

MAPPING THE CUSTOMER EXPERIENCE IN VIRTUAL ENVIRONMENTS: INTEGRATED BIBLIOMETRIC INSIGHTS FROM BIBLIOMERGE, VOSVIEWER CITESPACE

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ABSTRACT

This study provides a bibliometric review of research on customer experience in the context of virtual technologies, with particular attention to immersive technologies, such as virtual reality (VR), augmented reality (AR), and metaverse-related applications. Drawing on bibliographic data collected from the Web of Science and Scopus databases, the study analyzes 931 publications published between 2016 and 2026. To ensure data consistency and reliability, bibliographic records were merged and cleaned using BiblioMerge, while CiteSpace and VOSviewer were employed to visualize publication trends, keyword co-occurrence, citation bursts, thematic clusters, and country collaboration networks. The findings reveal a rapid growth of scholarly interest in immersive customer experience research, particularly since 2020. The core themes cluster into three major areas: (1) VR/AR application contexts in retail and service environments, (2) consumer behavior and experience-related outcomes such as purchase intention, trust, and engagement, and (3) technological and managerial challenges, including privacy, usability, and adoption barriers. By mapping the intellectual structure of this domain, the study contributes a comprehensive overview of current research patterns and offers a foundation for future investigations into the role of immersive technologies in shaping customer experience and digital retail transformation.

Keywords: BiblioMerge, CiteSpace, VOSviewer, bibliometric analysis, publication trends, research hotspots.

1. INTRODUCTION

Customer experience (CX) has emerged as a critical area of research, especially with the growing influence of digital technologies on consumer behavior and business strategies [1, 2, 3]. As immersive technologies such as Virtual Reality (VR), Augmented Reality (AR), and the metaverse continue to shape the future of retail, understanding the evolving trends and emerging topics in CX research is essential [4, 5]. This study aims to provide a comprehensive bibliometric analysis of customer experience research, with a particular focus on the role of digital transformation in enhancing consumer interactions.

To conduct the customer experience analysis, this study utilizes bibliometric tools such as BiblioMerge, VOSviewer, and CiteSpace [6, 7]. BiblioMerge was instrumental in merging bibliographic data from various academic databases, ensuring consistency and completeness of the dataset used for further analysis [8]. This step was crucial for the preparation and standardization of data retrieved from multiple sources, allowing for a more reliable and accurate examination of the literature.

CiteSpace was then employed for visualizing citation networks, enabling us to map the structure and evolution of research in the field of customer experience. CiteSpace's ability to visualize co-citation networks and analyze research trends has proven invaluable in identifying influential papers, authors, and key research themes within the literature [6]. By processing data from Scopus and Web of Science [9], CiteSpace and VOSviewer generated visual representations of citation patterns, revealing clusters of highly cited papers and the interconnections between various research topics. The software's features allowed us to uncover significant research hotspots and track the shifting focus of CX research over time.

This study makes three main contributions to the literature on customer experience in immersive digital environments. First, it advances prior research by integrating bibliographic records from both Scopus and Web of Science, thereby improving dataset coverage and reducing the risk of omission associated with single-database studies. After screening and preprocessing, the final dataset comprised 931 publications, providing a broader empirical basis for identifying research trends and thematic structures. Second, the study adopts a rigorous multi-tool bibliometric workflow in which BiblioMerge is used for data harmonization and duplicate removal, VOSviewer for visualizing collaboration and keyword co-occurrence networks, and CiteSpace for detecting thematic evolution, citation bursts, and emerging research fronts, thus enhancing the robustness and interpretability of the analysis. Third, this integrated design enables the study to uncover the intellectual structure of the field more systematically, revealing major thematic clusters, interdisciplinary linkages, and the publication trends of customer immersive experience research with greater analytical depth.

2. LITERATURE REVIEW

The concept of customer experience has evolved into a focal point of research, driven by its pivotal role in shaping consumer perceptions, behaviors, and interactions with brands in an increasingly digital and immersive environment. Over the past decade, technological advancements have reshaped the landscape of customer interactions, pushing the boundaries of traditional service delivery models. Virtual Reality (VR), Augmented Reality (AR), and the emerging metaverse are increasingly being integrated into customer journeys, offering opportunities for businesses to create more engaging, personalized, and immersive experiences for consumers. These transformations necessitate a deeper exploration of how these technologies influence customer behavior and contribute to the overall customer experience [10]-[13].

A key aspect of CX research is its interdisciplinary nature, drawing on insights from fields such as marketing, psychology, business management, and technology. The integration of immersive technologies like VR and AR into retail and customer engagement strategies has garnered considerable attention, with scholars examining their potential to enhance user engagement, satisfaction, and loyalty. These technologies allow consumers to interact with products in ways that were previously impossible in traditional retail environments, thus providing a more interactive and immersive shopping experience [6]. The growing adoption of these technologies in retail settings is reshaping consumer expectations and creating new opportunities for businesses to connect with their target audiences.

Recent studies have explored the impact of VR and AR on consumer behavior, focusing on aspects such as perceived enjoyment, impulse buying, and product evaluation. VR, for example, has been shown to increase consumer engagement by offering immersive experiences, enabling customers to visualize products in a more realistic and personalized manner. Similarly, AR has been utilized to enhance product presentations, allowing consumers to interact with virtual representations of products in real-time. These advancements not only improve customer satisfaction but also create new opportunities for businesses to drive sales and enhance the overall shopping experience.

The literature also highlights the growing role of the metaverse in shaping customer experiences. The metaverse, an expansive virtual environment where users can interact with each other and digital objects in real-time, has gained significant attention as a new frontier for customer engagement. Research indicates that the metaverse offers novel opportunities for businesses to create immersive brand experiences that go beyond the limitations of physical and online stores. As the metaverse continues to evolve, its impact on consumer behavior and brand loyalty is an area of growing interest in academic literature.

Bibliometric studies have also played a crucial role in understanding the evolution of CX research, mapping the progression of key themes, research areas, and influential authors within the field. Tools like CiteSpace have enabled scholars to visually track the development of CX research, identifying co-citation clusters and keyword trends that reveal the interconnectedness of various research topics [6]. By analyzing citation patterns, these studies offer valuable insights into the emergence of new research directions, such as the integration of artificial intelligence (AI) and machine learning (ML) in enhancing customer experiences through personalization and predictive analytics.

Despite the advancements in CX research, there remain several gaps in the literature, particularly regarding the long-term effects of immersive technologies on customer loyalty and brand perception. While much of the existing research focuses on the immediate impacts of technologies like VR and AR, there is a need for more longitudinal studies to assess their enduring effects on consumer behavior. Furthermore, research exploring the ethical implications of immersive technologies, including privacy concerns and the digital divide, is still limited but increasingly relevant in the current technological landscape [7].

The literature on customer experience continues to evolve as new technologies reshape the ways in which consumers interact with brands. The integration of VR, AR, and the metaverse into the retail sector has opened up new avenues for enhancing customer engagement, satisfaction, and loyalty. However, further research is needed to explore the long-term implications of these technologies and address the emerging ethical challenges associated with their adoption. Bibliometric tools such as CiteSpace offer valuable insights into the trends and future directions of CX research, providing a roadmap for scholars and practitioners alike in navigating this dynamic and rapidly evolving field.

3. METHODOLOGY

This study adopted a bibliometric approach to map and synthesize the intellectual structure of research on customer experience in immersive digital environments. Bibliometric analysis is particularly suitable for identifying publication trends, thematic evolution, influential topics, and knowledge structures within a research field. To ensure broad disciplinary coverage and data reliability, bibliographic records were collected from Scopus and Web of Science (WoS), two widely recognized international academic databases [14]. Scopus was selected because of its strong interdisciplinary coverage and reliability in bibliometric research, while Web of Science was included to enhance dataset comprehensiveness and reduce the limitations associated with relying on a single database.

3.1. Data collection

The search was conducted in titles, abstracts, and keywords of publications in Scopus and in the Topic field of Web of Science. The following search strings were used:

Scopus search query TITLE-ABS-KEY (("customer experience*" OR "consumer experience*" OR "shopping experience*" OR experience* OR "immersive experience*" OR immersi*) AND ("virtual reality" OR VR OR "augmented reality" OR AR OR "mixed reality" OR "mobile augmented reality applications" OR "extended reality" OR XR OR "virtual try-

on" OR "virtual fitting room*" OR "smart mirror*" OR avatar* OR metaverse) AND (retail* OR shopping OR e-commerce OR ecommerce OR store*)).

Web of Science search query TOPIC (("customer experience*" OR "consumer experience*" OR "shopping experience*" OR experience* OR "immersive experience*" OR immersi*) AND ("virtual reality" OR VR OR "augmented reality" OR AR OR "mixed reality" OR "mobile augmented reality applications" OR "extended reality" OR XR OR "virtual try-on" OR "virtual fitting room*" OR "smart mirror*" OR avatar* OR metaverse) AND (retail* OR shopping OR e-commerce OR ecommerce OR store*))

The Scopus and Web of Science data were retrieved on 18 March 2026. Because 2026 is still in progress, publication data for that year should be interpreted as partial, reflecting only records indexed up to the retrieval date.

3.2. Screening

A multi-stage screening procedure was applied to refine the dataset. In Scopus, the initial search returned 3,004 records. After limiting the document type to articles and review articles, the dataset was reduced to 1,243 records. Restricting the results to English-language publications yielded 1,214 records. A further subject-area filter was then applied to retain studies relevant to social sciences, education, business, and decision sciences, resulting in 649 records. Finally, the publication period was limited to 2016–2026, producing a final Scopus dataset of 592 records. In Web of Science, the initial search yielded 1,273 records. After restricting the results to articles and review articles, 1,267 records remained. Limiting the results to English-language publications further reduced the dataset to 1,257 records. The dataset was then filtered by publication years 2016–2026, resulting in 997 records. Finally, a subject-category filter was applied to retain studies in business and management-related fields, yielding a final Web of Science dataset of 430 records. Subsequent to merging the datasets from both databases, duplicate records were removed using data cleaning tools, resulting in a final, unduplicated dataset of 931 publications. Drawing on bibliographic data collected from the Web of Science and Scopus databases, the study analyzes these 931 publications published between 2016 and 2026.

3.3. Inclusion and exclusion criteria

The inclusion and exclusion criteria are summarized in Table 1. Only academic articles and reviews were considered. The search was restricted to English-language publications. A temporal filter was applied, limiting the dataset to papers published between 2016 and 2026, ensuring that the analysis captured the most recent trends in the field. Studies that were not directly related to the topic of customer experience, such as those focusing on unrelated areas of technology or general business practices, were excluded. Additionally, non-peer-reviewed materials such as conference proceedings and retracted articles were removed from the dataset.

Table 1. Database search inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Database	Scopus; Web of Science	Other databases
Search fields	TITLE-ABS-KEY (Scopus); TOPIC (WoS)	Full-text-only searches
Language	English	Non-English publications
Document type	Articles; Review articles	Conference papers, book chapters, editorials, notes, letters, etc.
Subject areas/categories	Scopus: social sciences, education, business, decision sciences; WoS: business and management-related fields	Unrelated disciplines
Time period	2016–2026	Publications outside 2016–2026

(Source: proposed by the author)

3.4. Data merging and cleaning

After screening, records from Scopus and Web of Science were exported and combined into a unified bibliographic dataset. Because the two databases contain overlapping publications and use different metadata formats, the merged records were processed using BiblioMerge to support metadata harmonization, duplicate detection, and data cleaning. This step was necessary to improve consistency across author names, keywords, source titles, and bibliographic fields before conducting network and cluster analyses. The cleaned dataset was subsequently used for bibliometric visualization and interpretation.



Figure 1. Link to BiblioMerge [8]

Prior to analysis, the raw bibliometric data were processed and cleaned using BiblioMerge, which helped merge data from both databases into a unified dataset (Figure 1). The tool performed essential tasks, including the elimination of duplicate records, ensuring that the analysis was based on unique publications. BiblioMerge also standardized the metadata, such as author names, titles, and journal information, ensuring consistency across different datasets. This step was critical in maintaining the integrity of the analysis and ensuring the reliability of the results.

3.5. Data analysis tools

Three tools were employed in the analysis. First, BiblioMerge was used to merge records from multiple databases, remove duplicate entries, and standardize bibliographic metadata. Second, VOSviewer was applied to visualize keyword co-occurrence networks, country collaboration patterns, and related bibliometric structures. Third, CiteSpace was used to identify thematic evolution, research hotspots, and citation bursts, thereby enabling a deeper understanding of the developmental trajectory of the field.

The visualized results generated by CiteSpace, including clustered networks and evolution timelines, improve the interpretability of bibliometric data. This enhanced visualization makes correlations, evolutions, and research structures more intuitive and easily comprehensible. By employing CiteSpace, this study identifies key publication trends, collaboration patterns, and research hotspots in customer experience research related to immersive technologies. The in-depth analysis undertaken will enrich our understanding of customer experience as a research domain, offering valuable insights to shape the course of future research [14, 15]. The operational details of this analysis, including data import, co-citation, and visualization steps, are outlined in Figure 2 to demonstrate the analytical process and its results.

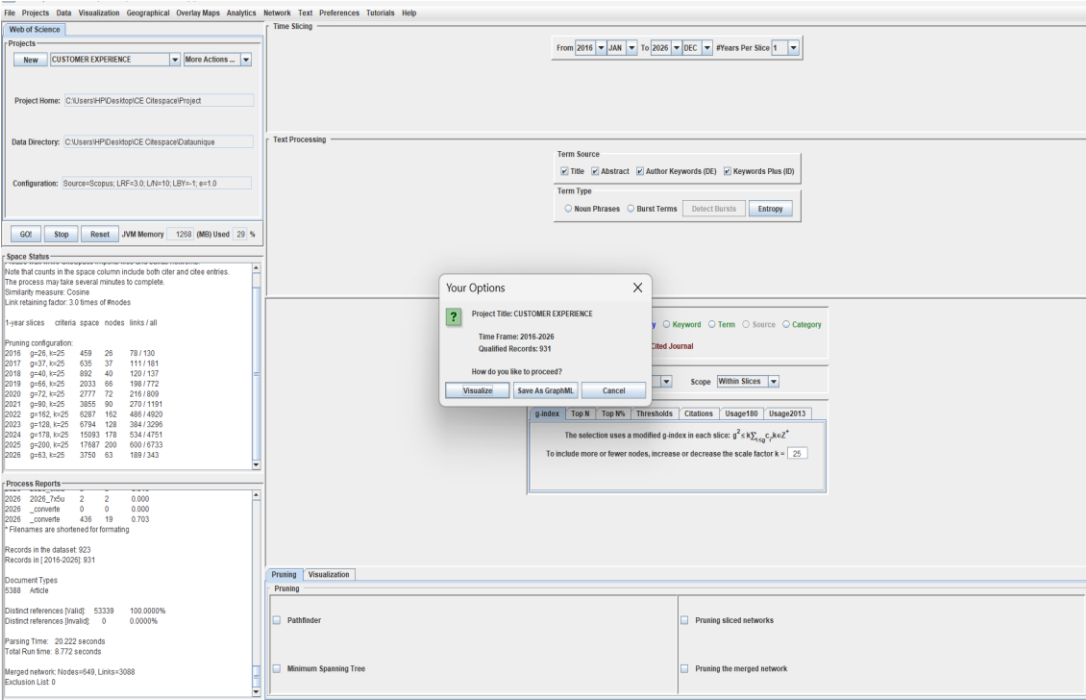


Figure 2. The customer experience research in CiteSpace
(Source: compiled by the author)

4. DATA ANALYSIS

Publication statistics are valuable for understanding the current status and trends within a specific research area. By analyzing these statistics, researchers can identify which topics and journals are favored by scholars, highlighting emerging areas of interest.

Analysis of publication trends

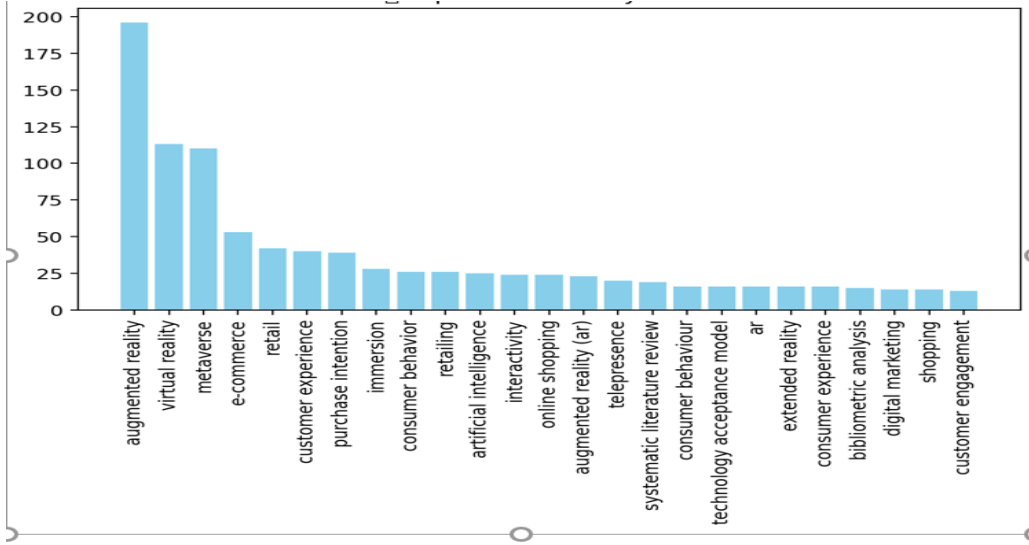


Figure 3. Keyword occurrence frequency from 2016 to 2026
(Source: compiled by the author)

The keyword frequency distribution illustrated in Figure 3 provides insight into the conceptual prominence and thematic priorities within the research domain. Notably, augmented reality and virtual reality emerge as the most dominant terms, indicating their central role as foundational technologies underpinning the field. The relatively high frequency of metaverse further suggests a growing scholarly interest in integrated immersive ecosystems that extend beyond isolated applications.

In addition, terms such as e-commerce, retail, and customer experience highlight the strong orientation toward commercial and service-related contexts, reflecting the application-driven nature of literature. The presence of purchase intention, consumer behavior, and consumer engagement underscores the emphasis on behavioral outcomes and experiential value. Meanwhile, keywords such as artificial intelligence, interactivity, and telepresence indicate the technological enablers that enhance immersion and user interaction.

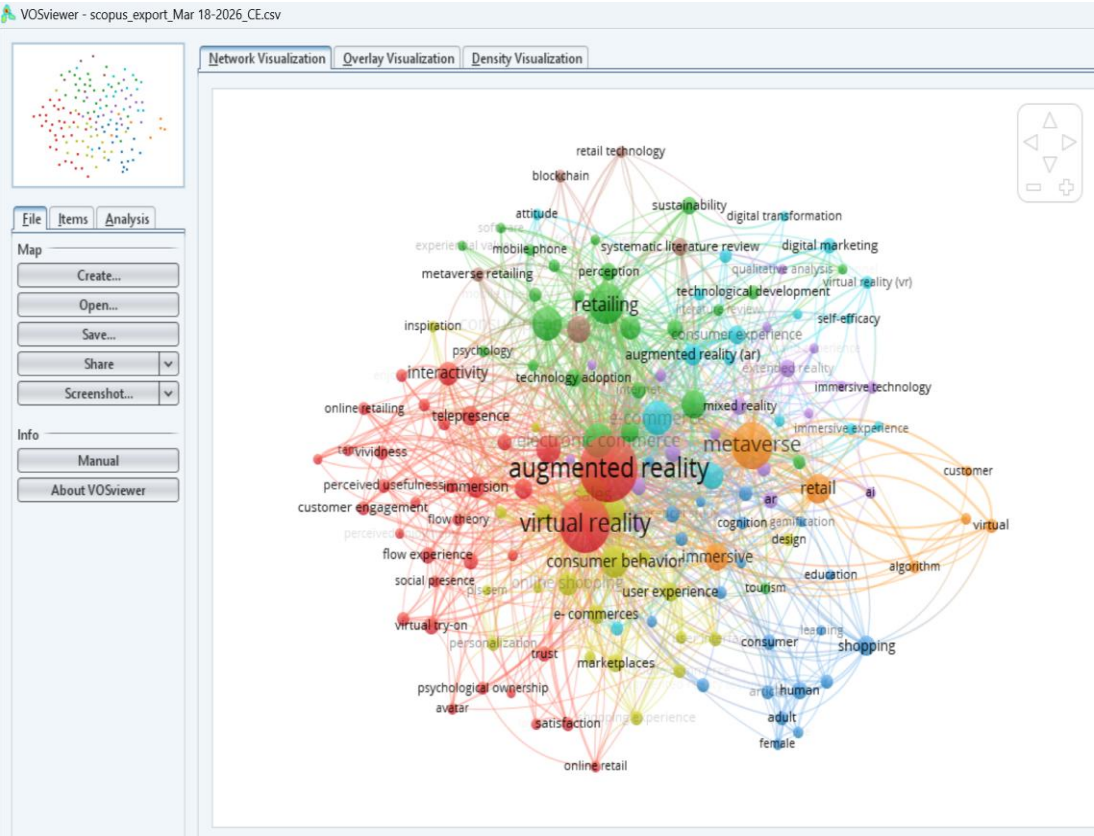


Figure 4. Network visualization of research trends in VOSviewer

(Source: compiled by the author)

The rapid advancement of immersive technologies, such as augmented reality (AR) and virtual reality (VR), has significantly transformed the landscape of customer experience and retail environments. This study explores the emerging trends in consumer behavior, digital marketing, and the integration of innovative technologies within the retail sector in Figure 4. *First, the cluster highlights augmented and virtual reality immersive technologies.* The first cluster (red) is centered around augmented reality (AR) and virtual reality (VR), which have become key components of the digital transformation in retail and customer experience. Terms like consumer behavior, consumer engagement, immersive technology, and user experience dominate this cluster. This indicates a strong focus on how AR and VR are enhancing consumer interactions by providing immersive and interactive experiences. These

technologies are seen as tools that can significantly transform traditional retail settings by creating new, engaging experiences for customers, whether through virtual stores, interactive product displays, or personalized shopping experiences. Keywords such as perceived usefulness and immersion further suggest the importance of creating experiences that resonate emotionally with consumers, influencing their buying decisions. *Second, retailing and digital marketing constitute another major cluster.* The second cluster (green) revolves around retailing, particularly digital marketing and the role of technology in modern commerce. Keywords like retail technology, metaverse retailing, technology adoption, and consumer experience highlight the shift towards digital and virtual environments where businesses are leveraging new technologies to enhance the shopping journey. This cluster underscores the rising importance of the metaverse and other immersive digital spaces, where brands are engaging customers in new ways. Additionally, perception and attitude suggest that customer responses to these technological shifts are a major research focus. *Third, technological advancements and consumer-related consequences form a distinct group.* The third cluster (blue) is dedicated to advanced technological concepts that are shaping consumer behavior, including blockchain, artificial intelligence, and algorithms. These keywords point to the integration of emerging technologies in retail, particularly in terms of data analysis and personalized services. As businesses seek to understand and predict consumer behavior more accurately, these technologies provide insights into optimizing the customer journey and enhancing product recommendations, payment solutions, and supply chain management. *Fourth, the cluster underscores the psychological and social aspects of customer experience.* The fourth cluster (orange) highlights the psychological and social factors influencing consumer behavior, focusing on concepts like personalization, social presence, and trust. Keywords such as customer satisfaction and consumer trust reflect the emotional and cognitive aspects that play a crucial role in consumer decisions. This cluster suggests that while technology drives the interaction, emotional and psychological factors continue to significantly influence consumer choices, particularly in virtual and immersive retail experiences. Understanding these dynamics is critical for creating meaningful and engaging digital shopping environments. The clusters emphasize the growing integration of advanced technologies like AR, VR, and AI in retail, while also considering the psychological, social, and technological factors that affect consumer behavior.

Figure 5 presents a CiteSpace visualization of keyword trends and their interrelationships from 2016 to 2026. The chart reveals a growing focus on emerging topics such as immersive technologies, consumer engagement, and metaverse retailing, with peaks occurring around 2020-2024. The keywords virtual stores and shopping experience appear prominently, indicating that these themes have gained traction as consumer behaviors evolve in response to digital transformation and immersive environments. Consumer behavior, head-mounted displays, and sales highlight the intersection of technology and retail, where researchers focus on how virtual and augmented reality are influencing consumer experiences. The survey and quantitative literature review terms suggest an increase in empirical research and studies examining these evolving consumer interactions. The rise of terms like digital assistants and location-based mobile apps indicates the increasing role of personalized technologies in shaping customer engagement. The diagram's clustering and keyword flows emphasize the shift towards integrating immersive digital tools with retail strategies, offering a more engaging shopping experience.

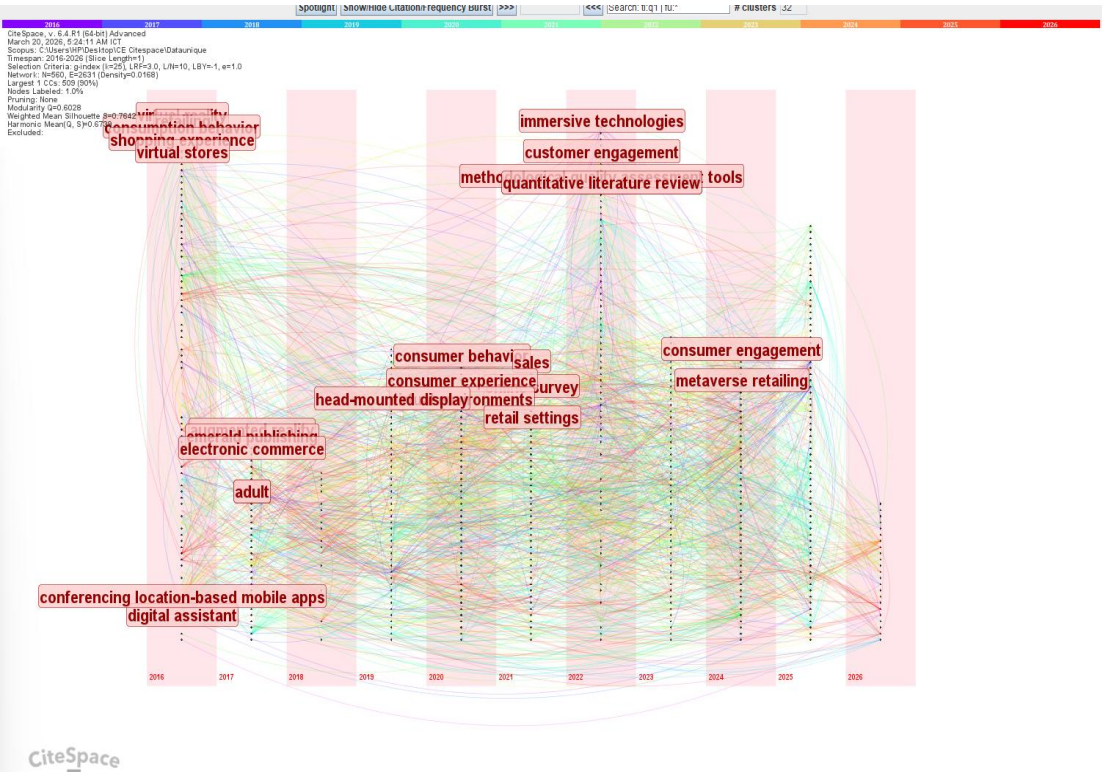


Figure 5. Keyword trends in immersive technologies (2016-2026)
(Source: compiled by the author)

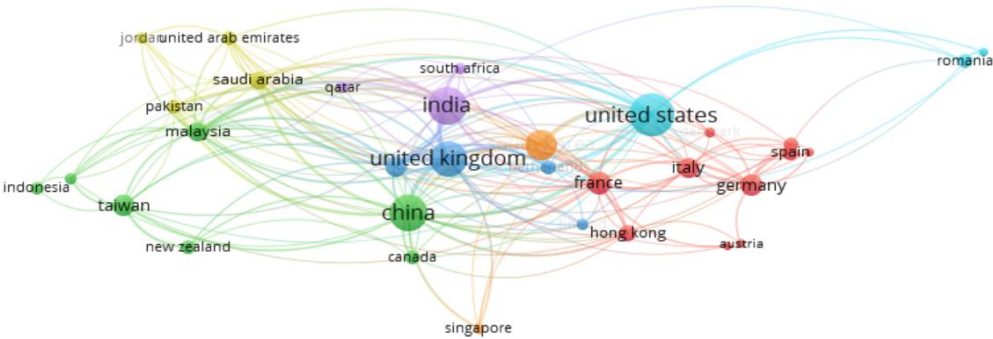


Figure 6. Distribution of publications by country
(Source: compiled by the author)

The VOSviewer-based country co-authorship network (Figure 6) reveals the global structure of scientific collaboration within the field, highlighting both the central actors and the clustering patterns of international research partnerships. The visualization indicates that the United States, the United Kingdom, China, and India occupy prominent and highly connected positions, suggesting their roles as key hubs in the global knowledge production system. Their large node sizes and dense linkages reflect both high publication output and strong collaborative intensity.

The network is further organized into distinct clusters representing regional and thematic collaboration patterns. For instance, European countries such as Germany, Italy, Spain, and France form a closely connected cluster, indicating strong intra-regional cooperation.

Similarly, Asian countries, including China, India, Malaysia, and Pakistan, exhibit cohesive collaboration networks, reflecting growing research capacity and regional integration. The presence of countries such as Saudi Arabia and the United Arab Emirates suggests increasing participation from emerging research economies.

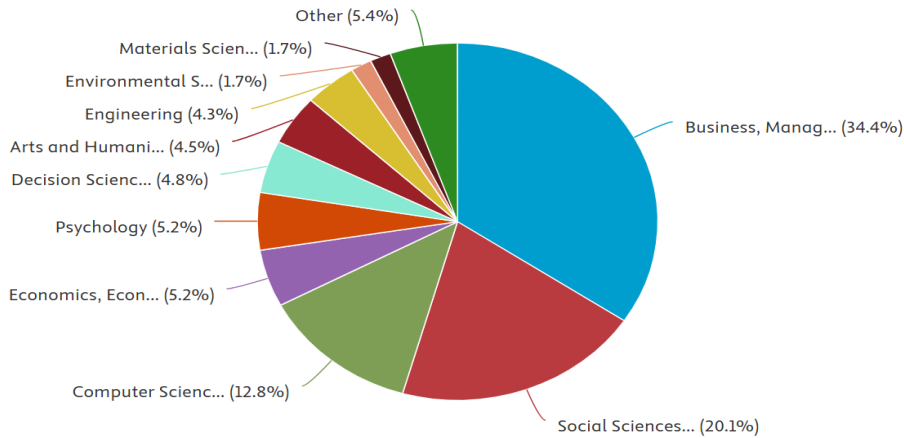


Figure 7. Distribution of customer experience by field

(Source: compiled by the author)

The pie chart in Figure 7 shows the distribution of academic research across various fields, highlighting the largest contributions. Business and Management leads with 34.4%, followed by Social Sciences with 20.1%, and Computer Science with 12.8%. Other fields like Psychology and Economics each contribute 5.2%, while smaller fields like Engineering and Environmental Sciences have 4.3% and 1.7%, respectively. The "Other" category makes up 5.4%. This distribution demonstrates the prominence of business and social sciences in research publications, while other areas like engineering and materials science contribute less.

Figure 8 presents a CiteSpace visualization that highlights the evolving trends in customer experience research, with a focus on the integration of advanced technologies such as virtual reality (VR), augmented reality (AR), and the metaverse. The clusters in the visualization reflect the increasing importance of these technologies in shaping customer interactions. The red cluster emphasizes VR and AR, illustrating their significant role in enhancing customer engagement by offering immersive and interactive experiences. The blue cluster, which includes terms like mobile apps and omni-channel, shows the importance of providing seamless, multichannel experiences across various platforms. Additionally, the purple cluster features the metaverse, suggesting a growing interest in virtual spaces and their potential to revolutionize consumer experiences. Another noteworthy trend is the emphasis on user satisfaction and experience products, which highlights the ongoing focus on measuring and improving customer satisfaction in the digital age. The increasing presence of terms like "virtual try-on" signals a shift toward allowing customers to interact with products virtually, enhancing their purchase decision-making process. The timeline at the top indicates that these trends have been gaining momentum since 2017, emphasizing the growing role of immersive technologies and multichannel strategies in reshaping the customer experience landscape.

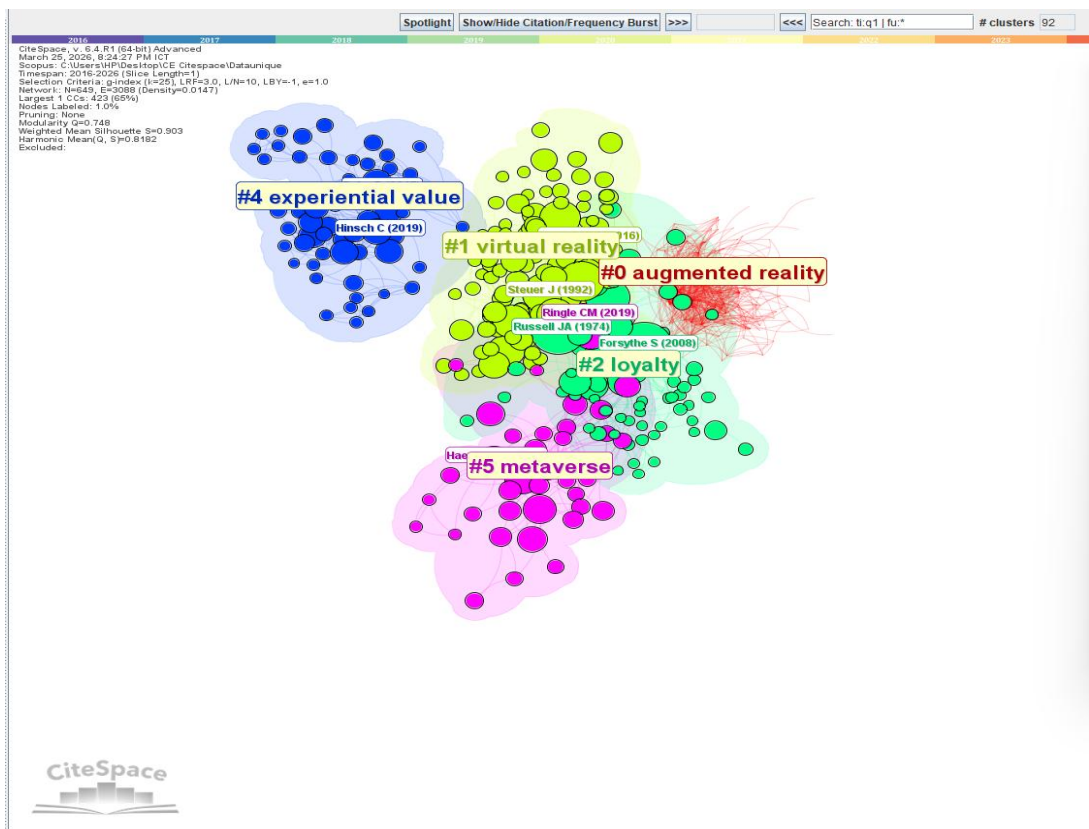


Figure 8. Impact of immersive technologies in Citespace
(Source: compiled by the author)



Figure 9. Top 15 keywords with the strongest citation bursts in CiteSpace
(Source: compiled by the author)

Figure 9 provides an analysis of the top keywords with the strongest citation bursts from 2016 to 2026, highlighting the evolving trends in customer experience research. Keywords like virtual reality and retailing emerged as significant topics early on, with virtual reality

showing a peak citation burst in 2018, reflecting the rapid advancements in immersive technologies. Other terms such as practical implications and perception also gained traction between 2017 and 2020, emphasizing the increasing focus on how digital technologies impact consumer behavior and business strategies. The COVID-19 pandemic appears as a major citation-burst theme beginning in 2021, reflecting the broader shift in consumer behavior and business operations during the pandemic period. Additionally, newer terms like real world and recent years emerging in 2023 suggest a reflective turn in research, focusing on current trends and past studies. E-commerce studies are expected to see an increase in citations in 2024, signaling a growing interest in online shopping and academic reviews. This trend highlights how customer experience research continues to evolve, particularly with the rise of immersive technologies, the lasting impact of the pandemic, and the digital shift in commerce.

5. DISCUSSION

The bibliometric findings reveal that the intellectual structure of this research domain is organized around three closely interrelated thematic areas: VR/AR application contexts, consumer behavior and technological advancement accompanied by implementation challenges. This thematic configuration suggests that the field has evolved into a multidisciplinary research area in which technological development is increasingly examined alongside its practical and behavioral implications.

First, the co-occurrence of keywords such as *fashion*, *retail*, *healthcare*, *virtual try-on*, and *immersive shopping* indicates that existing literature has been predominantly application-driven. In this regard, researchers have devoted considerable attention to investigating how VR and AR technologies are implemented across diverse service environments and consumption contexts [16,17, 18]. The prominence of these terms reflects not only the breadth of immersive technology applications but also the growing academic interest in their capacity to transform conventional consumer interactions into more dynamic, interactive, and personalized experiences.

Second, the high visibility of keywords related to *purchase intention*, *satisfaction*, *trust*, *decision-making*, and *sensory marketing* demonstrates that consumer-centered outcomes represent a central research hotspot within the field [11, 19, 20]. This pattern suggests that literature has evolved beyond primary concern with technological feasibility toward a broader examination of psychological, emotional, and behavioral outcomes. In particular, the growing emphasis on consumer response suggests that VR and AR are increasingly being conceptualized not merely as technological tools, but as strategic mechanisms capable of shaping perceptions, enhancing engagement, and influencing consumption behavior.

Third, the frequent occurrence of terms such as *privacy*, *user-centered design*, *interface*, and *technological limitations* underscores the substantial scholarly attention devoted to the barriers constraining the broader adoption and scalability of immersive systems [10, 12, 21]. These challenges highlight that, despite the considerable promise of VR and AR technologies, their effective implementation remains contingent upon addressing critical technical, ethical, and usability-related concerns. Accordingly, the literature reflects a parallel line of inquiry focused not only on the opportunities created by immersive technologies but also on the structural and managerial conditions required for their successful integration into real-world settings.

These findings suggest that the field has developed along two main perspectives: one oriented toward the expansion of immersive applications across industries, and the other concerned with the technological and organizational challenges that shape implementation outcomes. From a bibliometric perspective, this dual structure is indicative of a gradually maturing body of knowledge in which technological innovation, user experience, and applied relevance are becoming increasingly interconnected. In light of this development, future

research should place greater emphasis on strengthening cross-cluster integration, particularly by examining how advancements in immersive system design and functionality influence consumer perceptions and behavioral outcomes across varied application domains.

6. THEORETICAL AND PRACTICAL IMPLICATIONS

6.1. Theoretical implications

This study contributes to the literature by clarifying the intellectual structure of customer experience research in immersive digital environments. Through bibliometric mapping, the findings demonstrate that the field has evolved from a fragmented body of work into a more coherent and interdisciplinary domain that integrates marketing, consumer behavior, retail technology, and digital innovation. More specifically, the results identify three dominant knowledge clusters: immersive technology applications, consumer-centered experiential outcomes, and implementation-related challenges. This categorization helps refine the conceptual boundaries of the field and provides a structured understanding of how VR, AR, virtual try-on, and metaverse-related technologies are positioned within customer experience scholarship.

In addition, the study extends existing theoretical discussions by showing that immersive technologies are no longer treated solely as functional tools for product visualization, but increasingly as mechanisms that shape perception, trust, emotional engagement, and purchase-related behavior. The bibliometric evidence also suggests that customer experience research is moving toward a more integrated perspective in which technological affordances, psychological responses, and contextual application settings are examined together. In this sense, the study offers a knowledge map that may support theory development in digital customer experience, immersive retailing, and technology-enabled consumer interaction.

6.2. Practical implications

The findings also provide several practical implications for managers, retailers, and digital platform developers. First, the prominence of keywords such as virtual reality, augmented reality, and customer engagement indicates that immersive technologies have become strategically important for enhancing customer interaction in digital commerce. Firms can use these technologies to reduce uncertainty, enrich product evaluation, and create more personalized and interactive shopping experiences.

Second, the strong association between immersive technologies and consumer outcomes such as trust, satisfaction, and purchase intention suggests that businesses should not view VR and AR merely as technological novelties. Instead, these tools should be integrated into broader customer experience strategies aimed at improving emotional connection, decision confidence, and brand engagement. In particular, virtual try-on solutions may be especially valuable in sectors such as fashion, cosmetics, furniture, and lifestyle retail, where visual fit and experiential evaluation strongly influence purchase decisions.

Third, the identification of barriers related to privacy, usability, and technological limitations highlights the importance of user-centered design and responsible implementation. Managers should therefore invest not only in innovation adoption but also in interface simplicity, data protection, and seamless omnichannel integration. These factors are essential for ensuring customer acceptance and maximizing the practical value of immersive technologies in real-world retail settings.

7. LIMITATIONS AND FUTURE RESEARCH

7.1. Research limitations

Despite its contributions, this study has several limitations. First, the bibliometric dataset was restricted to publications indexed in Web of Science and Scopus and limited to English-language journal articles and reviews. As a result, relevant studies published in alternative databases, other languages, or different document types might have been omitted. Second, bibliometric analysis primarily reveals patterns of publication, citation, and thematic association; it does not provide a deep interpretive assessment of research content comparable to a full systematic literature review. Third, the study focuses on publication trends within the period from 2016 to 2026, which may not fully reflect earlier conceptual foundations of customer experience or later developments beyond the search date. Finally, the interpretation of clusters and keyword relationships depends on the quality of metadata and the parameter settings used in CiteSpace and VOSviewer, which may influence the visualization results.

7.2. Future research

Future research should extend this work in several directions. First, scholars may combine bibliometric analysis with systematic literature reviews or meta-analytic approaches to provide deeper theoretical interpretation and stronger empirical generalization. Second, more attention should be given to longitudinal studies examining the long-term impact of immersive technologies on customer loyalty, brand attachment, and post-purchase behavior. Third, future studies should explore underexamined issues such as privacy concerns, digital fatigue, inclusiveness, accessibility, and the ethical implications of immersive customer experience systems.

In addition, comparative research across industries and cultural contexts would help clarify whether the effects of AR and VR differ according to product category, market maturity, or consumer characteristics. Future investigations may also examine the growing convergence between immersive technologies and other emerging tools, such as artificial intelligence, blockchain, and digital assistants, in shaping next-generation customer journeys. Finally, there is a need for more theory-driven research that connects technological design features with psychological mechanisms and measurable business outcomes, thereby strengthening the cross-cluster integration identified in this bibliometric analysis.

8. CONCLUSION

This study offers a bibliometric overview of customer experience research in the context of immersive technologies, highlighting its rapid growth and evolving intellectual structure. The findings identify three dominant research streams: VR/AR application contexts, consumer behavior and experiential outcomes, and technological and implementation challenges. The results suggest that the field has transitioned from technology-focused exploration to a more integrated perspective that combines technological innovation with consumer-centric insights. Moreover, the global collaboration network and interdisciplinary nature of the research indicate a maturing domain with increasing academic and practical relevance. This study provides a structured understanding of current research trends and lays a foundation for future investigations into how immersive technologies continue to reshape customer experience in digital environments.

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