Trends And Impact of Augmented Reality In Digital Marketing: A Comprehensive Bibliometric Analysis

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Abstract

This study aims to map the trends and impacts of augmented reality (AR) in the context of digital marketing through bibliometric analysis. Data were collected from Google Scholar for the period 2002–2025 using Publish or Perish (PoP) software. The results show that publications on AR in digital marketing have increased significantly, with 956 articles and 78,548 citations during the study period. The most dominant keywords are augmented reality, augmented reality marketing, purchase intention, consumer behaviour, and digital marketing strategy, indicating a research focus on the influence of AR on consumer behaviour and marketing strategies. Network visualisation shows thematic clusters linking AR with consumer behaviour, marketing strategies, and the adoption of disruptive technologies such as artificial intelligence and the metaverse. However, research related to long-term loyalty, brand equity, and the application of AR in non-traditional sectors is still limited. These findings confirm that AR not only serves as an innovative marketing tool but also as a catalyst for broader digital transformation. Further research is recommended to expand the focus on the integration of AR with disruptive technologies and explore its application in the education, health, and public service sectors.

Keywords : *augmented reality, bibliometric, consumer behaviour, digital marketing, digital marketing strategy*.
JEL Codes : M31, O33, M15

INTRODUCTION

The rapid advancement of digital technologies has fundamentally transformed the way businesses interact with consumers, creating new opportunities for personalised engagement and immersive experiences. Among these innovations, augmented reality (AR) has emerged as one of the most promising tools in the field of digital marketing. AR allows companies to overlay digital content onto real-world environments through smartphones, smart glasses, and other devices, enabling consumers to engage with products in more interactive and meaningful ways. As a result, AR has been positioned not only as a marketing trend but also as a strategic driver of digital transformation within global industries.

The growing relevance of AR in marketing is closely linked to shifting consumer expectations. Modern consumers increasingly demand personalized, interactive, and experiential brand interactions. Studies indicate that AR applications in retail and advertising enhance customer satisfaction, improve purchase intentions, and foster deeper emotional connections between brands and consumers (Jessen et al., 2020). For instance, global brands such as IKEA and L'Oréal have implemented AR-based applications to allow customers to virtually try out furniture in their homes or test cosmetics on their faces before purchase. According to Buchholz (2023), the global AR market in retail and marketing is projected to surpass USD 18 billion by 2030, reflecting its rapid adoption and commercial potential.

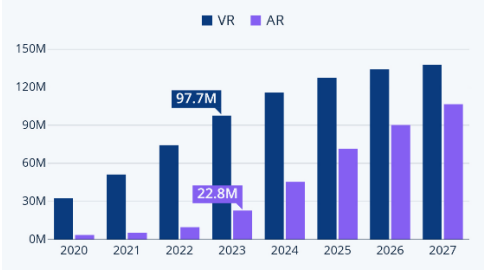

Figure 1. Number of Users of AR and VR

The number of Augmented Reality (AR) users has shown rapid growth over the years. In 2020 and 2021, the number of AR users was still very small. By 2022, it began to increase to around 10–15 million users, and in 2023, the figure rose significantly to 22.8 million. This growth trend continued strongly in the following years, reaching about 35 million users in 2024, around 65 million in 2025, and approximately 90 million in 2026. By 2027, the number of AR users is projected to surpass 110 million. Overall, the data shows that AR adoption is accelerating quickly, especially after 2023, and is expected to continue growing until it comes closer to Virtual Reality (VR) user numbers (Richter, 2023).

Despite its benefits, AR adoption in digital marketing also faces several challenges. First, the technology requires significant investment in hardware, software, and skilled professionals, which may not be accessible to all businesses, especially small and medium enterprises. Second, issues of data privacy and security remain critical, as AR often relies on the collection of consumer behavioural data. Third, the effectiveness of AR marketing campaigns varies depending on consumer demographics, cultural preferences, and levels of technological literacy (Dwivedi et al., 2022). Without addressing these challenges, there is a risk that AR will remain a niche tool rather than a mainstream driver of digital marketing transformation.

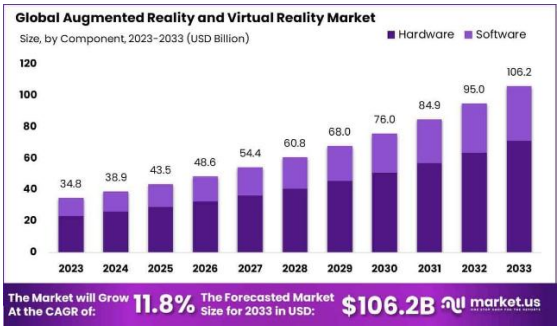

Figure 2. Global AR dan VR Market

The global Augmented Reality (AR) and Virtual Reality (VR) market is projected to experience significant growth between 2023 and 2033. In 2023, the market size was valued at USD 34.8 billion, with hardware accounting for the majority share compared to software. This value is expected to increase steadily over the years, reaching USD 54.4 billion in 2027 and USD 76.0 billion in 2030. By 2033, the market size is forecasted to reach USD 106.2 billion. Overall, the AR and VR market is anticipated to grow at a compound annual growth rate (CAGR) of 11.8%, reflecting a strong upward trend in demand for both hardware and software components. This growth highlights the expanding role of AR and VR technologies across various industries, including gaming, healthcare, education, retail, and enterprise applications (Market us, 2024) .

At the same time, the rise of AR raises important questions about its long-term impact on consumer behavior and brand strategy. By creating immersive experiences that blur the boundary between online and offline environments, AR has the potential to redefine customer journeys and reshape marketing ecosystems. This evolution also implies the need for new theoretical frameworks and empirical evidence to understand how AR contributes not only to short-term engagement but also to sustainable brand loyalty and market competitiveness.

Bibliometric analysis is necessary in this topic because research on AR in digital marketing is still fragmented across disciplines such as marketing, information systems, computer science, and consumer behavior. While many studies highlight the potential of AR to enhance customer experiences and strengthen brand engagement, there has been limited effort to systematically map how knowledge in this area has developed over time. Bibliometric analysis helps address this gap by quantitatively identifying influential publications, authors, and thematic clusters, thus providing a structured overview of the field field (Donthu et al., 2021). In addition, it enables researchers to detect emerging trends and research gaps, offering valuable guidance for future studies and helping practitioners understand which strategies are supported by scholarly evidence. Without such an approach, insights into AR's role in digital marketing remain scattered and risk overlooking important connections across the growing body of literature.

LITERATURE REVIEW

The Concept of Augmented Reality (AR)

Augmented Reality (AR) is defined as a technology that integrates virtual objects into the real world in real time, thereby creating interactive experiences that extend users' perceptions of their environment (Azuma, 2017). In marketing contexts, AR functions to enhance consumer interaction with brands through simulations, product visualisation, and immersive experiences. Studies show that AR can increase customer engagement, strengthen purchase intentions, and build brand loyalty due to its interactive nature and ability to personalise consumer experiences (Jessen et al., 2020). This concept has evolved into a key innovation in digital marketing strategies, as it bridges the gap between physical and digital experiences.

AR in Digital Marketing

The implementation of AR in digital marketing spans across various sectors, including retail, advertising, and tourism. For instance, IKEA and L'Oréal have adopted AR applications that allow customers to virtually try furniture in their homes or test cosmetics on their faces before purchasing. The automotive industry also uses AR to provide virtual demonstrations of vehicles (Bonetti et al., 2018). Empirical research finds that AR reduces consumer uncertainty before purchase, accelerates decision-making, and improves post-purchase satisfaction (Scholz & Duffy, 2018). Moreover, AR supports experiential marketing strategies, in which consumers' emotional engagement becomes a central factor in creating long-term brand value.

Previous research further reinforces the impact of AR in shaping consumer behaviour and brand interactions. Javornik (2016) demonstrated that AR applications enhance the sense of immersion and interactivity, which significantly influence consumer attitudes toward products and brands. AR-based shopping experiences generate higher levels of enjoyment and perceived usefulness, leading to stronger purchase intentions compared to traditional online shopping (Periyasamy, 2023). Similarly, emphasised that AR not only improves product evaluation but also strengthens brand attachment by providing memorable and personalized experiences. These findings collectively suggest that AR is more than a technological add-on; it is a transformative marketing tool that reshapes how consumers perceive value, make decisions, and engage with brands.

Bibliometric Analysis in Research Mapping

Bibliometric analysis is a quantitative method used to examine patterns of scholarly publications through indicators such as citation counts, collaboration networks, keyword co-occurrence, and thematic evolution (Donthu et al., 2021). This approach provides a comprehensive overview of the development of a research field, identifies influential authors, and projects future research directions. Beyond mapping trends, bibliometric analysis also uncovers research clusters, interdisciplinary connections, and the dynamic evolution of topics over time (Van Eck & Waltman, 2010). Previous studies have employed bibliometric methods to map literature in digital transformation and marketing technologies (Aria & Cuccurullo, 2017). However, bibliometric studies specifically focusing on AR in digital marketing remain relatively limited. Therefore, conducting a bibliometric analysis in this area is crucial to understanding AR's position within the modern marketing landscape, identifying research gaps, and providing a strategic foundation for both scholars and practitioners to advance AR-driven marketing research and practices.

RESEARCH METHOD

Research Design

This study employs a bibliometric research design to systematically analyze research trends and impacts of Augmented Reality (AR) in digital marketing. The bibliometric approach is appropriate because it enables the mapping of scholarly outputs, identifies the most influential authors and publications, and highlights key research themes.

Data Source

The bibliometric data for this study were retrieved from Google Scholar using the software Publish or Perish (PoP)**.** Google Scholar was chosen because of its wide coverage of academic materials, including journal articles, conference proceedings, theses, books, and working papers. Publish or Perish was used to extract publication metadata such as title, author(s), year, source, number of citations, and related bibliographic information.

Data Collection Procedure

The data collection process was carried out using Google Scholar as the main database and Publish or Perish (PoP) as the extraction tool. Relevant keywords such as *"Augmented Reality,"* and *"Digital Marketing"* were applied, with Boolean operators used when necessary to refine the results. The extracted metadata included the title, author(s), year of publication, source, and citation count. To ensure relevance, the dataset was limited to the period 2002–2025 and then subjected to a cleaning process, which involved removing duplicates, irrelevant records, and incomplete entries. The cleaned dataset was subsequently exported into Microsoft Excel, which was used for organizing, tabulating, and conducting preliminary descriptive analyses such as the number of publications per year, citation distributions, and top authors.

RESULTS AND DISCUSSION

The bibliometric analysis conducted in this study provides an overview of the development of scientific understanding through academic publications covering augmented reality and digital marketing. This study maps research trends, emerging topics, and the contributions of authors and institutions over time. The following are the results of the data processing.

Citation metrics Help

Publication years:	2002-2025
Citation years:	23 (2002-2025)
Papers:	956
Citations:	78548
Cites/year:	3415.13
Cites/paper:	82.16
Cites/author:	47935.26
Papers/author:	496.08
Authors/paper:	2.52
h-index:	115
g-index:	273
hI,norm:	76
hI,annual:	3.30
hA-index:	62
Papers with ACC >= 1,2,5,10,20:	
664,517,360,247,159	

Figure 3. Descritive General Data of the Included Studies (Year)

This study used articles obtained from Pop to produce scientific publications between 2002 and 2025. The results show significant productivity. Over 23 years, 956 articles were published with a total of 78,548 citations. The average number of citations per year was 3,415.13, while the average number of citations per article was 82.16. This shows that each publication received considerable attention from the international academic community. The average number of authors per article is 2.52, indicating intensive research collaboration. With a total productivity of 956 articles, the average contribution of authors is 496.08 articles per author, reflecting the existence of a group of leading authors with very high productivity. In terms of scientific impact, the h-index of 115 and g-index of 273 indicate that the publications are not only productive but also have a broad impact in their field. The hI,norm value of 76 and hI, annual of 3.30 reflect the consistency of citations each year, while the hA-index of 62 reinforces the picture of works that are truly highly influential.

The distribution of articles based on the number of citations also shows the consistent quality of publications, with 664 articles receiving at least 1 citation, 517 articles receiving at least 5 citations, 360 articles receiving at least 10 citations, 247 articles receiving more than 20 citations, and 159 articles receiving more than 50 citations. This pattern shows not only a high quantity of publications, but also the quality and reach of the research produced. The data shows that publications during this period have

made a substantial contribution to the development of science. The high number of citations and strong impact index reflect the relevance, quality, and sustainability of the research conducted, both in a national and international context.

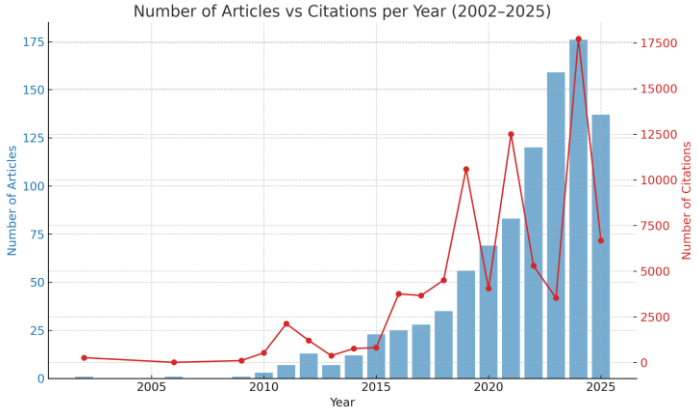

Figure 4. Number of Articles and Citations (Years)

The graph shows the development of the number of articles (blue bars) and citations (red lines) from 2002 to 2025. In general, there is a significant upward trend in both publication productivity and citation impact, despite fluctuations in certain periods. In the early phase (2002–2009), the number of articles was still very low (1–3 articles per year), but several publications managed to obtain relatively high citations, such as in 2002 (268 citations) and 2010 (532 citations). Entering the 2011–2014 period, the number of articles began to increase more steadily (7–13 articles per year), along with the growth in citations, for example, in 2011 (2,126 citations), which was quite prominent compared to previous years. A sharper increase was seen in the 2015–2019 period. The number of articles grew from 23 articles (2015) to 56 articles (2019). In line with this, citations also increased significantly, especially in 2016 (3,759 citations) and peaked in 2019 (10,590 citations). This shows that publications during this period began to gain wider recognition in the international academic community.

In 2024 and 2025, the number of publications declined slightly, to 159 and 137 articles, respectively. This downward trend could be due to various factors, including research cycles, resource constraints, or ongoing publication processes that have not yet been fully recorded. This pattern shows that scientific article publication productivity has grown progressively, with significant acceleration in the last decade. The surge in the number of publications, especially since 2020, indicates the increasing attention and contribution of academics in relevant fields of research. However, the decline after the peak in 2023 needs to be addressed in order to maintain productivity in the coming years.

These findings indicate that the research topic under review is in a phase of rapid development. This condition opens up opportunities for research to explore aspects that are still rarely touched upon, while strengthening scientific contributions in deepening understanding of this evolving issue.

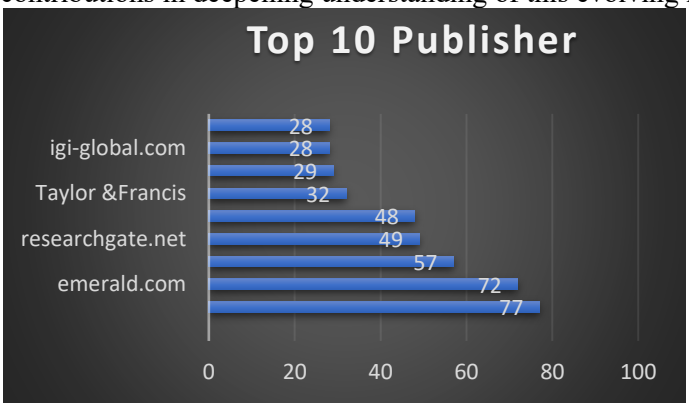

Figure 5. Top 10 Publisher

The figure shows the top ten publishers that are the main sources of publications in this field of study. In general, it can be observed that Springer (77 articles) and Emerald (72 articles) dominate publications,

followed by IEEE Xplore (57 articles), ResearchGate (49 articles), and Elsevier (48 articles). Meanwhile, other publishers such as Taylor & Francis, Academia.edu, IGI Global, SAGE Journals, and Wiley Online Library have relatively lower publication numbers, ranging from 26 to 32 articles. Overall, these findings indicate that the research topic has received widespread attention from the global academic community, with the highest concentration on major publishers that influence the credibility and reach of publications.

The dominance of Springer and Emerald indicates that these two publishers are the main vehicles for disseminating knowledge in this field, particularly because they are widely known as publishers with strong international reputations and a focus on management, economics, technology, and social science issues relevant to the research theme. This shows a tendency for researchers to publish their work in journals managed by reputable publishers in order to gain wider global visibility. IEEE Xplore, with its significant number of publications, shows a major contribution from the fields of technology and engineering, which confirms the interdisciplinary nature of this study. In addition, the existence of community-based platforms such as ResearchGate and Academia.edu shows the important role of open access repositories in disseminating knowledge more widely, even though their academic quality differs from that of conventional publishers such as Springer or Elsevier.

From an academic perspective, this distribution pattern highlights two important points. First, researchers tend to choose reputable international publishers to increase citations and the impact of their research. Second, the significant contribution of open platforms shows that the accessibility of publications is also an important consideration in the dissemination of research results. Future research should focus on a balanced publication strategy between quality (through reputable publishers) and accessibility (through open platforms) in order to broaden scientific impact.

Figure 6. CO-Authorship Network

The results of co-authorship network visualization show that collaboration patterns between authors are still relatively limited and fragmented. This condition has several important academic implications. Limited collaboration between authors can reduce opportunities to produce multidisciplinary research, which usually arises from cross-disciplinary and cross-institutional cooperation. In fact, current global research trends show that collaborative research tends to produce publications with higher citation rates and influence. The dominance of several highly productive authors such as Rachmad, YE, Rauschnabel, PA, and Dieck, MC Tom demonstrates their central role as key actors in this field of research. However, the lack of connectivity between major authors indicates the potential for suboptimal collaborative network development. If connectivity between authors increases, a stronger core network can be formed and serve as a center for knowledge growth in this field.

Opportunities for cross-border and cross-disciplinary collaboration remain wide open. Given the increasing complexity of academic issues, the involvement of authors from various scientific backgrounds and international institutions can improve the quality of methodology, enrich analytical perspectives, and expand the reach of publications in reputable journals. The academic implication that

can be drawn is the need to encourage networking among authors through collaborative projects, international conferences, and interdisciplinary academic forums. This is expected to not only increase publication productivity, but also amplify the impact of research at the global level, thereby making this field of study more relevant and competitive in the international scientific landscape.

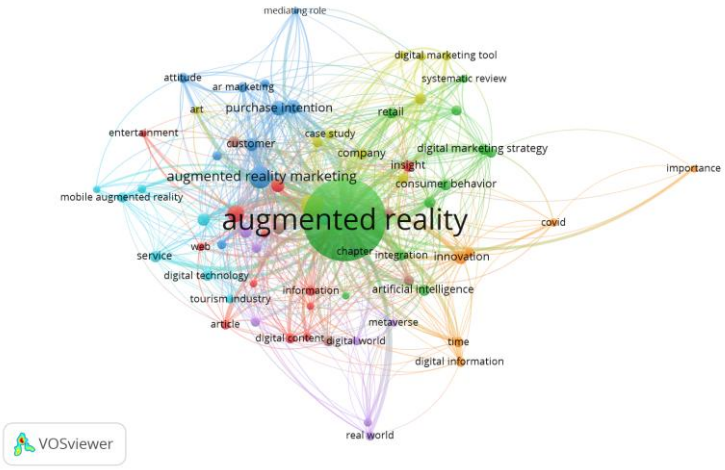

Figure 7. Network Visualization

The results of network visualization using VOSviewer software show that the keyword "augmented reality" occupies a central position in research related to digital marketing. This is indicated by the large size of the node and its extensive connections to various other keywords, so it can be concluded that augmented reality is the main focus of scientific discourse in this field. Other large nodes that appear are "augmented reality marketing," "digital marketing strategy," and "consumer behavior," which indicate that studies on AR not only emphasize its technological aspects but also its strategic implementation in marketing and its impact on consumer behavior. The visualization reveals several main clusters that describe the focus of the research. The first cluster emphasizes marketing strategy and consumer behavior, where keywords such as digital marketing tool, digital marketing strategy, consumer behavior, and retail indicate that AR is used as an instrument to strengthen marketing strategies, particularly in influencing consumer behavior in the retail sector.

The second cluster focuses on consumer behavior and purchase intent, with keywords such as purchase intention, attitude, customer, entertainment, and mobile augmented reality. This confirms that many studies highlight how the use of AR can enhance the customer experience and drive purchase intent through immersive and entertainment-based interactions. Furthermore, there is a cluster that focuses on technology and its applications, for example through keywords such as digital technology, tourism industry, service, web, and digital content. This cluster shows that AR is integrated in various industries, including tourism and digital services. On the other hand, there is also a cluster that raises contemporary issues and innovation, with keywords such as artificial intelligence, COVID, innovation, and importance. This shows academic interest in how the COVID-19 pandemic has driven the adoption of digital technologies, including AR, and how AR is connected to other technological innovations such as artificial intelligence and the metaverse. The last cluster shows the connection between the real world and the digital world, as reflected in the keywords real world, digital world, and metaverse. This cluster underlines the role of AR as a bridge between real and virtual experiences.

The pattern of relationships between keywords shows that research on AR in digital marketing is moving in two major directions, namely consumer orientation and technology-strategic orientation. Consumer orientation emphasizes how AR shapes customer experience, increases engagement, and influences purchase intent. Meanwhile, technology-strategic orientation relates to the integration of AR in digital marketing strategies, supported by cutting-edge technology, and its application in various industrial sectors. These findings position AR as an important instrument in creating interactive and personalized consumer experiences, as well as an innovative strategy to increase competitiveness in the era of digital marketing. There is still a limited number of studies on the role of AR in building long-term customer loyalty, brand equity, and its contribution to sustainability marketing. In addition, although there are

already links with AI and the metaverse, the conceptual and empirical integration of these technologies with AR has yet to be explored in depth.

The development of an integrative model that connects AR with other disruptive technologies, the application of AR in non-traditional sectors such as education, health, or public services, and empirical analysis of the impact of AR on business sustainability and consumer experience post-pandemic. Further research has great potential to expand the contribution of AR not only in commercial aspects, but also in social and sustainability dimensions.

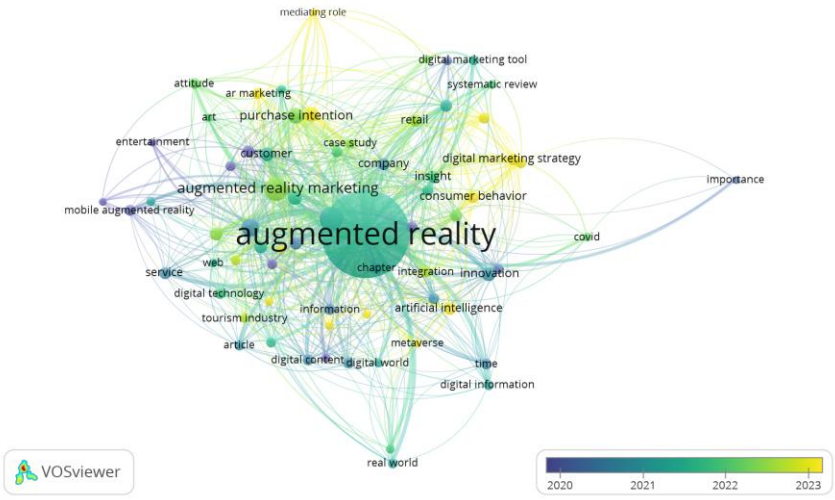

Figure 8. Overlay Visualization

The overlay visualization results show the dynamics of research development on augmented reality in the context of digital marketing from 2020 to 2023. Darker colors (purple-blue) indicate keywords that were used more frequently in the early period, while lighter colors (green-yellow) indicate keywords that are relatively new and developing in the current period. Key terms such as "augmented reality" and "augmented reality marketing" have been the focus since the beginning, with extensive connections to classic themes such as "purchase intention," "customer," "attitude," and "tourism industry." This indicates that early research focused more on understanding the basic impact of AR on consumer behavior, especially in the context of tourism, entertainment, and services.

Entering a more recent research period (2021–2023), new green-yellow keywords have emerged, such as "digital marketing strategy," "digital marketing tool," "consumer behavior," and connections to disruptive technologies such as "artificial intelligence" and "metaverse." This reflects an expansion in the focus of research, from simply testing consumer purchase intent to more complex, technology-based digital marketing strategies. In addition, the emergence of the keyword "Covid" indicates that research has been adjusted to the global context, where AR is seen as an alternative solution to overcome the limitations of physical interaction during the pandemic.

This finding is that the development of AR research in digital marketing is increasingly oriented towards integrative strategies, which not only emphasize user experience but also highlight the adaptation of new technologies in creating added value for consumers and companies. There is a lack of longitudinal studies assessing the long-term impact of AR on customer loyalty and brand equity. In addition, although the connection with "artificial intelligence" and "metaverse" is beginning to emerge, empirical research that builds an integrative conceptual model between AR and these technologies is still limited. This study explores the role of AR in sustainable marketing, its integration with cutting-edge technologies (AI, metaverse, big data), and its application in non-traditional sectors such as education, health, and public services. Further research has the potential to make significant theoretical and practical contributions, both in the development of technology-based digital marketing models and in supporting the global digital transformation agenda.

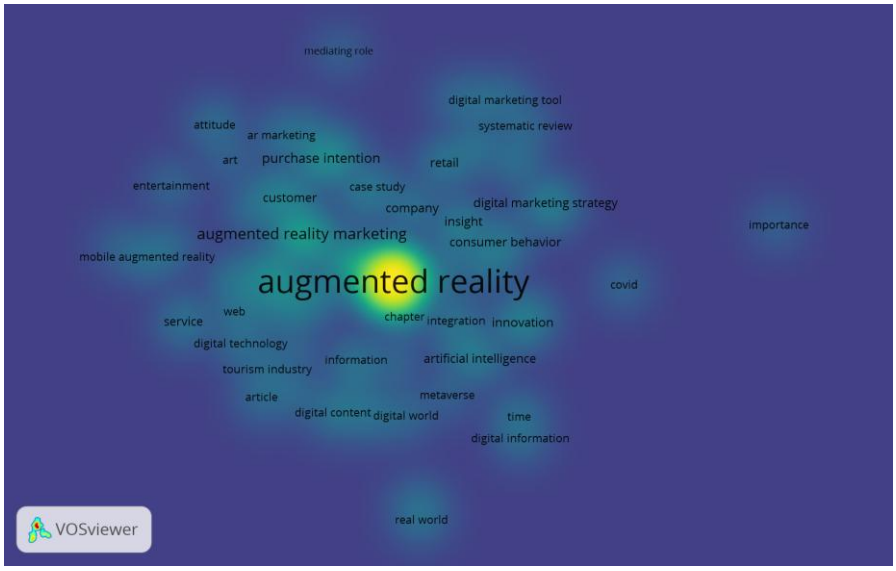

Figure 9. Density Visualization

The density visualization results show that the topic of augmented reality is the main focus of scientific studies related to digital marketing. The brightest colors indicate the high frequency of this term's appearance in the literature, confirming that augmented reality is the core of the research. The keywords "augmented reality marketing," "purchase intention," "consumer behavior," and "digital marketing strategy" show a relatively high intensity of research. This indicates that current research focuses on how augmented reality technology can influence consumer behavior and drive purchase intent in the context of digital marketing strategies. On the other hand, the keywords "artificial intelligence," "metaverse," "digital content," "tourism industry," and "innovation" have lower density, although they remain relevant to the core topic. This shows that the relationship between augmented reality and advanced technological innovation and its application in specific sectors such as tourism is still an area of developing research. In addition, the keywords "covid" and "importance" appear to be quite separate from the main group, indicating that research related to the pandemic and the urgency of applying technology in digital marketing has not been fully integrated into the main discourse.

Findings on augmented reality in digital marketing have grown rapidly, particularly in influencing consumer behavior and purchase intention. These results are important for marketing practitioners to utilize augmented reality as a differentiation strategy in improving customer experience and loyalty. In addition, integration with other technologies such as artificial intelligence and the metaverse opens up opportunities for broader innovation, including in the tourism, retail, and digital-based services sectors. Several research gaps can be identified. First, research linking augmented reality with artificial intelligence and the metaverse is still limited, even though the synergy of these technologies has the potential to create a more immersive digital marketing ecosystem. Second, the role of augmented reality in specific sectors such as tourism and digital services has not been explored in depth. Third, the relationship between augmented reality and the context of the pandemic (COVID-19) or global issues is still marginal, even though these situations have the potential to accelerate the adoption of digital technology.

This study seeks to integrate augmented reality with broader digital marketing strategies through a cross-technology and cross-sector approach. Rather than focusing solely on purchase intention or consumer behavior, recent research emphasizes how augmented reality interacts with artificial intelligence, the metaverse, and digital content to form a sustainable marketing ecosystem that is adaptive to changes in the external environment. Thus, this research contributes to broadening the horizon of understanding about the role of augmented reality, not only as a marketing tool, but also as a catalyst for more comprehensive digital transformation.

CONCLUSION AND SUGGESTION

Conclusion

This study shows that augmented reality (AR) in digital marketing has experienced rapid development with a significant increase in publication and citation trends, especially from 2015 to its peak in 2023. The main focus of research is still on the influence of AR on consumer behavior and purchase intention, while its connection with disruptive technologies such as artificial intelligence and the metaverse is beginning to develop but is still limited. Author collaboration patterns are still fragmented, although contributions from reputable international publishers confirm the academic legitimacy of this field. Thus, AR is positioned not only as an innovative marketing tool, but also as a catalyst for broader digital transformation.

Suggestion

Further research is recommended to develop an integrative model between AR and cutting-edge technologies such as AI and the metaverse, as well as to expand studies to non-traditional sectors such as education, health, and public services. Longitudinal studies are needed to assess the long-term impact of AR on customer loyalty and brand equity. In addition, cross-disciplinary and cross-country collaboration needs to be strengthened to improve the quality and relevance of research, with a balanced publication strategy between reputable international journals and open access platforms to optimize global visibility.

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