the Metaverse is Second Life. As shown in this review, Second Life is the most applied example of the Metaverse within the business and management context. The past decade has shown that businesses (e.g. Adidas, Hyatt) have engaged with and utilized Second Life in order to enter the virtual landscape (c.f. Hassouneh and Brengman 2015; Papagiannidis et al. 2008). In its early sense, businesses used the systems as a source for co-creation of value (e.g. collecting customer feedback about new products or developments) (Lanz et al. 2010) or as a freemium business model (Mäntymäki and Salo 2015) whereby brands sold virtual objects for user entertainment/aesthetic pleasure and to facilitate the creation of a social identity. However, digital advancements, the emergence of XR, intelligent AI technologies, blockchain technology and the increasingly interconnected nature of the internet of things (IoT) create an entirely different ecosystem for virtual worlds (Cranmer et al. 2022). This will lead to enhanced social experiences, value co-creation opportunities, and the improvement of service quality (Gadalla et al. 2013). This is in line with the findings of the scoping review of the business and management papers, with themes