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A Bibliometric Analysis of Mixed Reality in the Marketing Context

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Abstract:

Research Question: The paper presents the results of a conducted bibliometric analysis, addressing a gap in a relatively under-explored research area, the use of mixed reality in a marketing context. **Motivation:** The COVID-19 pandemic has led to a greater use of various technologies to enhance company-customer interactions. Mixed reality (MR) is one of these technologies that bridges the gap between digital and physical touchpoints, offering companies innovative ways to engage consumers. MR integrates augmented reality (AR) and virtual reality (VR), creating a seamless blend of virtual and physical environments. Although AR and VR have been widely researched in the marketing context so far, there is a lack of papers covering MR, especially when considering papers related to bibliometric analysis. **Idea:** To fill this gap, desk research was conducted using data from the Web of Science core collection platform. **Data:** Standard bibliometric indicators were applied to present research productivity, publication types and sources, language of publications, distribution of publications by country, authorship, keywords, and citation analysis. **Tools:** In addition to the filters in the WoS platform, the data were analyzed using the VOSviewer software. **Findings** indicate that research on MR in a marketing context began in 2018, with a significant increase in scientific literature in 2020, coinciding with the pandemic. The study identifies 20 publications directly related to mixed reality in marketing, all indexed on the Web of Science core collection platform. All papers are published in English, and most are journal articles authored by 76 researchers from 22 different countries and 65 affiliations. **Contribution:** To the best of the author's knowledge, this research is among the first attempts to systematically explore mixed reality in a marketing context, highlighting its potential as an emerging trend and outlining future directions for exploiting mixed reality in the rapidly evolving digital landscape.

Keywords: mixed reality, marketing, phygital marketing, metaverse, bibliometric analysis

JEL Classification: M31, O33

1. Introduction

The rapid development of various technologies is significantly shaping consumer behaviour, and the technologies themselves have become one of the main disruptors due to their profound impact on consumers' everyday lives. Mixed reality (MR), as one of these technologies, gained prominence during the COVID-19 pandemic, due to the increased demand for innovative solutions that bridge the physical-digital gap more easily.

MR alternately combines virtual and physical objects, i.e., mixing virtual and augmented reality in the interaction between companies and consumers (Ambika et al., 2023). Thus, MR, together with virtual reality (VR) and augmented reality (AR), can be recognized as a key immersive technology of Industry 5.0 that enables the development of a phygital environment. The term "phygital" refers to the seamless integration and coexistence of physical and digital worlds, involving the simultaneous integration of physical and digital elements within the same location (Ciftci & Cizel, 2024). Phygital experiences have been widely explored in various fields, including marketing. This has influenced the development of the term "phygital marketing", which aims to merge both environments to create a unique, rich user experience throughout the customer

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journey (Matic Sosic & Gregurec, 2024). Additionally, through MR technology, the concept of the metaverse has emerged. The metaverse combines technologies through ambient intelligence to provide users with a bridge between the digital and physical worlds, allowing them to connect resources and holistic experiences, effectively leading toward blended living (Buhalis et al., 2023).

Therefore, MR can be considered a technological innovation that merges VR and AR to seamlessly blend the physical and digital worlds (Ciftci & Cizel, 2024; Buhalis et al., 2023). In other words, MR merges the real and virtual worlds to create dynamic visual environments where physical and digital elements coexist and interact in real time within a single environment (Hoyer et al., 2020; de Jong et al., 2021; Rana et al., 2022). This technology integrates the user's real environment with highly photorealistic 3D content (Rauschnabel, 2021). Additionally, laser scanning facilitates the creation and reconstruction of 2D and 3D objects, enhancing interactions between physical and digital elements (Buhalis et al., 2023). The use of touchscreen devices, large projections, and holographic displays further enriches the MR experience by engaging several senses (including sound, motion, touch, taste, and smell), bridging the gap between online and offline shopping experiences (Yu et al., 2024) and thereby providing a better user experience and value co-creation (Ciftci & Cizel, 2024; Buhalis et al., 2023). According to Rauschnabel (2021), MR offers a highly realistic augmentation of the real world, aiming to be so realistic that users can no longer differentiate between virtual elements and physical objects. Typically, MR relies on specialized hardware, such as smart glasses, which feature transparent screens instead of traditional lenses and are equipped with multiple sensors to track and interact with the user's environment. So, MR requires smart glasses, headsets, or similar wearable devices for an immersive experience (Hoyer et al., 2020).

The scientific papers analyzed for the purpose of writing this paper examine the impact of MR, alongside technologies such as VR, AR, Internet of Things (IoT), and artificial intelligence (AI), on various aspects of marketing. Analyzed papers mainly explore topics such as user experience (Ciftci & Cizel, 2024; Mandal et al., 2025; Yu et al., 2024; Buhalis et al., 2023; Pantelidis et al., 2024; Hoyer et al., 2020; de Jong et al., 2021; Rana et al., 2022) and consumer behaviour in the metaverse (Ciftci & Cizel, 2024; Mandal et al., 2025; Ambika et al., 2023; Buhalis et al., 2023; Silva & Bonetti, 2021; Tan et al., 2023; Rana et al., 2022). The papers also examine the influence of MR across different industries, such as tourism (Ciftci & Cizel, 2024; Buhalis et al., 2023; Pantelidis et al., 2024), retail (Yu et al., 2024; Silva & Bonetti, 2021), and healthcare (Marin-Pantelescu & Hint, 2020; Buhalis et al., 2023) within the marketing context. Additionally, the papers investigate users' willingness to interact with digital personas or avatars (Khakpour et al., 2020; Rauschnabel, 2018; Tan et al., 2023; Rana et al., 2022) and the role of incentives in technology adoption, as well as how MR as technology can improve brands by interacting with customers (Rauschnabel et al., 2019). The papers also explore how MR as a technology facilitates the selling of products and services, service delivery and support, as well as cooperation among all involved stakeholders (de Jong et al., 2021).

Although extensive research has explored the use of AR and VR technologies in the marketing context, the usage of MR still remains a relatively under-researched area. Therefore, this paper aims to contribute both scientifically and practically by summarizing the existing literature that addresses this area. The scientists can use this paper as a direction for more detailed research, while for practitioners, it can serve as a foundation for the future development of mixed reality across various industries, with consideration of the marketing context. Table 1 can be considered as a valuable reference for both.

2. Methodology

The main aim of this paper is to conduct a systematic review of the literature on mixed reality in the marketing context and analyze the conceptual structure of scientific publications in this field. The review examines papers published on the Web of Science Core Collection Platform until February 10th, 2025. To achieve this aim, desk research was conducted, and a bibliometric analysis was performed based on the collected secondary data. Bibliometric analysis has become increasingly relevant in research in recent years (Costa-Feito et al., 2023; Donthu et al., 2021; Linnenluecke et al., 2020), typically involving descriptive statistics to identify authors, keywords, citations, journals, affiliations, countries, and their interconnections at the scientific level (Passas, 2024; Donthu et al., 2021; Linnenluecke et al., 2020).

Various databases provide data for bibliometric analysis, but the Scopus database and Web of Science Platform are the most commonly used (Donthu et al., 2021; Linnenluecke et al., 2020). In this study, the author used the Web of Science Core Collection Platform for several reasons. Initially, the goal was to reduce the possibility of repeating the analysis of the same studies, which can occur when papers appear in multiple databases such as Scopus and WoS. Additionally, WoS was selected due to its reputation as the most

selective database with high-impact factors and comprehensive citation analysis. Ultimately, WoS is recognized as one of the world's leading research databases (Passas, 2024; Donthu et al., 2021; Linnenluecke et al., 2020).

Based on the author's knowledge, a bibliometric analysis of this research topic has not yet been conducted. However, a previous bibliometric analysis focused on the term "mixed reality" has been carried out, but in different contexts and different research areas. In the marketing field, only one paper has been published and is visible on the WoS platform. It is titled "Electroencephalography in consumer behaviour and marketing: a science mapping approach" and was written in 2023 by Costa-Feito et al. This paper aimed to identify current research trends and define emerging topics in both consumer neuroscience and neuromarketing using electroencephalography (EEG) (Costa-Feito et al., 2023). Moreover, in the mentioned paper, the search query, visualization tool, and research process were not the same as those used for the purpose of writing this paper. So, the contribution of this paper is evident. Therefore, based on the insight into the current state, the author decided to conduct a bibliometric analysis of papers published in Web of Science Core Collection using the search query "mixed reality" AND "marketing".

The research questions that this analysis seeks to answer are:

RQ1: What is the most cited paper in the research field (the use of mixed reality in a marketing context)?

RQ2: Who are the most prominent researchers in the research field (the use of mixed reality in a marketing context)?

RQ3: What are the most important scientific journals in the research field (the use of mixed reality in a marketing context)?

RQ4: What are the leading scientific conferences in the research field (the use of mixed reality in a marketing context)?

A bibliometric analysis research process (Figure 1) consists of the following stages:

1. Research design – The term "mixed reality" emerged while the author was researching the marketing field and the impact of digital technologies on it. In order to delve deeper into the field, the author conducted desk research, investigating this term through several databases, including the most comprehensive databases today, Scopus and WoS. During the database search, the author noticed a lack of scientific papers exploring mixed reality in the marketing context in general, and especially a deficiency of bibliometric analysis papers covering this topic, which indicated the need for further research to fill that gap.
2. Search strategy definition and selection of the appropriate database – After determining the primary keywords (search query) for the literature search ("mixed reality" AND "marketing"), several scientific databases were searched, including the two most relevant: Scopus and WoS (Donthu et al., 2021; Linnenluecke et al., 2020). In the Scopus database, 9 papers were found based on the search query, which the author considered insufficient for bibliometric analysis (Donthu et al., 2021). However, aside from the insufficient number of papers for bibliometric analysis, another reason for rejecting this database as fundamental for bibliometric analysis was the fact that some of those papers (5 of them) were also indexed within the WoS platform. On the WoS platform 67 papers were found so it was decided that the bibliometric analysis would be conducted on papers visible on the WoS platform. Based on the search query, which included variations of all terms in all fields, 67 papers were obtained in the entire WoS database up to February 10th, 2025. However, after filtering first by language, and then by the "Business Economics" research area, 20 papers were obtained.
3. Refining the initial search results – In this phase, those 20 papers were scanned to filter the data according to the given criteria, which were the papers investigating mixed reality as technology used in the marketing context. By reviewing the titles, abstracts, and main texts and by performing manual coding of each paper, it was determined that all the papers met the given criteria. Information for documents that met the threshold included year of publication, language, journal, title, author, affiliation, keywords, document type, and number of citations, all of which were exported in plain text format for the next phase – data analysis.
4. Data analysis – In this phase, descriptive statistics in WoS and bibliometric mapping in the VOSviewer software (version 1.6.10) were used to perform and to visualize the obtained results, i.e., a network of papers co-occurrences, co-citations, and bibliographic matching. VOSviewer as a tool was chosen as one of the most frequently used tools for visualizing bibliometric indicators according to literature (Bukar et al., 2023; Donthu et al., 2021; Kirby, 2023; Linnenluecke et al., 2020).

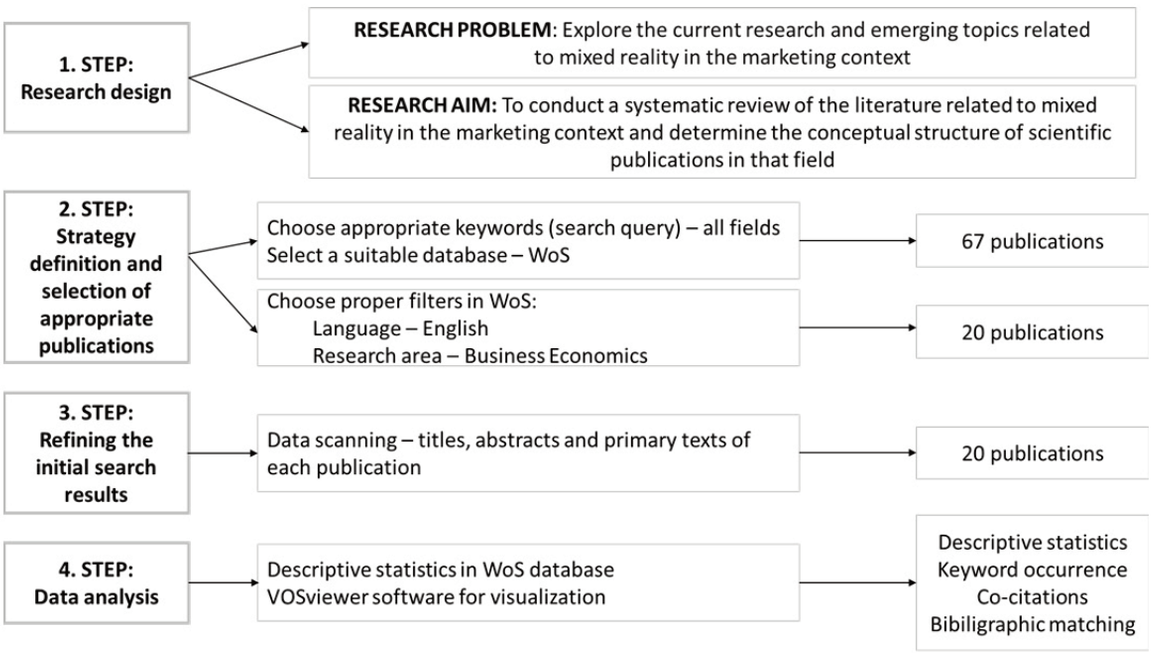

Figure 1: Stages of the research process
Source: Author's work

3. Research Results

3.1 Descriptive statistics results

As stated earlier, to achieve the main aim of this paper a desk research was conducted. According to the collected secondary data, after the second phase of the research process, 20 papers covering the research topic were filtered. All 20 papers were published in English between 2018 and 2025. These papers were authored by 76 researchers from 22 different countries and 65 affiliations. These publications included 14 original research articles, 5 review articles, 3 book chapters, 3 early access articles, and 1 proceeding article. The paper entitled "Virtually enhancing the real world with holograms: An exploration of expected gratifications of using augmented reality smart glasses" was the first published scientific paper on this topic. It was published in 2018 and written by Rauschnabel, Philipp A. The paper focused on customer satisfaction and experience when using augmented reality smart glasses. From that first published paper until February 10th, 2025, a total of 20 papers on this topic were published, 16 of them have been cited until that date. The total number of citations of all papers is 1 326 (1 321 without self-citations), with an average of 66.3 citations per item and H-index of 11. The highest number of analyzed papers was published in 2023, 5 of them. The highest level of citations was achieved in the same year, reaching 358 citations. The most cited paper was published in the Journal of Interactive Marketing in 2020, and it is the paper titled "Transforming the Customer Experience Through New Technologies" and written by Hoyer, Wayne D, Kroschke, Mirja, Schmitt, Bernd, Kraume, Karsten, and Shankar, Venkatesh. This paper has been cited 383 times (with an average of 63.83 per year). Table 1 shows all papers published in the WoS database that address mixed reality in the marketing context. The main focus of these publications was investigating customer attitudes, satisfaction, customer experience, and customer journey, as well as the use of appropriate marketing strategy and customer value (co-creation) in the marketing domain across different industries. The distribution of the number of published papers, the number of citations and the total number of citations in the period from 2018 until February 10th, 2025, is presented graphically in Figure 2.

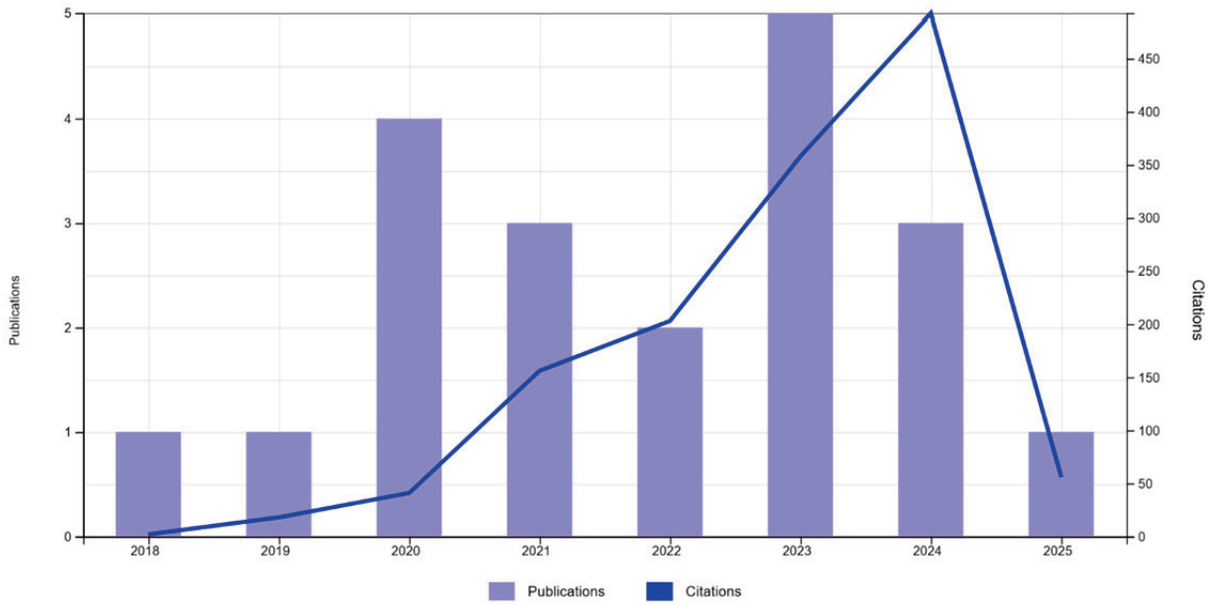

Figure 2: Distribution of the number of published papers and citations by year
Source: Authors's work based on Clarivate Web of Science, February 10th, 2025

Table 1: Published papers on the Web of Science core collection platform on the topic of mixed reality in the marketing context - according to the citations of the paper

RANK	PAPER	AUTHOR(S)	SOURCE TITLE	YEAR	TOTAL WoS CITATIONS	MAIN FINDINGS
1	Transforming the Customer Experience Through New Technologies	Hoyer, WD; Kroschke, M; Schmitt, B; Kraume, K; Shankar, V	Journal of Interactive Marketing	2020	383	The paper explores how MR (among other technologies) enhances customer interactions and experience in B2C businesses. It analyzes how MR creates value through the cognitive, sensory-emotional, and social dimensions of the experience.
2	Augmented reality marketing: How mobile AR-apps can improve brands through inspiration	Rauschnabel, PA; Felix, R; Hinsch, C	Journal of Retailing and Consumer Services	2019	337	The paper explores how AR apps impact consumer perception and attitudes toward brands. The authors test a model that examines how consumers perceive the usefulness and quality of AR applications, and how this perception affects changes in attitude towards the brand.
3	Metaverse as a driver for customer experience and value co-creation: implications for hospitality and tourism management and marketing	Buhalis, D; Lin, MS; Leung, D	International Journal of Contemporary Hospitality Management	2023	203	The paper explores the potential of the metaverse in improving customer experience and creating shared value in the hospitality and tourism sectors. It analyzes how the metaverse, by bridging the physical and virtual worlds, enables personalized and hybrid experiences, increasing interaction between customers and service providers before, during, and after a visit.

RANK	PAPER	AUTHOR(S)	SOURCE TITLE	YEAR	TOTAL WoS CITATIONS	MAIN FINDINGS
4	Virtually enhancing the real world with holograms: An exploration of expected gratifications of using augmented reality smart glasses	Rauschnabel, PA	Psychology & Marketing	2018	130	The paper explores the expected benefits of using augmented reality smart glasses (ARGS). It examines people's motivation for using ARGS in different contexts (private and public). The research identifies six key gratifications of using such glasses – utility, enjoyment, sensual gratification (desired enhancements to reality and comfort of wearing), social gratification, and self-promotion.
5	Digital humans in fashion: Will consumers interact?	Silva, ES; Bonetti, F	Journal of Retailing and Consumer Services	2021	74	The paper analyzes consumer attitudes toward digital humans and provides insights for fashion businesses on designing, developing, testing, and marketing MR-driven solutions. It focuses on how MR (among other technologies) enhances consumer engagement in online fashion retail.
6	Metaverse in marketing and logistics: the state of the art and the path forward	Tan, GWH; Aw, ECX; Cham, TH; Ooi, KB; Dwivedi, YK; Alalwan, AA; Balakrishnan, J; Chan, HK; Hew, JJ; Hughes, L; Jain, V; Lee, VH; Lin, BS; Rana, NP; Tan, TM	Asia Pacific Journal of Marketing and Logistics	2023	43	The paper explores the impact of the metaverse on the fields of marketing and logistics. The authors analyze the integration of the metaverse into marketing ethics, marketing communication, relationship marketing and retail marketing, supply chain management, and transportation management areas.
7	Key trends in business-to-business services marketing strategies: Developing a practice-based research agenda	de Jong, A; de Ruyter, K; Keeling, DI; Polyakova, A; Ringberg, T	Industrial Marketing Management	2021	42	The paper addresses the gap between service marketing theory and real-world implementation, providing strategic roadmaps for MR adoption. It explores key trends in B2B services marketing. The authors identify five major trends shaped by digitalization, including MR. For each trend, they propose specific questions for future research, focusing on how these trends can help companies develop strategic service capabilities and improve collaboration within the B2B market.

RANK	PAPER	AUTHOR(S)	SOURCE TITLE	YEAR	TOTAL WoS CITATIONS	MAIN FINDINGS
8	Reinforcing customer journey through artificial intelligence: a review and research agenda	Rana, J; Gaur, L; Singh, G; Awan, U; Rasheed, MI	International Journal of Emerging Markets	2022	36	The paper analyzes the role of artificial intelligence (AI) and machine learning (ML) in improving the customer experience throughout the entire purchasing process. The authors define a three-dimensional research framework, review the existing literature on the application of AI tools (chatbots, recommender systems, mixed reality) in the retail sector, and propose a new customer journey model supported by AI and ML.
9	Phygital technologies and environments for breakthrough innovation in customers' and citizens' journey. A critical literature review and future agenda	Del Vecchio, P; Secundo, G; Garzoni, A	Technological Forecasting and Social Change	2023	27	The paper provides a literature review to determine how customer experience has undergone a renaissance due to the Covid-19 pandemic. It identifies the main trends associated with the adoption of technologies and groupes them into 5 groups: marketing and consumer behaviour, cultural heritage, tourism and urban development; education and learning, social issues and politics, and technical and legal issues. The authors show how different environments provide new and immersive experiences for customers across different industries.
10	Immersive technologies and consumer behaviour: A systematic review of two decades of research	Ambika, A; Shin, H; Jain, V	Australian Journal of Management	2023	19	The paper presents a comprehensive systematic review of research on the impact of immersive technologies (AR, VR, MR, and 3D) on consumer behaviour over the past two decades. The research uses an integrated TCM-ADO framework to analyze 129 papers comparing the impact of different technologies within different sectors.
11	Forecasting the video data traffic of 5 G services in South Korea	Shin, H; Jung, J; Koo, Y	Technological Forecasting and Social Change	2020	15	The paper predicts the number of 5G service users and their preferences for different 5G services (UHD video, VR/MR, holograms). It also includes a sensitivity analysis, exploring the impact of various factors (device price, service price, content availability) on predicted traffic growth for telecommunications companies.

RANK	PAPER	AUTHOR(S)	SOURCE TITLE	YEAR	TOTAL WoS CITATIONS	MAIN FINDINGS
12	Exploring relations among authentic tourism experience, experience quality, and tourist behaviours in phygital heritage with experimental design	Ciftci, SF; Cizel, B	Journal of Destination Marketing & Management	2024	8	The paper highlights the importance of mixed reality in enhancing the authenticity of customer experiences in museums. The study highlights the dynamic interactions among MR, guided tours, and visitor experiences, and how mixed services can enhance perceptions of objective and existential authenticity.
13	Place attachment theory and virtual reality: the case of a rural tourism destination	Pantelidis, C; Dieck, MCT; Jung, TH; Smith, P; Miller, A	International Journal of Contemporary Hospitality Management	2024	5	The paper explores the impact of immersive virtual reality (VR) experiences on tourist destination attachment. It develops a new framework for understanding place attachment in the context of VR, incorporating dimensions such as accessibility, memory, and increased knowledge of place, alongside existing variables such as aesthetics and presence.
14	Turning digital technology to immersive marketing strategy: a strategic perspective on flexibility, agility and adaptability for businesses	Yawised, K; Apasrawirote, D; Chatrangsan, M; Muneesawang, P	Journal of Entrepreneurship in Emerging Economies	2024	2	The paper provides a systematic literature review on the adoption of immersive marketing technology (IMT) in terms of strategic planning, resource requirements, and its implications and challenges. It presents three main themes: proactive flexibility, response agility, and reactive adaptability, that enable business owners and managers to develop strategies for IMT adoption.
15	Exploring practical use - cases of augmented reality using photogrammetry and other 3D reconstruction tools in the Metaverse	Singh, A; Mishra, S; Jain, S; Dogra, S; Awasthi, A; Roy, NR; Sodhi, K	Augmented and Virtual Reality in Industry 5.0	2023	1	The book chapter analyzes the increasing use of mobile applications for daily activities and immersion in Meta's Metaverse network, a virtual world where users can communicate and socialize. The authors propose a new type of system that could develop a socio-meta platform, powered by augmented reality and other technologies for immersive customer experiences.
16	Romanian customers' satisfaction regarding private health services	Marin-Pantelescu, A; Hint, M	Proceedings of the International Conference on Business Excellence	2020	1	This paper highlights the need for private health services in Romania to focus on quality care, technological integration, and effective patient communication using different technologies, while also considering the broader context of public health system challenges.

RANK	PAPER	AUTHOR(S)	SOURCE TITLE	YEAR	TOTAL WoS CITATIONS	MAIN FINDINGS
17	Exploring the orientation towards metaverse gaming: Contingent effects of VR tools usability, perceived behavioural control, subjective norms and age	Mandal, S; Dubey, RK; Basu, B; Tiwari, A	Journal of Innovation & Knowledge	2025	0	The paper presents a systematic literature review on the "greenability" of augmented reality (AR), virtual reality (VR), and mixed reality (MR). The authors investigate the environmental impact of these technologies, especially in terms of energy consumption and environmental efficiency. The main goal is to gain a holistic insight into the sustainability of these technologies, observing their environmental advantages and disadvantages.
18	Virtual fitting room technology: unleashing the transformative potential for fashion brands' retail operational performance	Yu, JY; Xie, JX; Lu, HL	Asia Pacific Journal of Marketing and Logistics	2024	0	The book chapter explores the exponential growth of technologies, with a particular focus on the development of augmented, virtual, and mixed reality. These technologies offer companies opportunities to enhance brand reputation and create unique brand engagement experiences for customers.
19	Mixed reality - mainstream for the lasting competitiveness of companies	Genovino, C; Mauro, PP; Tortora, D	Digital Transformation and Corporate Branding: Opportunities and Pitfalls for Identity and Reputation Management	2024	0	The paper explores the significance of understanding user experiences and the broader implications of the metaverse in understanding players' attitudes and behavioural intentions.
20	What We Know About the Greenability of Reality Technologies: A Systematic Literature Review	Khakpour, A; Sanchez-Gordon, M; Colomo-Palacios, R	Entrepreneurship and Organizational Change: Managing Innovation and Creative Capabilities	2020	0	The paper analyzes the impact of virtual fitting room (VFR) technology on the operational performance of fashion brands' retail activities. It highlights factors such as visual vividness, interactive control, and personalization, all of which are central to customer engagement and marketing success.

Source: Authors's work based on Clarivate Web of Science, February 10th, 2025

From Table 1, it can be seen that only a few papers were published in the same journals (2 papers in the Asia Pacific Journal of Marketing and Logistics, 2 in the International Journal of Contemporary Hospitality Management, 2 in the Journal of Retailing and Consumer Services, and 2 in the Technological Forecasting and Social Change journal). The remaining 12 papers were published in different journals, so the most relevant journal for this field cannot be proposed. However, those journals with at least two publications clearly demonstrate openness to research that combines mixed reality with marketing. Additionally, only one paper from this analysis was published in Conference proceedings. It is a paper titled "Romanian customers' satisfaction regarding private health services" written by Marin-Pantelescu, Andreea and Hint, Mihaela, and published in Proceedings of the International Conference on Business Excellence. This indicates that in the future, this conference may be more likely to accept papers related to the field covered by this paper.

15 papers are indexed in journals within the the Social Sciences Citation Index (SSCI), 3 of them in the Book Citation Index – Social Sciences & Humanities (BKCI-SSH) category, and 1 paper is indexed in each of the following: Emerging Sources Citation Index (ESCI), Book Citation Index – Science (BKCI-S) and Conference Proceedings Citation Index – Science (CPCI-S) category. Based on the research area and bearing in mind the set search query, the results show that all 20 scientific papers are related to the Business Economics

research area, 3 are related to the Social Sciences - Other Topics area, while 2 publications are related to Public Administration. And to research areas: Computer Science, Psychology and Science Technology Other Topics only one paper is related. It should be noted that papers can span multiple research areas, as demonstrated in this case. Based on these findings, it can be concluded that mixed reality is a technology that has applications across various fields. Additionally, marketing is an interdisciplinary science that draws from multiple sciences and research areas.

A total of 22 countries were involved in the publications. The most active country, with 6 publications, is the USA. It is followed by India (5 publications), England (4 publications), Germany and PRC (3 publications), Finland and Italy with 2 publications. Australia, Canada, Denmark, Fiji, Malaysia, Norway, Pakistan, Qatar, Romania, South Korea, Thailand, Turkiye, United Arab Emirates, Uzbekistan, and Wales have one publication each on the topic of mixed reality in the marketing context. The most active academic affiliations are Mica and the University of Texas System, with 2 publications. The other 63 institutions had one publication each until February 10th, 2025. Only one author, Rauschnabel, Philipp, has 2 published papers on this topic, and he can be considered as the most prominent researcher combining mixed reality with marketing. Other papers were authored or co-authored by 76 additional authors.

3.2 Visualisation of bibliometric analysis

This section describes the bibliometric analysis of keyword co-occurrence, bibliographic coupling of documents to identify the links between published papers and their authors, as well as citation metrics.

A total of 17 keywords, found in the papers included in the bibliometric analysis on the topic of mixed reality in the marketing context, that occurred more than twice in the WoS database. These keywords are distributed across 4 clusters of different colours, with 62 links and a total link strength of 83 (see Figure 3). The first cluster, coloured red, includes 7 keywords (AR, customer experience, e-commerce, impact, information, retail, and technology). The second cluster, coloured green, includes 4 keywords (augmented reality, marketing, metaverse, and virtual reality). The third cluster, coloured blue, also includes 4 keywords (analytics, experiences, satisfaction, and services), while the fourth cluster, which is coloured yellow, consists of two keywords (mixed reality and online). The most frequent keyword, also the core keyword related to search queries, was “mixed reality” with 11 occurrences, 14 links, and a total link strength of 27. This keyword is followed by “augmented reality” with 7 occurrences, 11 links between other keywords, and a total link strength of 21. “Virtual reality”, as the third most frequently used keyword (4 occurrences), has 8 links and a total link strength of 15. This is not surprising, as mixed reality is a combination of both virtual and augmented reality. “Satisfaction” is the fourth keyword, with just 3 occurrences. Other keywords (AR, customer experience, e-commerce, impact, information, retail, technology, marketing, metaverse, analytics, experiences, satisfaction, and services) are mentioned at least twice in published papers as keywords. Also, it should be pointed out that “augmented reality” and “AR” are synonyms, therefore, this keyword appears 9 times across the 16 observed papers.

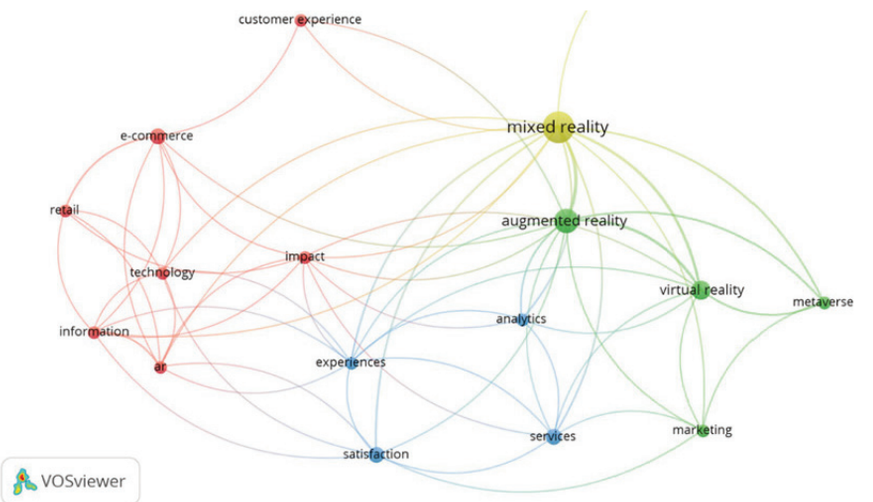

Figure 3: Visualization map of keywords co-occurrence
Source: Authors’s work based on collected data, February 10th, 2025

The author's co-citation method is used in bibliometric analysis as a significant approach to identifying the intellectual structure of the research area. It helps determine how often an author's paper is cited alongside another author's paper in the references of other papers. Thus, this method determines the similarity between the two cited documents. When multiple papers cite the same two documents together, their co-citation strength increases (Donthu et al., 2021; Linnenluecke et al., 2020). Papers on the topic of mixed reality in the marketing context are cited by 994 different authors. According to the co-citation of the authors, the authors are divided into 2 clusters that share similarities in research subject, and have crossed the threshold of a minimum of 5 citations per author. These two clusters have 62 links and a total link strength of 371. The first cluster, coloured red, includes 7 authors, and the second cluster, which is coloured green, includes 6 authors. The most cited author is Rauschnabel, Philipp, with 14 citations, 12 links, and a total link strength of 128 (Figure 4).

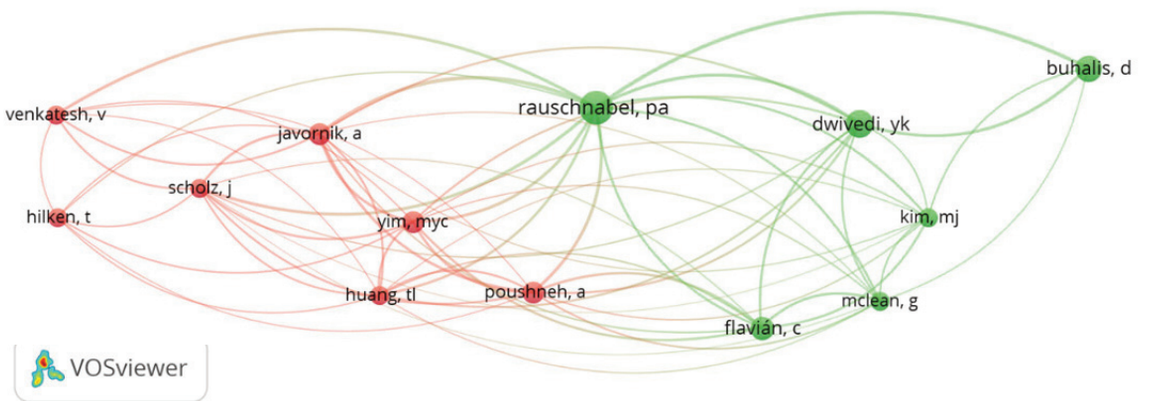

Figure 4: Visualization map of co-citation of the author on the topic of mixed reality in the marketing context
Source: Authors's work based on collected data, February 10th, 2025

From Figure 5, it can be seen that when matching the available papers, 5 clusters exist. In the first cluster, coloured red, 4 papers were found. In the second cluster, which is coloured green, 3 papers were found. The third cluster, which includes 3 papers, is marked in blue. The fourth cluster, coloured yellow, consists of 2 papers, as does the fifth cluster, coloured purple. This visualization shows that the papers "Augmented reality marketing: How mobile AR-apps can improve brands through inspiration" written by Rauschnabel et al. in 2019, and the paper "Transforming the Customer Experience Through New Technologies" written by authors Hoyer et al. and published in 2020, represent a research base for all other papers published in the field of mixed reality in the marketing context. The first-mentioned paper has recorded 259 citations, 7 links with other papers, and a total strength of 15.00. The second paper has 253 citations, 9 links, and a total link strength of 12.00.

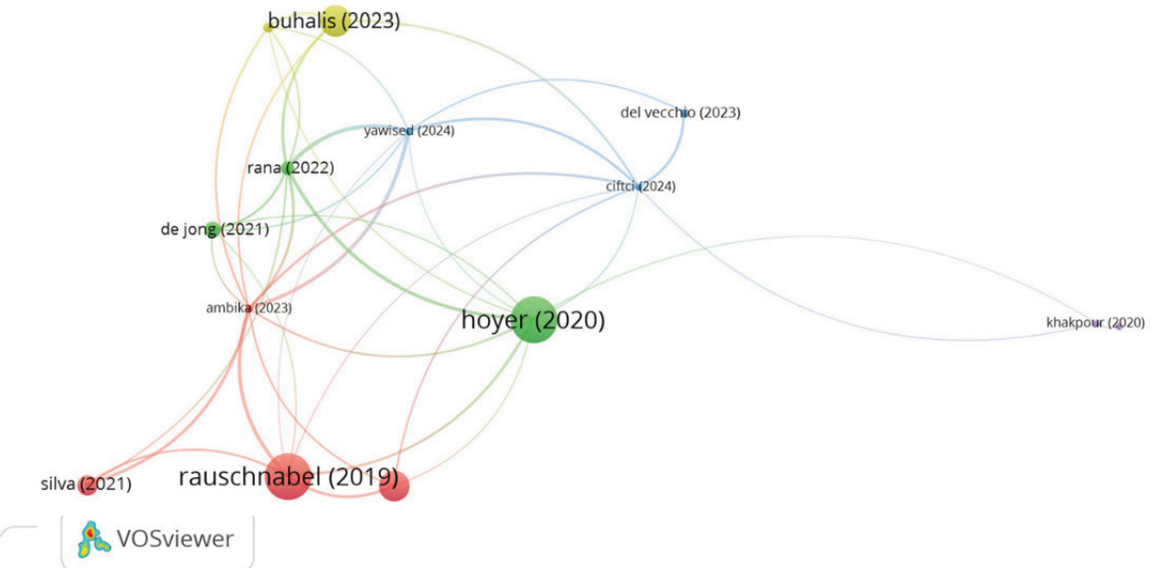

Figure 5: Visualization map of bibliographic coupling of documents - fractional counting
Source: Authors's work based on collected data, February 10th, 2025

Bibliographic coupling occurs when two papers both reference a common third paper in their bibliographies. This indicates that there is a probability that these two papers address a similar topic. In other words, two documents are bibliographically linked if both cite one or more common documents. This method complements co-citation analysis. While co-citation shows that two papers appear together in the reference list of another paper, bibliographic coupling adds up the number of references that a group of documents has together (Bukar et al., 2023; Donthu et al., 2021; Kirby, 2023; Linnenluecke et al., 2020). According to this method, from Figure 6, it can be seen that the authors are divided into 9 clusters. There are 14 authors in the first cluster, 8 authors in the second and third, 7 authors in the fourth, 5 authors in the fifth, sixth, and seventh clusters, 4 authors in the eighth, and 3 authors in the ninth cluster. The author Jain, Varsha (45 links and 1160 link strength) has the strongest bibliographic coupling, and he is followed by Alalwan, Ali Abdallah (33 links and 762 link strength), De Jong, Ad (24 links and 433 link strength), Apasrawirote, Darlin (43 links and 426 link strength) and Rauschnabel, Philipp (23 links and 247 link strength). Other authors have a weaker link in bibliographic coupling.

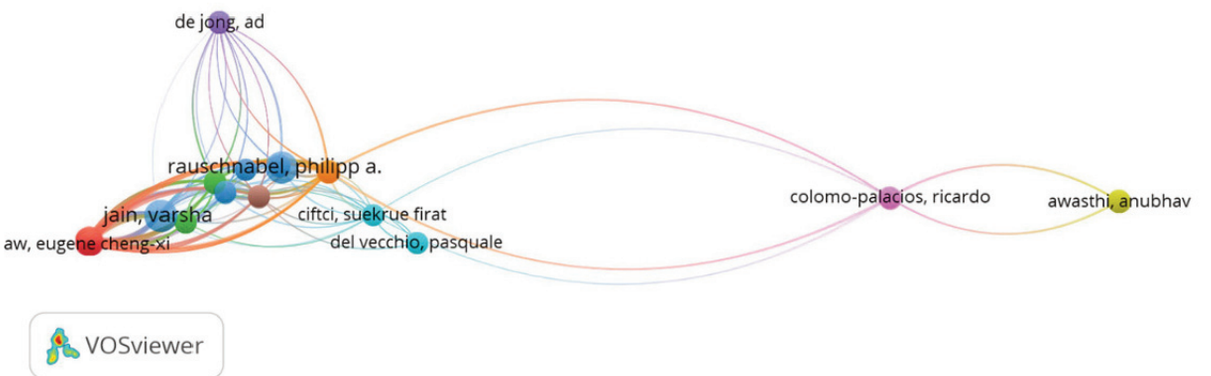

Figure 6: Visualization map of bibliographic coupling of authors on the topic of mixed reality in the marketing context
Source: Authors's work based on collected data, February 10th, 2025

3.3 Research limitations

This paper and the conducted research have certain limitations. Firstly, the bibliometric analysis relies solely on the Web of Science Core Collection Platform. Although the WoS is considered as a very comprehensive platform, future studies should expand the scope by including additional scientific databases. This would enable a more universal analysis and facilitate comparisons across different databases. Additionally, the limitations of the research can be recognized in the search query used, as the author imposed certain limitations in this regard. Furthermore, the use of advanced filtering options, such as language and research area, may have excluded relevant papers, which can lead to another potential limitation of this paper.

Conclusion

This paper gives a short theoretical review of mixed reality and its usage in marketing. Afterward, the bibliometric analysis was conducted based on data collected through desk research. Data shows that mixed reality as a technology in the marketing context began to be researched in 2018. Having in mind that mixed reality is a technology that is based on the combination of two well-known and used technologies in marketing, virtual and augmented realities. This is also evident from the presented analysis of keywords that appeared most frequently in published papers. Additionally, the analysis and the answers to the research questions can be found. An analysis was conducted for the purpose of writing this paper to determine which paper has received the highest number of citations, who is the leading researcher in the field, and which scientific journals and conferences are the most influential in publishing papers on mixed reality in marketing. Furthermore, it should be noted that only a small subset of papers, authors, affiliations, and countries are actively researching the mentioned field. However, there is an anticipation that this situation will change over time. Until then, the scientific significance of this paper remains indisputable.

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