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## **From Technology to Experience: Evolution of Augmented Reality in Consumer Behaviour – A Bibliometric and Topic Modelling Review**

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### **ABSTRACT**

The implementation of Augmented Reality (AR) technology in digital retail brings about new interactive experiences that allow customers to engage with products through virtual displays. Despite the increasing academic interest, research on how consumers behave with AR technology remains fragmented as scholars have yet to connect its fundamental framework with their research progress. This review fills the gap by performing a systematic literature review based on the SPAR-4-SLR protocol, while also using bibliometric analysis and Latent Dirichlet Allocation (LDA) topic modelling to fulfil the research objectives. It analysed 116 Scopus-indexed articles that were published between 2014 and 2025. The results show five main research domains which focus on technology-enabled customer experience, AR-based purchasing behaviour, brand interaction, value creation through virtual environments and user experience design. The bibliometric analysis reveals top academic journals, key researchers and research networks, whereas developed nations account for most research outputs and international collaborations are on the rise. The results indicate that the focus of research has deviated from technological adoption studies to experiential and behavioural research. The current study offers a holistic, structured synthesis of AR-related consumer behaviour studies that can benefit academic research and business applications in digital retail environments.

**KEYWORDS:** Augmented Reality, Consumer Behaviour, Digital Retail, Immersive Technologies, Topic Modelling

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## **1. Introduction**

Researchers continue to examine how Augmented Reality (AR) affects customer behaviour in digital retail environments as they have not yet developed complete academic knowledge of this effect (Verma et al., 2026; Pandey & Pandey, 2025). Existing studies have primarily focused on AR as a disruptive technology, which are presented from various perspectives (Kumar, 2021), thus creating deviations on understanding how AR affects consumer decision making and their overall experience.

AR has been established as a technological medium that functions as an interactive experience tool (Azuma, 1997; Rauschnabel et al., 2022; Verhulst et al., 2021). Users experience interactive virtual elements which developers create through the technology that enables users to view virtual content in their actual surroundings using smartphones, tablets and smart glasses (Gan et al., 2022; Hammady et al., 2021). Digital retail environments have transformed online shopping through the development of smart devices and immersive technologies, which provide customers with better shopping experiences and support their product research activities (Jiang et al., 2021; Kumar et al., 2024; Saeed et al., 2024). Due to such interactive environments, the e-commerce industry has experienced rapid growth, which has enhanced the process of technology adoption across multiple sectors, resulting in changes to the ways customers discover and interact with products and brands (Kim et al., 2020).

The use of AR and virtual reality (VR) technologies has become a standard practice in marketing and retail operations to improve customer value and drive customer engagement (Javornik 2018). Applications such as virtual mirrors and “try-before-you-buy” interfaces simulate in-store experiences, allowing consumers to interact with products virtually and reducing the intrinsic limitations of online retail (Hilken et al., 2017; Peukert et al., 2019; Suh & Chang, 2006). Prior research also demonstrates that AR applications stimulate cognitive, emotional, behavioural, sensory and social responses across multiple touchpoints and shape the overall consumer experience (Javornik, 2016; Flavián et al., 2019; Yrjölä et al., 2018; Riar et al., 2022). Additionally, AR enables the transformation of two-dimensional information into three-dimensional contexts (Liu, 2026), enabling intuitive information processing and enhancing consumer decision-making (Hilken et al., 2018). Consequently, retailers are also progressively adopting AR to create interactive service environments and strengthen consumer–brand relationships (Hilken et al., 2017).

These developments are situated within a broader shift toward digitally mediated consumption, where advancements in information technology (IT) and communication technologies have primarily transformed consumer behaviour and marketing practices (Gaile-Sarkane, 2009; Jun et al., 2010; Singh et al., 2024). A crucial feature of AR lies in its ability to seamlessly integrate digital content into the physical environment, thereby creating contextually rich and interactive experiences (Von Der Au et al., 2023; Pfaff & Spann, 2023). Furthermore, the merging of AR with the metaverse is expected to further reshape consumer interactions and redefine digital engagement strategies (Dwivedi et al., 2022). Developments in digital and social media marketing also highlight new opportunities and challenges that are related to the adoption of AR (Dwivedi et al., 2021), while prior studies highlight the role of consumer inspiration in enhancing brand attitudes through immersive applications (Flavián et al., 2018).

Advancing on this idea, a growing body of literature has examined how consumers adopt, engage with and respond to immersive technologies across various contexts (Choi & Taylor, 2014; Li et al., 2002; Dwivedi et al., 2021). Thus, existing research can be broadly categorised into studies focusing on technology adoption, experiential value creation and

behavioural outcomes such as purchase intention. For example, Ambika et al. (2023) conducted a two-decade systematic review of immersive technologies by using the TCM-ADO framework, although their analysis was not specifically focused on AR-driven consumer behaviour. Kumar et al. (2023) applied means-end chain (MEC) theory to explain the exclusivity of AR in product presentation, while Paul et al. (2024) explored digital transformation through a multidisciplinary perspective covering technologies such as AI, AR, VR and the metaverse. Similarly, Wu et al. (2025) integrated construal level theory (CLT) and elaboration likelihood model (ELM) to examine how immersive technologies influence consumer attitudes and purchase intentions. Other studies (Dong et al., 2025; Mkedder et al., 2024; Chen et al., 2024) have used quantitative approaches to analyse the effects of AR on consumer perceptions and purchasing behaviour.

Despite these contributions, the existing literature remains fragmented with limited integration of bibliometric techniques and advanced analytical approaches to scientifically map the intellectual structure and thematic evolution of AR-driven consumer behaviour research. Prior reviews, such as (Lavoye et al., 2021; Zarantonello & Schmitt, 2022), have largely depended on traditional methodologies, individual industries and have not fully explored the latent thematic patterns underlying the field (Ambika et al., 2023). This limits a comprehensive understanding of how research on AR and consumer behaviour has evolved and where future research opportunities lie. To address these gaps, this study aims to systematically examine the intellectual structure, collaboration patterns and thematic evolution of AR-driven consumer behaviour research. Specifically, the study aims to identify influential research contributions, analyse collaboration networks among authors and countries, find dominant and emerging themes and then propose future research directions within the domain. The following are the key questions addressed in this study:

**RQ1:** Who and what constitute the most influential intellectual contributions shaping AR-driven consumer behaviour research?

**RQ2:** How are the collaboration patterns among researchers and institutions in this field?

**RQ3:** What are the dominant and emerging themes that support AR- driven consumer behaviour research?

The remainder of this article is organised as follows. Section 2 presents the materials and methods that are adopted for the review, which include the collection of data, screening procedures, bibliometric and topic modelling analyses. Section 3 presents the results of the bibliometric and thematic analyses. Section 4 discusses the findings and their implications, and Section 5 concludes by summarising its central findings and contributions. Section 6 outlines the theoretical and managerial implications, while Section 7 highlights potential directions for future research. Finally, Section 8 discusses the limitations of the study.

## **2. Materials and Methods**

This study adopts a systematic literature review approach by integrating bibliometric analysis and topic modelling to examine AR-driven consumer behaviour. The review follows the SPAR-4-SLR protocol, which provides a structured framework to ensure transparency and accuracy in the review process (Paul et al., 2021; Lim et al., 2021). Bibliometric analysis is often used to map the intellectual structure of the field, while Latent Dirichlet Allocation (LDA) is used to extract latent thematic patterns from textual data by representing each document as a mixture of topics (Blei et al., 2003; Madzik & Falát, 2022; Zimmermann et al., 2024; Y. Chen et al., 2025).

To ensure data quality and coverage, the Scopus database was selected due to its widespread indexing of high-impact journals and strong representation in the social sciences (Hallinger, 2018; Guo et al., 2022; Luo et al., 2023; Yadav et al., 2026). The first search was conducted on 31st October 2025 with the query “Augmented Real\*” AND “online shopping” OR “shop\*” OR “purchase behaviour” OR “purchase decision” which restricted search results to titles, abstracts and author keywords. The initial search produced 741 documents, which researchers applied their established inclusion and exclusion criteria (for selection see Table 1). The review required articles from journals that had only A\* and A rankings according to the Australian Business Deans Council ABDC 2025 Journal Quality List. The study excluded publications that did not meet these criteria. The research period, established from 2014 until October 2025, provided the authors with a complete understanding of AR technology and its effects on consumer purchasing behaviour.

**Table 1:** Inclusion and Exclusion Criteria of articles

| <b>Filtering Criteria</b>                                                                                                                                | <b>Rejected</b> | <b>Accepted</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|
| Search Criteria                                                                                                                                          |                 | 741             |
| <b>Search engine:</b> Scopus                                                                                                                             |                 |                 |
| <b>Search Year Interval:</b> 2014 to 2025                                                                                                                |                 |                 |
| <b>Search term:</b> (“Augmented Real*”) AND (“online shopping” OR “shop*” OR “purchase behaviour” OR “purchase decision”)                                |                 |                 |
| <b>Subject area:</b> Business, management and accounting                                                                                                 | 267             | 474             |
| <b>Document type:</b> Articles                                                                                                                           | 104             | 370             |
| <b>Publication stage:</b> Final                                                                                                                          | 99              | 341             |
| <b>Source type:</b> Journal                                                                                                                              | 29              | 341             |
| <b>Language screening:</b> English only                                                                                                                  | 2               | 339             |
| <b>Quality screening:</b> Included documents in journals ranked “A*”, “A” in the Australian Business Deans Council (ABDC) 2025 Journal Quality List only | 173             | 166             |
| <b>Manual screening:</b> Documents exclusively on AR and consumer behaviour                                                                              | 50              | <b>116</b>      |

The SPAR-4-SLR protocol structures the systematic review process into three primary stages, viz., assembling (data collection), arranging (data organisation) and assessing (data evaluation) and is further refined into six sub-stages: identification, acquisition, organisation, purification, evaluation and reporting (Paul et al., 2021). To examine the intellectual structure of AR-driven consumer behaviour research, this study adopts a scientific mapping approach (Morris & Van Der Veer Martens, 2008). Three bibliometric techniques are specifically employed: performance analysis, co-authorship and institutional collaboration mapping and thematic analysis using keyword co-occurrence. These analyses were conducted using Biblioshiny by R and VOSviewer to ensure compelling and visually interpretable mapping.

While keyword co-occurrence analysis captures relationships among terms, it may not fully reveal the underlying conceptual structure. Therefore, this study also employs LDA, a probabilistic topic modelling technique that identifies latent themes within textual data (Blei et al., 2003; Madzik & Falát, 2022). A total of 114 article abstracts were analysed using RStudio (version 4.4.3). The analysis involved corpus creation, text preprocessing (including lowercasing, stop-word removal and stemming), document–term matrix construction, topic modelling and visualisation. Sparse terms were removed using a 0.99 sparsity threshold to

reduce noise and improve model interpretability (Bystrov et al., 2023). Hence, two documents were excluded due to inadequate textual content.

The LDA model was set to extract five topics based on coherence and interpretability. Each document was allotted a dominant topic based on the highest posterior probability. Key thematic terms were identified, and topic prevalence was calculated using frequency distributions.

### 3. Results

#### 3.1 Performance Analysis

To address RQ1, the study examines the most influential intellectual contributions in AR-driven consumer behaviour research. The classification of articles (see Table 2) reveals that quantitative studies dominate the field with 61% of the total sample. Conceptual ( $\approx 15\%$ ), qualitative ( $\approx 14\%$ ), and mixed-method studies ( $\approx 10\%$ ) form comparatively smaller proportions. This distribution highlights a strong empirical orientation in the field, with relatively limited importance on the development of theories and qualitative studies.

**Table 2:** Classification of retrieved articles

| Type of document | Frequency  | Proportion (%) |
|------------------|------------|----------------|
| Quantitative     | 71         | 61.2           |
| Conceptual       | 17         | 14.7           |
| Qualitative      | 16         | 13.8           |
| Mixed            | 12         | 10.3           |
| <b>Total</b>     | <b>116</b> | <b>100.0</b>   |

Table 3 indicates that AR-driven consumer behaviour research is primarily concentrated within journals that are focused on marketing and retail. The Journal of Retailing and Consumer Services and the Journal of Business Research emerge as leading journals, collectively contributing a significant share of the literature. The research focus of AR studies concentrates on practical applications, which examine how people interact with technology in online shopping environments.

**Table 3:** Top contributing journals in AR-Consumer Behavioural research

| ABDC rank | Journal Title                                   | Articles Count |
|-----------|-------------------------------------------------|----------------|
| A         | Journal of Retailing and Consumer Services      | 41             |
| A         | Journal of Business Research                    | 19             |
| A         | International Journal of Consumer Studies       | 5              |
| A         | International Journal of Information Management | 4              |
| A         | Technological Forecasting and Social Change     | 4              |
| A         | Asia Pacific Journal of Marketing and Logistics | 4              |
| A         | Journal of Services Marketing                   | 4              |
| A         | Australasian Marketing Journal                  | 2              |
| A         | Current Issues in Tourism                       | 3              |
| A*        | European Journal of Marketing                   | 2              |

Table 4 presents the most influential articles based on citation metrics. The research work of Dwivedi et al. (2022) and Flavián et al. (2018) serves as evidence for the increasing academic research about immersive technologies and their effects on consumer behaviour and user experience. The studies serve as basic research foundations that guide future studies in the field.

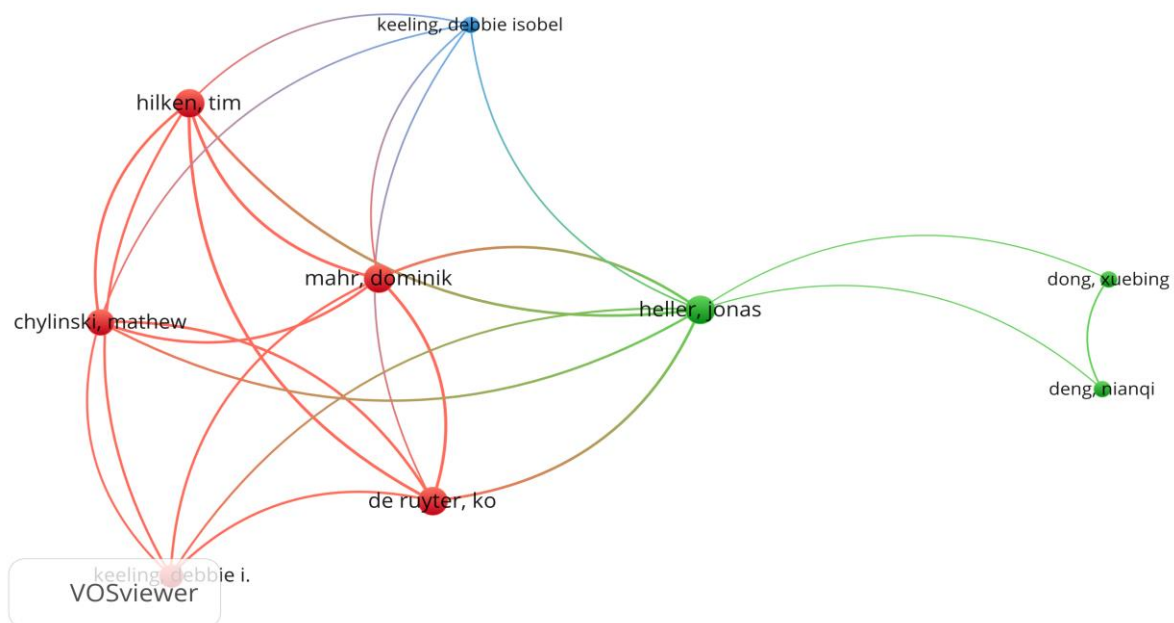
**Table 4:** Top ten cited articles on AR and consumer behaviour

| Authors                   | DOI                                                                                                             | Total Citations | TC per year | TC Normalized |
|---------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------|
| Dwivedi et al. (2022)     | <a href="https://doi.org/10.1016/j.ijinfomgt.2022.102542">https://doi.org/10.1016/j.ijinfomgt.2022.102542</a>   | 1320            | 330.00      | 12.10         |
| Dwivedi et al. (2021)     | <a href="https://doi.org/10.1016/j.ijinfomgt.2020.102168">https://doi.org/10.1016/j.ijinfomgt.2020.102168</a>   | 1029            | 205.80      | 8.21          |
| Flavián et al. (2018)     | <a href="https://doi.org/10.1016/j.jbusres.2018.10.050">https://doi.org/10.1016/j.jbusres.2018.10.050</a>       | 827             | 118.14      | 2.52          |
| Rauschnabel et al. (2019) | <a href="https://doi.org/10.1016/j.jretconser.2019.03.004">https://doi.org/10.1016/j.jretconser.2019.03.004</a> | 440             | 62.86       | 1.34          |
| Hilken et al. (2017c)     | <a href="https://doi.org/10.1007/s11747-017-0541-x">https://doi.org/10.1007/s11747-017-0541-x</a>               | 392             | 43.56       | 1.00          |
| Lim et al. (2021)         | <a href="https://doi.org/10.1016/j.jbusres.2021.11.014">https://doi.org/10.1016/j.jbusres.2021.11.014</a>       | 270             | 67.50       | 2.47          |
| Barrera & Shah (2022)     | <a href="https://doi.org/10.1016/j.jbusres.2022.113420">https://doi.org/10.1016/j.jbusres.2022.113420</a>       | 329             | 109.67      | 8.47          |
| Chung et al. (2017)       | <a href="https://doi.org/10.1177/0047287517708255">https://doi.org/10.1177/0047287517708255</a>                 | 269             | 33.63       | 1.03          |
| Scholz & Duffy (2018)     | <a href="https://doi.org/10.1016/j.jretconser.2018.05.004">https://doi.org/10.1016/j.jretconser.2018.05.004</a> | 253             | 31.63       | 0.97          |
| Park & Yoo (2019)         | <a href="https://doi.org/10.1016/j.jretconser.2019.101912">https://doi.org/10.1016/j.jretconser.2019.101912</a> | 231             | 38.50       | 2.03          |

The study of top authors (Table 5) shows that a specific group of researchers has made important and ongoing contributions to their academic discipline. The research work of Rauschnabel, Hilken and Dwivedi has achieved high citation rates together with substantial research output which demonstrates their importance in developing AR-based studies of consumer behaviour.

**Table 5:** Highest contributing authors on AR and consumer behaviour

| Author           | H-Index | G-Index | M-Index | Total Citations | Number of publications | Start Year |
|------------------|---------|---------|---------|-----------------|------------------------|------------|
| Chylinski M      | 6       | 6       | 0.667   | 857             | 6                      | 2017       |
| De Ryuter K      | 6       | 6       | 0.667   | 857             | 6                      | 2017       |
| Hilken T         | 6       | 6       | 0.667   | 857             | 6                      | 2017       |
| Keeling D. I     | 6       | 6       | 0.667   | 857             | 6                      | 2017       |
| Mahr D           | 6       | 6       | 0.667   | 857             | 6                      | 2017       |
| Rauschnabel P. A | 6       | 6       | 0.857   | 2994            | 6                      | 2019       |
| Heller J         | 5       | 6       | 0.833   | 465             | 6                      | 2020       |
| Flavián C        | 4       | 4       | 0.571   | 998             | 4                      | 2019       |
| Ahmad H          | 3       | 3       | 0.750   | 70              | 3                      | 2022       |
| Dwivedi Y. K     | 3       | 3       | 0.600   | 2405            | 3                      | 2021       |



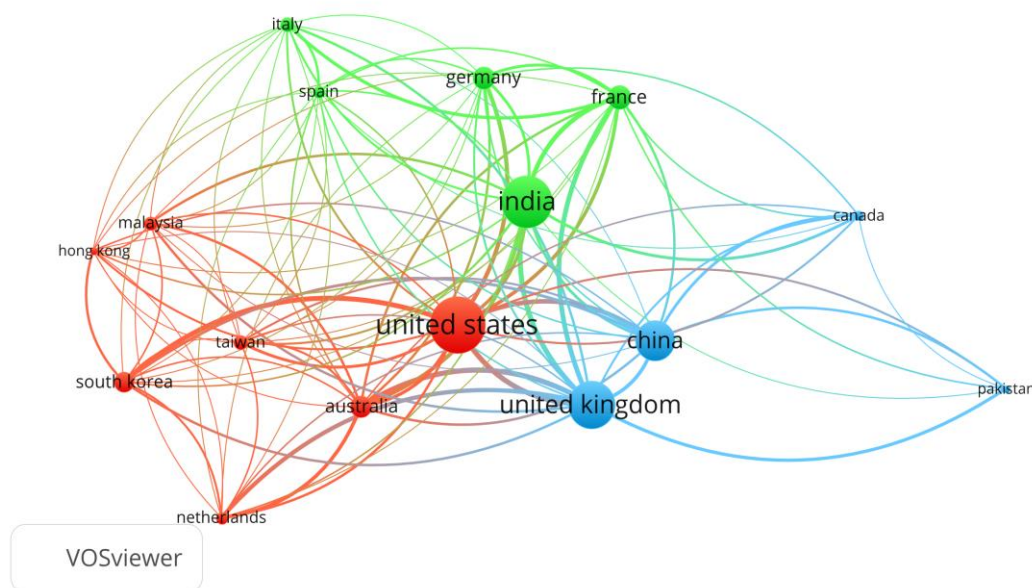
**Source:** Author(s) own creation in VOSviewer

**Figure 1:** Co-authorship analysis

### 3.2 Collaboration Patterns

To answer RQ2, researchers completed a co-authorship analysis, which they performed at both the author level and country level. The author collaboration network (see Figure 1) shows different research communities that work together to study particular research topics. The clusters establish that academic groups with strong connections created specific bodies of knowledge.

The collaboration network shows strong representation of developed economies at the country level, which connects the United States of America (USA), the Netherlands and Australia as central research hubs of the international research network. The research contributions from emerging economies, which include India and Malaysia, show gradual progress toward developing research participation from different geographical areas.



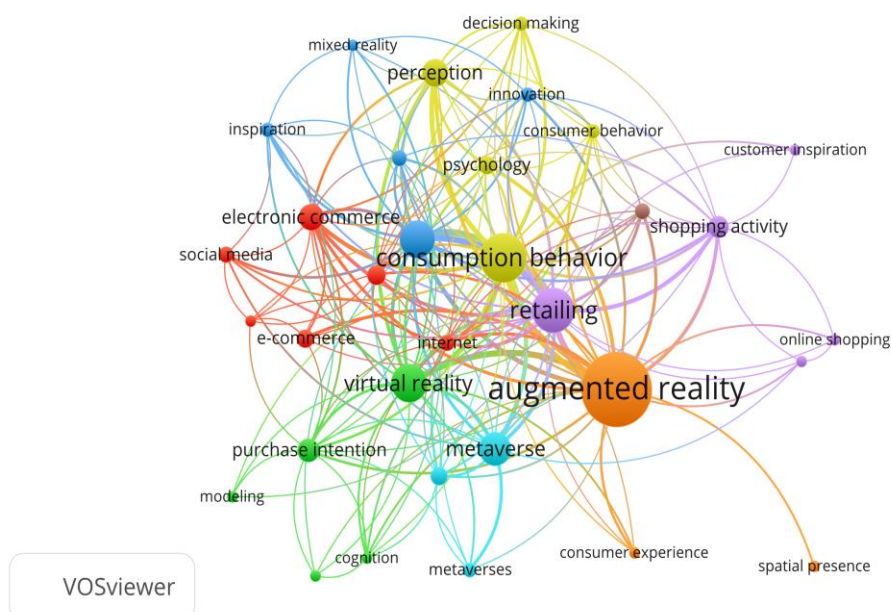
**Figure 2:** Country-wise co-authorship analysis

### 3.3 Thematic Analysis

Keyword co-occurrence analysis (see Figure 3) identifies the dominant themes within AR-driven consumer behaviour research. “Augmented reality” serves as the central node, interconnected with key constructs such as purchase intention, consumer perception, technology adoption and the metaverse. These clusters highlight the multidisciplinary nature of the field, covering marketing, technology and consumer psychology.

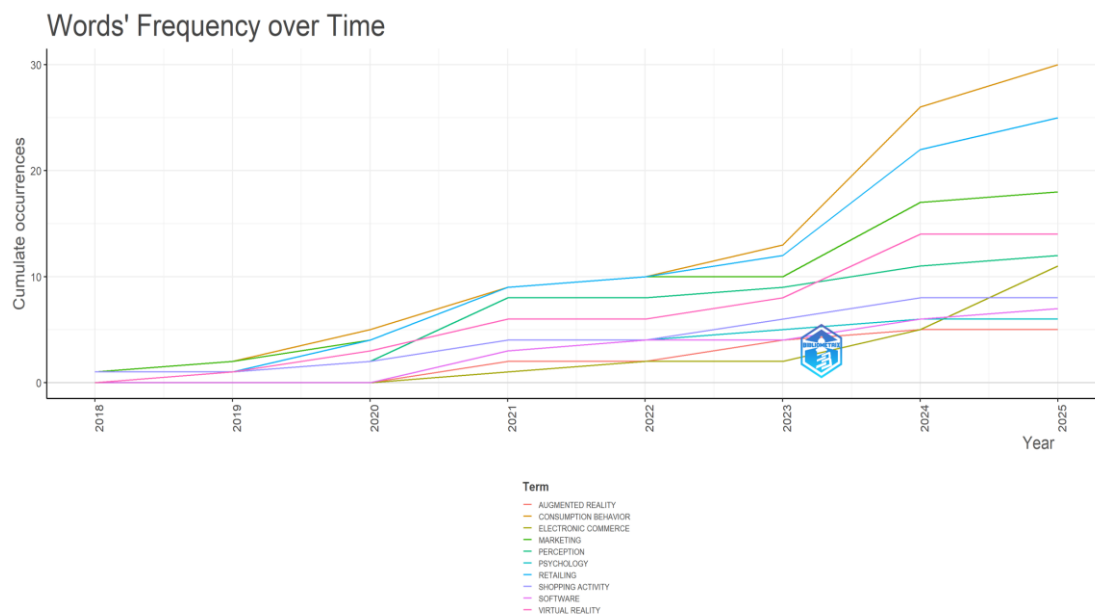
**Figure 3:** Keyword co-occurrence analysis

### 3.4 Word Frequency Trends



The analysis of keyword usage throughout different time periods shows how research priorities have changed over the course of time. The first studies showed how people adopted technology, but research after that time started to investigate how psychological factors, such as perception and cognition and emotional engagement, affected technology use.

**Figure 4:** Keywords frequency over time



### 3.5 Topic Modelling Analysis

The LDA-based topic modelling identifies five dominant themes (see Table 6), each representing a distinct research focus within the domain. The main research themes of this study include value creation in immersive environments, technology-enabled customer experience, AR-driven purchase behaviour, brand engagement and user interaction design. The research topics show two patterns of relationship because some topics remain closely related, while other topics maintain their independent character, which indicates separate research fields that exist within the main field of study.

**Table 6:** Summary of topic distribution

| Sl. No  | Thematic Label                            | No. of Documents | Top Keywords                                        |
|---------|-------------------------------------------|------------------|-----------------------------------------------------|
| Topic 1 | Value Creation in the Metaverse           | 21               | study, value, metaverse, intent, consumer           |
| Topic 2 | Technology-Enabled Customer Experience    | 30               | customer, experience, service, technology, reality  |
| Topic 3 | AR and Purchase Behaviour                 | 26               | consumer, product, effect, purchase, use            |
| Topic 4 | Brand Engagement via AR                   | 24               | brand, app, attitude, augment, experience           |
| Topic 5 | User Experience in Immersive Environments | 13               | user, interaction, metaverse, perceived, technology |

#### 4. Discussion

The findings demonstrate that the field is currently moving from its previous emphasis on technology to establish a new focus on user experiences and behavioural research. It shows that quantitative methodologies lead the field because researchers have mostly studied how consumers respond to AR applications through empirical evidence, according to Table 2. The research demonstrates methodological rigour as it has developed proper measurement methods, but it lacks qualitative research and theoretical development. Existing studies do not adequately measure consumers' cognitive and emotional responses because they have not balanced their research between immersive AR experiences and experiential aspects of AR. The field has strong empirical evidence, but it lacks theoretical development because researchers have not studied how people experience AR technology in their daily lives.

The density of publications within leading marketing and retail journals (see Table 3) further reinforces the applied orientation of the field. AR research primarily focuses on digital retailing, customer experience management and consumer decision-making studies. The study shows how academic discourse directly supports real-world industry applications, AR functioning as a strategic tool that improves consumer engagement instead of being treated as a purely technological development. It also validates how marketing research has shifted towards experiential and service-dominant approaches, which recognise value creation during interactive experiences between consumers and brands.

The analysis of highly cited articles, which appears in Table 4, provides detailed information about how the field developed its intellectual foundations. The first important research studies examined AR technology through its functional and technological features, which enabled better product visualisation and decreased online environment uncertainty. Recent studies focus on consumer inspiration and engagement together with their perceived value of products through experiential, psychological and affective elements. The new development shows how researchers have started to focus on complete human behaviour models, which include all cognitive and emotional processes. The field of AR research results

now supports both experiential marketing theory and new digital consumer behaviour models, which show how consumers react to immersive interactive experiences.

The author level results (Table 5) demonstrate that only a small group of researchers has made major contributions to the field. The author groups that share similar citation patterns demonstrate strong research partnerships, which lead to the creation of distinct academic research groups. Research concentration permits fields to develop their knowledge base through cumulative learning while building their core theoretical framework, but this practice restricts academic discourse because it diminishes alternative viewpoints. The AR research field follows an intellectual path that depends on a small group of core researchers because most academic networks remain unexplored, so researchers must include more participants to achieve better theoretical diversity.

The author and country collaboration patterns shown in Figures 1 and 2 demonstrate how structural elements in the field operate. Developed economies dominate research activities because the USA and European countries represent major markets that have advanced technological capabilities and high levels of digital usage. The growing research presence of emerging economies like India and Malaysia indicates that research contexts are becoming more diverse. The existing literature has not yet examined how cultural, economic and technological factors affect AR consumer behaviour, which makes this research area important. The global collaboration network shows both field development through consolidation and field growth through expansion.

The thematic analysis establishes research focus areas through two methods, which include keyword co-occurrence analysis and temporal trend analysis. The research field has shifted focus from studying technology adoption methods and system usability testing to investigating psychological factors, which include perception and cognition, emotional engagement and consumer experience. The increasing usage of the terms "metaverse", "personalisation" and "customer experience" shows that AR research now explores complete digital environments which include complex virtual worlds. The field has developed into a more comprehensive understanding of digital experience consumption because its research now includes both practical use of technology and how people experience enhanced virtual environments. The LDA-based topic modelling results (see Table 6) show five main thematic areas, which include value creation in immersive environments, technology-enabled customer experience, AR-driven purchase behaviour, brand engagement and user interaction design. The research themes demonstrate how AR-based consumer behaviour studies explore multiple areas of research. Researchers have established a strong connection between experiential value and decision-making outcomes through their study of purchase behaviour and value creation methods. The user interaction design theme displays its specific design characteristics, which researchers have developed to study usability testing, interface design and human-computer interaction research that exists separately from general marketing research. The results of bibliometric and topic modelling studies converge to validate how the field has undergone extensive structural changes. AR technology functions as a technological advancement but also serves as a strategic tool that enhances consumer experiences and promotes brand interactions and value co-creation activities. The integration of technological, psychological and marketing perspectives leads to AR development, which exists as a cross-disciplinary research area. The field exhibits growth in both theoretical complexity and interdisciplinary depth because of this development.

## **5. Conclusion**

This study employed bibliometric analysis and topic modelling to examine the intellectual structure, collaboration patterns and thematic evolution of AR in consumer behaviour. The findings reveal that this field has substantially grown in the last decade, with increasing scholarly attention towards customer experience, purchase behaviour and value creation. The observed patterns also demonstrate that researchers should now develop newer theories and adopt different research methods while they expand their studies to various settings in order to understand how people behave in AR environments.

This review highlights the multidisciplinary nature of the field and also shows how technological, psychological and marketing perspectives have given shape to this domain. It attempts to provide a well-structured synthesis of the leading authors in this field, their influential work and key thematic areas that are crucial to continue the work. This study suggests opportunities for further theoretical advancement. As AR is rapidly evolving, it gives further scope to enhance the understanding of consumer behaviour in immersive and interactive digital environments.

## **6. Implications of the study**

### **6.1 Theoretical Implications**

The study delivers theoretical insights about AR consumer behaviour research through its structured field development, which uses both bibliometric analysis and topic modelling methods. The findings reveal a shift from technology-centric frameworks to experience-driven approaches, which focus on understanding consumer behaviour and how consumers interact with such immersive technologies. It establishes a theoretical foundation through five core research themes that include technology-based customer experience, consumer shopping patterns, brand interactions, value creation in immersive environments and digital interface development. The findings indicate a growing emphasis on dynamic interaction-based frameworks, which replace previous technology adoption models that used linear mechanisms. Methodologically, the study shows how bibliometric methods and data-driven approaches can uncover new knowledge about complex interdisciplinary fields through their ability to reveal hidden thematic trends.

### **6.2 Managerial Implications**

The research provides practical recommendations for retail managers who want to implement AR technology. Firstly, organisations should view AR as a strategic tool that can enhance the experience of their customers. This improvement process also requires companies to create virtual experiences that generate both cognitive and emotional reactions from their customers. AR has a strong relationship with consumer buying patterns. Businesses can use AR to decrease product uncertainty, which will result in better customer purchasing decisions. As AR enables consumers to see products in their actual environments, it has potential to increase the perceived product value and purchase confidence. This process can result in higher conversion rates. Secondly, the researchers found user interaction design to be a separate research area, which demonstrates how vital usability and interface design are. Businesses need to implement an omnichannel approach that combines physical and digital elements to provide users with consistent experiences across all their contact points. In developing markets, they must understand how cultural and technological differences between countries impact their AR solution development process for effective user interaction with their products.

## 7. Future research directions

The existing research shows human perception and engagement together with emotional responses, but researchers have not yet studied their interactive effects in immersive environments. Future research can investigate how people pay attention to their surroundings while retaining information, experiencing emotional responses and making decisions based on mental shortcuts in AR environments. Prior studies have demonstrated that AR creates a positive connection between usage and customers' willingness to buy products. This opens a scope for future studies to conduct a study to explore whether there are other factors that might hinder the relationship between AR and purchase intentions. It can investigate how product type, consumer involvement and situational context act as moderating factors within the research. The increasing significance of brand engagement within AR environments also creates research opportunities for studying consumer relationships with brands. Future studies can explore how AR enables brand storytelling, co-creation and emotional bonding. The emergence of user interaction design as an independent research area requires researchers to conduct more in-depth studies about usability and interface design for AR systems. Future research should focus on cognitive load, interface complexity and accessibility to study how design elements affect user engagement and user satisfaction. Existing research shows that research on immersive technologies in developed economies has been conducted extensively and is already developing newer and better versions infused with AI. Future studies can conduct cross-country studies and compare different cultures, economic systems and technological advancements to assess their impact on how consumers interact with immersive technologies.

## 8. Limitations to the study

Just like all research, this study also has its own set of boundaries and limitations. First, it solely depends on the Scopus database as its source of research materials. Second, the findings and discussions in this review are based on the published works that fall within the mentioned time period. Studies beyond this time period were not considered and hence can be considered as a limitation. Third, the study employs bibliometric techniques, which only track citation patterns and co-authorship connections, but these methodologies can fall short of capturing the entire research contribution. It also uses existing data sources as its main method while excluding any form of empirical testing.

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