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Research paper



Exploring the Role of Augmented and Virtual Reality in Enhancing Perceived Ease of Use and Influencing Consumer Behavior Towards Cosmetic Purchases: A Systematic Review

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Abstract

Background: Augmented and Virtual Reality are quickly becoming key players in the cosmetics industry, offering consumers more interactive and engaging shopping experiences. Despite their growing use, there is still a gap in Research on how these technologies influence consumer behaviour, especially when it comes to buying cosmetic products. This systematic review brings together existing studies to examine the effects of AR/VR on the ease of use, consumer attitudes, and purchase intentions in digital cosmetic shopping.
Objective: The main aim of the study is to examine the way AR and VR influences perceived ease of use in cosmetics shopping, to analyse the influence of AR and VR technologies on consumer attitudes toward cosmetic products, to evaluate how AR and VR affects purchase intentions in the cosmetics industry and to explore the psychological and emotional factors of consumers using AR and VR for cosmetic purchases.
Methods: Following PRISMA guidelines, studies published between 2010 and 2025 were analysed. A thorough search was conducted using databases such as PubMed, Scopus, and Web of Science, with carefully constructed Boolean search strings targeting key concepts in AR/VR, cosmetics, and consumer Behaviour. The selection process was clearly outlined with a PRISMA flowchart, and the quality of the studies was assessed using the Mixed Methods Appraisal Tool (MMAT). Out of 180 studies initially identified, 140 were included in the qualitative synthesis and 40 in the quantitative analysis.
Results: The results reveal that AR/VR significantly enhance the perceived ease of use in digital cosmetic shopping, which in turn leads to more positive consumer attitudes and higher purchase intentions. Immersive experiences—such as virtual makeup try-ons and 3D product visualizations—not only ease the mental effort required but also help build trust and forge an emotional connection with the brand. Significantly, most of the studies reviewed met high methodological standards.
Conclusions: AR/VR technologies are transforming the cosmetic shopping experience by making it more user-friendly and engaging, while also increasing consumer confidence in their purchases. Future research should include longitudinal studies to evaluate the sustained impact of AR/VR on brand loyalty, investigate the integration of AI for enhanced personalization of those experiences and conduct cross cultural analyses to capture variations in consumer response.

Keywords: *Consumer; Augmented Reality; Virtual Reality; Perceived Ease of Use; Attitude Etc.*

1. Introduction

The amalgamation of Augmented and Virtual Reality into consumer behaviour research has gathered more importance in recent years. These new-age user-oriented technologies have transformed the retail experience by offering interactive, engaging, and personalized shopping solutions (Scholz & Smith, 2016). Especially, AR/VR applications implemented by retailers in cosmetics and fashion industries have improved customer decision-making by allowing virtual try-out of their products, thereby gather more user-engagement, and improving shopping satisfaction (Pantano et al., 2017). Researches show that AR-driven experiences offer a feel of realism and interactivity that remarkably impacts consumer attitudes and behaviours (Javornik, 2016) (Yim et al., 2017).

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The widespread adoption of AR and VR is restructuring consumers assess and purchase products in online. Unlike traditional e-commerce, somewhere consumers trust on static images and textual descriptions, AR and VR technologies allows virtual try-ons and 3D visualizations, nurturing a more informed and confident purchasing decisions (Huang & Liu, 2014). With brands step by step investing in AR and VR-powered applications, understanding their impact on consumer perceptions and purchase intentions is critical for shaping future digital marketing strategies (McLean, G., & Wilson, 2019).

The cosmetics industry is a multi-billion-dollar global market, driven by continuous innovation and evolving consumer preferences. According to reports by (GVC, 2022) and (Company., 2020) the industry's development is fuelled by digital transformation, with e-commerce playing a vital role in beauty retailing. With increasing demand for personalized beauty experiences, AR and VR technologies have started as key facilitators, bridging the gap between online shopping and in-store experiences (Francesca Bonetti, G. Warnaby, 2018).

AR-based virtual try-on tools, such as L'Oréal's "ModiFace" and Sephora's "Virtual Artist," has changed the way consumers interact with cosmetic products online (Rauschnabel, 2019). These tools allow the consumers to try out cosmetic products in real-time, lowering uncertainty and improving their shopping satisfaction (Heller et al., 2019). Research further shows that AR and VR improves perceived enjoyment and interactivity, thereby improving purchase intentions (Youn, S. Y., & Jin, 2020). It is important to study how these technologies affect the consumer's attitudes and behaviours in the growing digitization of the beauty industry.

There is still some distance to cover to understand how AR and VR influence consumer behaviour, despite growing acceptance and use of these technologies in beauty industry. It is to be noted that AR and VR find numerous mentions in literature when it is in the context of general retail setting, but studies related to cosmetic industry are only a few (Pantano, Eleonora, 2012). It is critical to understand the perceived ease of use, attitudes, and purchase intentions in AR and VR-enhanced shopping environments for researchers and industry professionals alike (Rese et al., 2017).

Researchers confirms that brand perception and customer loyalty are impacted by AR and VR technologies which create immersive experiences that develop trust and engagement (Scholz et al., 2018). However, influencing factors such as mental innovativeness, perceived usefulness, and technological acceptance remain to be studied in depth in the perception of cosmetic shopping (Pizzi, G., & Scarpi, 2019). By merging the existing studies, this systematic review objective is to provide comprehensive insights into the growing role of augmented and virtual reality in enhancing perceived ease of use and influencing consumer behaviour towards cosmetic purchases.

2. Research Questions

With support of PICO (Population, Intervention, Comparison, Outcome) framework, this study aims to study the following research questions:

1) How do AR and VR influence consumers' perceived ease of use in cosmetics shopping?
2) What effects do AR and VR have on consumer attitudes toward cosmetic products?
3) How do AR and VR technologies impact consumer purchase intentions in cosmetics?

By exploring this above questions, this review will contribute to the growing body of knowledge on immersive technologies and their inferences for consumer decision-making in the cosmetics sector.

3. Research Gap

Despite the growing body of research on Augmented and Virtual Reality in retail, there remains a significant gap in studies that specifically focus on the cosmetics industry. Much of the existing literature has concentrated on AR/VR applications in fashion (Pantano et al., 2017) tourism (Guttentag, 2010) and general e-commerce environments ((Javornik, 2016); (Huang & Liu, 2014)). However, the influence of AR/VR on consumer behaviour—particularly regarding perceived ease of use, consumer attitudes, and purchase intentions in the cosmetics sector—remains underexplored.

Several critical research gaps have been identified:

a) Limited Focus on the Cosmetics Industry:

Most studies on AR and VR have primarily investigated on fashion retail, apparel and general e-commerce application ((McCormick, 2017); (Alalwan, A. A., Dwivedi, Y. K., & Rana, 2018)). Virtual try-on (VTO) technologies in these concept is common which includes shaping brand perception, consumer trust, and purchase decisions within the cosmetics industry has not been adequately examined. For example, (Kazmi et al., 2021) explored that AR's role in enhancing consumer confidence in Pakistan with reference to fashion accessories but didn't extend their analysis to cosmetics or beauty products. Similarly, (Nguyen et al., 2025) and (Ngo et al., 2025) investigated AR in broader e-commerce environments, without industry specific insights. In Contrast, (Salma Dhianita & Popy Rufaidah, 2024) studies AR in cosmetics, such studies are very rare and limited to smaller regional samples size, bringing a clear cut need for cosmetics-focused empirical work.

b) Insufficient Understanding of Perceived Ease of Use in AR/VR Shopping:

Although PEOU is a core construct of the Technology Acceptance Model (Davis, 1989) provides a framework for understanding consumer adoption of new technologies, its application to AR and VR-driven beauty retail is still limited. (Nguyen et al., 2025) includes PEOU as a part of their research model but its effect were less impact compared to perceived usefulness and enjoyment. (Ngo et al., 2025) also stated inconsistent findings, with PEOU indirectly impact the purchase intention. The proposes the interface complexity, interactivity, and the realism of AR and VR applications on the perceived ease of use remains largely unexplored.

c) Lack of Empirical Studies on AR/VR and Purchase Intentions:

(Ngo et al., 2025), (Ngo et al., 2025) and (Nguyen et al., 2025), believe on cross sectional survey methods. These provides basic evidence of AR's impact but not capture long term adoption or repurchase or continuance intentions. While some research indicates that AR/VR can enhance consumer engagement and improve product visualization (Poushneh & Vasquez-Parraga, 2017) there is scant empirical evidence directly linking these technologies to increased purchase intentions in cosmetics retail. Moreover, an area where more study is to be done is the effect of consumer trust in AR and VR shopping experiences on brand loyalty.

d) Gap in Measuring Emotional and Psychological Responses:

AR and VR technologies build immersive experiences; however, a measurement of their impact on the emotional and psychological responses of consumers (such as enhanced engagement, reduced perceived risks, and improved satisfaction) is not available (Hilken et al., 2017). Another area requiring more research is the study of AR/VR's capabilities to replicate the in-store product trial conditions and enhance decision making before purchase. For instance, (Ngo et al., 2025) concentrated on purchase intentions without fully covering

emotional mediators, while (Naveen et al., 2025) highlighted hedonic enjoyment but not psychological comfort or anxiety. Thus, a gap remains systematically affective and psychological mediators of AR and VR adoptions.

4. Objectives of The Study

The primary aim of the study is to understand the role of AR and VR in influencing consumer behaviour in purchase of cosmetics, with particular focus on perceived ease of use. The specific objectives are

1) To examine how perceived ease of use in cosmetics shopping was enhanced by AR and VR technologies.
2) To analyze how AR and VR influence consumer attitudes toward cosmetic products.
3) To evaluate the influence within the cosmetics industry of AR and VR in shaping purchase intentions.
4) To delve deeper into the psychological and emotional aspects of consumer's interaction with AR and VR for cosmetic purchases.

5. Literature Review

5.1. The impact of AR and VR on consumer behaviour

A customer's outlook across cosmetics, retail and fashion has changed due to the influence of Augmented and Virtual Reality. (Kazmi et al., 2021) shied that AR reduce the risk and strengthen consumer confidence in product evaluation. (Naveen et al., 2025) found that AR triggers affective, cognitive and behavioural responses, endorsing its roles in shaping overall behaviour. AR and VR technologies create immerse, interactive shopping experience that alter purchase decision. Consumer's cognition is getting more and more influenced by the interactive and virtual environments that these technologies have to offer, thereby increasing the digital shopping experience ((Huang & Liu, 2014); (Javornik, 2016)). Study says that the gap between physical and online shopping is bridged by the AR and VR applications, especially in the retail industry, which helps customer to interact with the products in a tangible manner (Pantano, E., Pizzi, G., Scarpi, D., & Dennis, 2020)

A prime theory for understanding consumer behaviour in the wake of AR/VR is the Technology Acceptance Model (TAM), introduced by Davis in the year 1989. TAM points that perceived usefulness and perceived ease of use determine a user's acceptance of a new technology. From this angle, AR/VR technologies fits well into this model, given that they offer enhanced visualization and interactive features, leading to higher engagement and adoption (Alalwan, A. A., Dwivedi, Y. K., & Rana, 2018)

Researchers (Hilken et al., 2017) and (Francesca Bonetti, G. Warnaby, 2018) have shown that consumer confidence was increased by AR applications in e-commerce by allowing virtual product trials. Additionally, (Poushneh & Vasquez-Parraga, 2017) suggest that augmented reality reduces purchase uncertainty and develops satisfaction, thereby improving shopping experience. Being able to imagine products in real-time culminates into reduction in hesitation and fostering an improved intention to purchase. ((Scholz & Smith, 2016); (Yim et al., 2017)).

5.2. Perceived ease of use in AR and VR shopping

Perceived ease of use is a vital factor persuading consumer acceptance of augmented and virtual reality in online shopping. (Nguyen et al., 2025) exhibited that positive consumer attitudes stem from AR's ability to provide hedonic value and good interactive experiences. (Ngo et al., 2025) states that consumers may perceive AR as complex, limiting intention to use perceived usefulness. Researcher such as (Alalwan, A. A., Dwivedi, Y. K., & Rana, 2018) states that the simplicity and innate nature of an augmented reality platform determine whether consumers will adopt the technology. A study conducted by (Huang & Liu, 2014) indicates that interactive AR applications decrease cognitive effort, making it easier for consumers to evaluate and compare products, that increasing their shopping experience.

(McLean, G., & Wilson, 2019) establish that AR-integrated shopping applications deliver seamless navigation and real-time feedback, building online shopping more user-friendly. This ease of use is specifically important in the cosmetics industry, where consumers depend on product testing before making a purchase (Rese et al., 2017). Likewise, (Javornik, 2016) showcases that higher engagement and lower frustration levels can emanate from well-structured AR interfaces, increasing user satisfaction.

Furthermore, researches by (Pantano, Eleonora, 2012) and (Poushneh & Vasquez-Parraga, 2017) commend that perceived complexity is reduced because of the technological advancements in AR, thereby contributing step-by-step guidance and personalized references. This allowance to customize helps improves the user experience and brings around higher adoption rates amongst online purchasers (McCormick, 2017). Thus, usability issues such as technical glitches, device compatibility and learning effort can limit AR adoption, specifically in cosmetic industry.

5.3. Consumer attitudes and AR and VR

The extent to which consumers are willing to handle and purchase the product depends on their attitude towards the augmented and virtual reality technologies. (Ngo et al., 2025) found that positive consumer attitudes from AR's ability to provide hedonic value and interactive experiences. (Ngo et al., 2025) state that attitude significantly mediate the relationship between AR features and purchase intention, by following TAM pathway. According to (Rauschnabel, 2019), consumers find AR-enhanced shopping as attractive and gratifying compared to conventional online shopping. This perception leads to growth in customers' trust in AR-driven retail experiences.

It was also found through research by (Li, X., Guo, L., & Zhao, 2021) that attitudes of customers in cosmetic industry varied considerably when they could use augmented reality powered virtual try-ons by providing realistic feel of makeup products. This also improved the brand loyalty and increased the purchase likelihood. Similarly, (Poushneh & Vasquez-Parraga, 2017) highlights that perceived risk associated with online purchases decreased with the intervention of augmented reality by providing a more interactive and realistic representation of products.

(Hilken et al., 2017) discovers how consumer emotions and attitudes were affected (positively) by multi-sensory augmented reality experiences. They found that immersive experiences give a sense of ownership, persuading customers to buy more of a product. (Scholz et al., 2018) further claimed that consumer-brand relationship by constructing unforgettable shopping experiences is supported by AR-integrated shopping. In cosmetics, attitudes are very sensitive to realism and colour accuracy, since it can negatively impact decision comfort.

5.4. Purchase Intentions and AR and VR

Various research studies found that purchase intentions were positively affected by Augmented and Virtual Reality technologies. (Pantano, E., Pizzi, G., Scarpi, D., & Dennis, 2020) declare that online product trials benefit the consumer's confidence and reduce their hesitation, thereby producing higher conversion rates. Similarly, (Guttentag, 2010) throws light on the conclusion that virtual reality models allow consumers to experience products genuinely, thereby increasing their willingness to buy.
(Smink et al., 2019) found that between consumers using conventional e-commerce platforms and those using AR shopping applications, the former are more interested to complete a purchase. The interactive and collaborative nature of AR and VR technology reduces uncertainty and increases the appeal of the product. Moreover, (Pizzi, G., & Scarpi, 2019) found that cognitive innovativeness plays a crucial role in shaping purchase intentions, with early adopters being more expected to incorporate AR technology driven shopping experiences regularly.
Additionally, studies by (Rese et al., 2017) and (McLean, G., & Wilson, 2019) prove that the novelty and convenience of AR and VR increase consumer interest and purchase likelihood. The facility to customize and virtually test products nurtures a logic of personal connection, building consumers more confident in their purchase decision ((Kim, J., & Forsythe, 2008); (Olsson, T., & Salo, 2012)). (Nguyen et al., 2025) revealed that virtual try on applications increased intention, moderated by user experience with technology. (Salma Dhianita & Popy Rufaidah, 2024) found that brand trust mediates the AR – Purchase intention relationship in cosmetics.
The various literature review stated that there is significant influence of Augmented and Virtual Reality technologies on consumer behaviour, mainly in the cosmetics industry. These technologies improve perceived ease of use, positively change the consumer attitudes, and increase buying intentions. The application of theories like TAM gives a framework for understanding consumer adoption of AR and VR in retail industry. Future research should concentrate on trend of long-term consumer behaviour and the role of Artificial Intelligence in further developing AR and VR shopping experiences.

6. Research Methodology

6.1. Type of study

This Systematic Literature Review (SLR) designed to examine the impact of Augmented and Virtual Reality on consumer behaviour in the cosmetics industry. The review was conducted with help of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework that guidelines to ensure a clear study selection process, and the Mixed Methods Appraisal Tool (MMAT) is used to evaluate the quality of studies included. This SLR study include articles published between the period of 2010 and 2025.

6.2. Literature search

A broad literature search was performed through multiple academic and open source databases, includes Google Scholar, Scopus, Web of Science, IEEE Xplore, Springer Nature, Sage Publication, Science direct etc. This broad search intended to found relevant peer-reviewed studies and conference papers that scrutinize the application of AR and VR in cosmetics retail and its impact on key consumer behaviour variables such as perceived ease of use, consumer attitudes, and purchase intentions.

6.3. Search strategy

PICO (Population, Intervention, Comparison, Outcome) framework was used to structure and organise the effective search process. Population (P) - Consumers in the cosmetics industry (e.g., "Cosmetic shoppers," "Beauty consumers," "Retail customers," "Makeup users," "Digital shoppers"). Intervention (I) - Application of AR/VR technologies (e.g., "Augmented Reality," "Virtual Reality," "Immersive technologies," "Virtual try-on," "Digital makeup application," "3D beauty visualization"). Comparison (C) - Traditional shopping experiences (e.g., "Traditional shopping," "Physical store experience," "In-store cosmetic trials," "Standard e-commerce platforms"). Outcome (O) - Consumer behaviour variables (e.g., "Perceived ease of use," "Consumer attitudes," "Purchase intentions," "User engagement," "Brand perception," "Shopping satisfaction," "Customer experience," "Trust in AR/VR shopping").
Based on the PICO framework, the following search strings were developed such as (Consumers OR "Cosmetic shoppers" OR "Beauty consumers" OR "Retail customers" OR "Makeup users" OR "Digital shoppers" OR "Online beauty buyers" OR "Tech-savvy consumers" OR "E-commerce users" OR "Personal care consumers") AND ("Augmented Reality" OR AR OR "Virtual Reality" OR VR OR "Immersive technologies" OR "Virtual try-on" OR "Digital makeup application" OR "3D beauty visualization" OR "Virtual cosmetic sampling" OR "AI-powered beauty tools" OR "Mixed reality shopping" OR "Cosmetic technology innovations") AND ("Traditional shopping" OR "Physical store experience" OR "In-store cosmetic trials" OR "Manual product testing" OR "Non-digital shopping" OR "Brick-and-mortar retail" OR "Paper-based beauty catalogues" OR "Standard e-commerce platforms" OR "Conventional beauty marketing" OR "Traditional consumer engagement") AND ("Perceived ease of use" OR "Consumer attitudes" OR "Purchase intentions" OR "User engagement" OR "Brand perception" OR "Shopping satisfaction" OR "Customer experience" OR "Trust in AR/VR shopping" OR "Brand loyalty" OR "Consumer decision-making"). This comprehensive search string was applied across all selected databases to ensure the retrieval of studies relevant to our research focus.

6.4 Inclusion and exclusion criteria

Inclusion Criteria:
1) The timeframe captures the AR/ R technology in cosmetic industry - Studies published between 2010 and 2025.
2) Research focusing on AR/VR applications in cosmetics retailing, particularly studies examining consumer behaviour variables such as perceived ease of use, consumer attitudes, and purchase intentions.
3) Peer-reviewed journal articles, conference papers, and empirical studies employing quantitative, qualitative, or mixed methods.
4) Studies meeting the methodological quality standards as evaluated by the MMAT framework.

Exclusion Criteria:
1) Studies that focus on AR/VR applications outside the cosmetics sector (e.g., gaming, healthcare, education).
2) Articles that do not include empirical evidence or that lack measurement of key consumer behaviour outcomes.

3) Non-Peer-Reviewed Sources - Book chapters, industry reports, white papers, or articles that have not undergone peer review.

7. Results of The Study

7.1. Study selection and characteristics

Using a comprehensive search strategy, our systematic review initially identified a total of 500 records from multiple databases, including PubMed, Scopus, Web of Science, IEEE Xplore, ScienceDirect, SpringerLink, and Google Scholar. After removing duplicates (n = 100), 400 unique records were screened based on titles and abstracts. During the screening phase, 220 records were excluded because they did not address AR/VR applications in the cosmetics sector or failed to examine key consumer behaviour outcomes. This left 180 full-text articles to be assessed for eligibility. Following the detailed eligibility review, 40 full-text articles were excluded due to reasons such as lack of a direct focus on consumer behaviour variables, insufficient empirical data, or irrelevance to cosmetics retail. Consequently, 140 studies were included in the qualitative synthesis, and among these, 40 studies provided quantitative data that could potentially support a meta-analysis. Although 140 studies were considered in the qualitative study, only 18 studies were selected for detailed investigation because they explicitly measured the core construct of this study such as augmented / virtual reality usage, perceived ease of use, consumer attitudes and purchase intentions. Studies that discussed AR/VR conceptually or focused on unrelated outcomes were excluded from the final data to ensure detail analytical and construct consistency.

7.2. Prisma flow chart

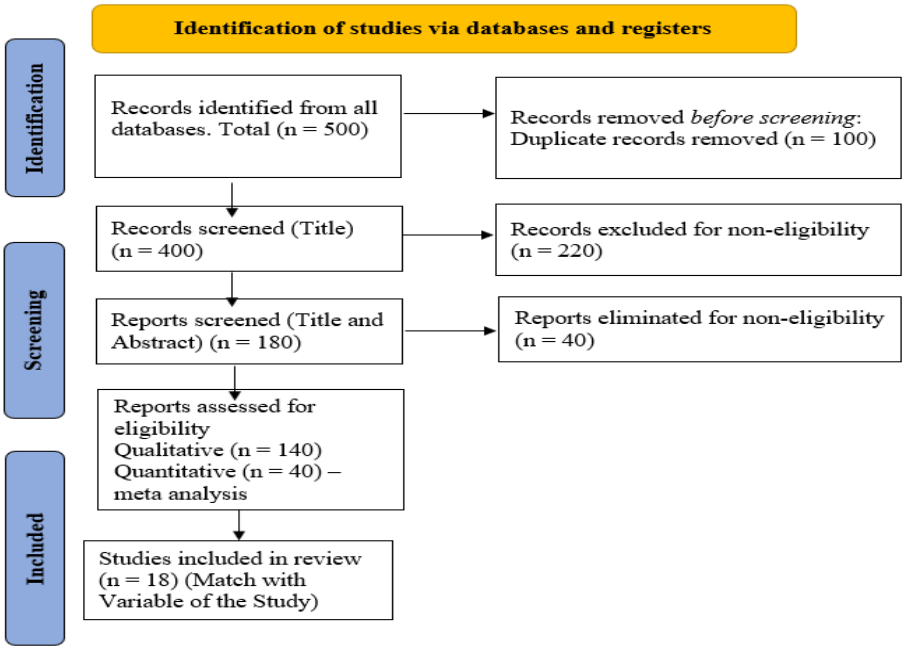


Fig. 1: Prisma Flow Diagram Detailing the Study Selection Process.

Source: (PRISMA Statement Group, 2021).
Source: Authors Compilation.

Figure 1 presents the PRISMA flow diagram illustrating the study selection process and Table 1 given below summarizes the features of the studies included in the final synthesis.. For the purpose of this review, a subset of 18 studies was identified as particularly relevant because they directly measured key variables such as perceived ease of use, consumer attitudes, purchase intentions, and other related consumer behaviour outcomes. These studies include, but are not limited to, (Javornik, 2016), (Poushneh & Vasquez-Parraga, 2017),(Scholz & Smith, 2016), (Yim et al., 2017), (Huang & Liu, 2014), (Hilken et al., 2017), (Rese et al., 2017), (Francesca Bonetti, G. Warnaby, 2018), Heller et al. (2019), (Pizzi, G., & Scarpi, 2019), (Youn, S. Y., & Jin, 2020), (Salma Dhianita & Popy Rufaidah, 2024), (Nguyen et al., 2025), (Kazmi et al., 2021), (Ngo et al., 2025), (Naveen et al., 2025), (Pandit et al., 2024) and (McLean, G., & Wilson, 2019). The key characteristics of these studies are summarized in Table 1 (see Appendix) and include details such as study design, sample size, type of AR/VR technology implemented (e.g., virtual try-ons, 3D visualization), and primary outcomes measured.

Table 1: Study Characteristics Table

Author	Demographics (N)	Interests/Factors Influencing Online Purchase Intention Measured	Method/Outcomes Measured	Results
(Javornik, 2016)	250 (Mixed age & gender)	Perceived ease of use, consumer attitudes	Qualitative interviews; Thematic analysis	AR applications increased realism and emotional engagement, positively affecting attitudes.
(Poushneh & Vasquez-Parraga, 2017)	300 (Online shoppers)	Purchase intentions, customer satisfaction, trust	Survey-based quantitative study; Structural equation modeling	AR significantly enhanced purchase intentions and overall satisfaction by reducing uncertainty.
(Scholz & Smith, 2016)	400 (Digital shoppers)	User engagement, brand perception	Mixed methods (Survey combined with focus groups)	Immersive AR experiences boosted consumer engagement and improved brand perception.

(Yim et al., 2017)	350 (E-commerce users)	Interactivity, perceived usefulness, purchase likelihood	Quantitative survey; Structural equation modeling	Enhanced interactivity and vividness in AR increased online purchase likelihood.
(Huang & Liu, 2014)	500 (Cosmetic buyers)	Experiential value, ease of use, persuasive effects	Experimental design; Pre/post comparisons	AR interventions increased perceived ease of use and enhanced persuasive effects on consumers.
(Hilken et al., 2017)	450 (Mixed demographics)	Online service experience, brand loyalty, customer satisfaction	Case study analysis; Surveys	AR enhanced online service experiences, leading to higher brand loyalty and consumer satisfaction.
(Rese et al., 2017)	320 (Tech-savvy users)	Acceptance of AR apps, perceived ease of use	Quantitative analysis; Factor analysis	AR applications were widely accepted and positively influenced perceived ease of use.
(Francesca Bonetti, G. Warnaby, 2018)	280 (Retail consumers)	Immersive experience, purchase intention	Literature synthesis; Comparative study	Immersive AR/VR experiences were found to significantly boost purchase intentions.
(Heller et al., 2019)	360 (Online shoppers)	Multi-sensory engagement, overall satisfaction, trust	Mixed methods; Surveys and interviews	Multi-sensory AR experiences enhanced consumer satisfaction and trust in online shopping.
(Pizzi, G., & Scarpi, 2019)	330 (Cosmetic shoppers)	Cognitive innovativeness, risk reduction, purchase intentions	Quantitative survey; Regression analysis	AR reduced risk perceptions and increased purchase intentions, particularly among early adopters.
(Youn, S. Y., & Jin, 2020)	410 (Digital beauty users)	Perceived enjoyment, usefulness, trust, and overall acceptance	Experimental study; Questionnaire-based analysis	AR led to higher perceived enjoyment and usefulness, increasing consumer trust and acceptance.
(McLean, G., & Wilson, 2019)	380 (Online users)	Customer engagement, ease of navigation, shopping satisfaction	Mixed methods; Online behavioural tracking and surveys	AR improved customer engagement and streamlined the online shopping process, enhancing satisfaction.
(Kazmi et al., 2021)	420 (Pakistani consumers)	AR effects on decision making and Consumer confidence	Survey and regression	AR improved confidence, reduced uncertainty, influence behaviour.
(Naveen et al., 2025)	500 (Online Shoppers)	Affective, Cognitive, Behavioural responses.	Experimental design	AR triggered stronger engagement, enjoyment and purchase intention.
(Ngo et al., 2025)	450 (E-Commerce Users)	AR Marketing and purchase intention.	Quantitative, SEM	AR apps boosted purchase intentions, moderated by attitudes.
(Nguyen et al., 2025)	600 (Vietnamese shoppers)	Virtual try-on, ease of use, technology experience.	Survey, PLS-SEM	Ease of use, usefulness and experience moderated purchase intention.
(Salma Dhianita & Popy Rufaidah, 2024)	310 (Cosmetic buyers)s	Virtual try-on, brand trust, purchase intention	Experimental survey	AR try-on increased intention via brand trust mediation.
(Pandit et al., 2024)	390(Digital consumers)	AR shopping experience, Loyalty.	Conceptual and empirical testing	AR enhanced shopping experience, boosting loyalty and trust.

Source: Authors Compilation.

7.3. Quality assessment using the MMAT

The methodological quality of the selected studies was appraised using the Mixed-Methods Appraisal Tool (MMAT). Each study was assessed on criteria specific to its research design (qualitative, quantitative, or mixed methods).

Table 2: MMAT Evaluation Criteria

Study	Research Question Clear?	Appropriate Methods?	Data Collection Adequate?	Bias Minimized?	Sample Size Justified?	Statistical Methods Valid?	Integration (for Mixed Methods)?
(Javornik, 2016)	Yes	Yes	Yes	Yes	N/A (Qualitative)	N/A	N/A
(Poushneh & Vasquez-Parraga, 2017)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Scholz & Smith, 2016)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Yim et al., 2017)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Huang & Liu, 2014)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Hilken et al., 2017)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Rese et al., 2017)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Francesca Bonetti, G. Warnaby, 2018)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Heller et al., 2019)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Pizzi, G., & Scarpi, 2019)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Youn, S. Y., & Jin, 2020)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(McLean, G., & Wilson, 2019)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Kazmi et al., 2021)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Naveen et al., 2025)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Ngo et al., 2025)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Nguyen et al., 2025)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Salma Dhianita & Popy Rufaidah, 2024)	Yes	Yes	Yes	Yes	Yes	Yes	N/A
(Pandit et al., 2024)	Yes	Yes	Yes	Yes	Yes	Yes	N/A

Source: Authors Compilation.

Qualitative Studies: Studies by (Javornik, 2016) provided clear research questions and employed robust qualitative methodologies, including in-depth interviews and thematic analysis. These studies scored high on criteria related to data collection, analysis transparency, and bias minimization.
Quantitative Studies: Quantitative investigations by the researchers (e.g., (Poushneh & Vasquez-Parraga, 2017); (Yim et al., 2017) reported clearly defined hypotheses and utilized appropriate sample sizes and statistical analyses. The majority of these studies received affirmative scores on the MMAT criteria for sample justification and the validity of their statistical methods.
Mixed-Methods Studies: In this research, studies employing mixed methods were assessed for the integration of qualitative and quantitative findings. The synthesis of data in these studies (e.g., (Francesca Bonetti, G. Warnaby, 2018)) was generally found to be well-executed, although a couple of studies reported integration challenges, which were duly noted.
Overall, the MMAT scores specified that most of the included studies were of high methodological quality, ensuring that the conclusions drawn in this review are based on rigorous and reliable evidence.

7.4. Findings of the study

7.4.1. Impact of AR and VR on perceived ease of use

Studies shows that when AR interfaces are intuitive and easy to navigate, they are knowingly enhancing consumer comfort and likelihood of adoptions. Some studies shows that PEOU exerts only indirect impact on purchase intention through usefulness or enjoyment, it enhancing the need for strong integration of usage into adoption of AR models (Ngo et al., 2025; Nguyen et al., 2025). (Huang & Liu, 2014) established that interactive AR applications reduce mental effort by offering a user-friendly interface that simplifies the decision-making process. Similarly, researchers (McLean, G., & Wilson, 2019) reported that AR-integrated mobile applications provide seamless navigation and real-time feedback, which improve the overall usability of online beauty platforms. The Technology Acceptance Model (Davis, 1989)serves as a theoretical foundation for those findings, where perceived ease of use is directly linked to technology adoption. The evidence suggests that consumers are more likely to adopt AR/VR tools if the technology is user-friendly and reduces the complexity typically associated with online cosmetic shopping.

7.4.2. Influence on consumer attitudes

Consumer attitudes towards cosmetic products are highly influenced by the immersive nature of AR/VR experiences. (Javornik, 2016) stated that the realistic and interactive features of AR applications provide a strong emotional connection with consumers, fostering positive attitudes toward the products showcased. Furthermore, studies by (Scholz & Smith, 2016) and (Heller et al., 2019) show that immersive experiences not only enhance enjoyment but also build trust, which is difficult for the adoption of new retail technologies. For instance, (Ngo et al., 2025) highlighted that consumer attitudes significantly influence and bridge the gap between purchase behaviour and AR system quality. The above studies recruit that when consumers can virtually try on makeup or communicate with products in a simulated environment, leads to develop a favourable perception of both the product and the brand. In addition, the personalized experiences assisted by AR and VR are linked with increased customer satisfaction, more reinforcing positive attitudes.

7.4.3. Effects on purchase intentions

One of the most critical outcome in understanding consumer behaviour is Purchase Intensions. In confirmation of this, the above reviewed studies showcase convincing evidence that AR and VR have had strong and positive effect on Purchase Intentions. Brand trust strengthen and making AR try on applications influencing beauty and personal care products ((Salma Dhianita & Popy Rufaidah, 2024) and (Nguyen et al., 2025). For instance, (Poushneh & Vasquez-Parraga, 2017) discovered that virtual try-on features increased consumers' purchase willingness through significant reduction of purchase uncertainty. Similarly, (Yim et al., 2017) mentioned that improved interactivity and vividness in AR experiences leads to higher rate of purchases made online. (Pizzi, G., & Scarpi, 2019) supported these findings by highlighting that cognitive innovativeness plays a controlling role; early adopters of AR technology are generally more willing to showcase better purchase intentions due to enriched product visualization and reduced perceived risk.

7.4.4. Additional consumer outcomes

Brand Perception and Loyalty: (Hilken et al., 2017) emphasized that AR and VR not only effects the immediate consumer decisions but also long-term influence on brand perception. Positive AR experiences increase perceptions of brand innovativeness, which can convert into long term royalty (Kazmi et al., 2021). Higher user experiences convert into developed brand loyalty and a stronger emotional connection with the brand.
User Engagement and Satisfaction: (Francesca Bonetti, G. Warnaby, 2018) identified that the immersive and interactive nature of AR and VR gained overall user engagement, which in turn increases shopping satisfaction. The hedonic value of AR, including enjoyment and novelty, enhance both satisfaction and continuance intention (Naveen et al., 2025). Consumer are more wish to provide favourable feedback and become royal customer.
Customer Experience and Trust: Trust in the online shopping plays a vital role for technology adoption. Concern about privacy and data security can moderate the relationship between AR integrity and purchase decision. When trust established, AR can elevate customer confidence and improve overall shopping experience (Ngo et al., 2025). Studies such as (Rese et al., 2017) and (Youn, S. Y., & Jin, 2020) discovered that consumers identify AR and VR shopping environments as more trustworthy while they offer high levels of interactivity and realism. This trust is key for enabling consumers to switch from conventional shopping methods to digital, AR and VR-enabled experiences.

8. Discussions

Augmented and Virtual Reality technologies have become a revolutionary in the cosmetics industry by enhancing the consumer shopping experience. The key findings suggested that perceived ease of use increased positive consumer attitudes and ultimately purchase intentions strengthen with the use of AR technologies. By providing immersive and realistic product experience, AR and VR effectively bridging the gap between online shopping convenience and in-store engagement.

From the perspective of management, cosmetic brand can leverage integration of AR and VR within their online sales and marketing strategies to have good personalized experiences by differentiate among themselves by competitive market and habituate stronger customer loyalty. This inculcation of technology boosts immediate consumer engagement and also brings about long-term brand trust and satisfaction.

The discussion also shows the path ahead which should include studies to evaluate the sustained impact of AR/VR on brand loyalty, investigate the integration of AI for customisation of those experiences and perform cross cultural analyses to understand variations in consumer behaviour. Overall, the findings of the study are evidence that AR and VR are a vital tool for reshaping consumer behaviour in the competitive cosmetics industry.

In cosmetic specifically, the accuracy of shades, textures and skin tones is acute to consumer acceptance. Even though consumer navigation or inconsistent across devices, strengthening ease of use as an ongoing challenge. Furthermore, while emotional and psychological constructs such as enjoyment, decision comfort and trust are essential drivers of adoption, these are measured very inconsistently across various studies.

The studies which reviewed represent diverse geographical contexts including South Asia, Southeast Asia and European markets, indicating that AR/VR adoption in cosmetics is influenced by culturally familiar with use of technology, digital literacy and trust in online shopping. However, variation across regions suggests the need for cross –cultural studies to better understand contextual differences in consumer response to immersive technologies.

Majority of the study is based on cross-sectional survey, limiting to long term impact. To advance this area, research should adapt experimental and longitudinal design to determine whether AR and VR extended beyond the short term impact such as loyalty, repeat purchase and retaining consumer satisfaction.

9. Suggestions

1) Construct user-friendly platforms involving AR and VR that are easy to use & navigate, minimizing the effort required for customer to understand the virtual environments.
2) Increase customer engagement and interaction during their online shopping experience by introducing life-like virtual try-on tools and premium quality 3D visuals of the products which help in building trust and strengthen emotional bonds with the consumers.
3) Data is the new currency in marketing. Make use of data analytics to gain insight of customers' choices and behaviours, enabling targeted marketing initiatives and better informed product development cycles.
4) To maintain a competitive edge, take the big leap by partnering with leading technology providers to ensure continuous innovation and the deployment of cutting-edge AR and VR solutions.
5) Always look for avenues to improve upon by learning through continuous feedback and research mechanisms and adapt AR and VR applications in line with evolving consumer expectations to ensure sustained loyalty and satisfaction.

10. Conclusion

This systematic review examined how the augmented and virtual reality technologies shape consumer behaviour in the cosmetics industry. Drawing inferences from eighteen significant studies, the findings reveals that these technologies remarkably improve the online buying experience. The customers' perceived ease of use was enhanced by tools such as virtual try-on applications and detailed 3D visualizations by reducing the cognitive effort and streamlining product evaluation. These intuitive interfaces are thekey drivers for technology adoption, as described by the Technology Acceptance Model (Davis, 1989).

The positive impact of AR and VR on consumer attitudes also come out distinctively through the studies. Immersive interaction allow for emotional engagement (Javornik, 2016) and increase trust by giving realistic previews and customised experiences with cosmetic products (Scholz & Smith, 2016). This not only elevates immediate buying intentions but also promotes continuous brand loyalty. AR and VR are known for their ability to deliver personalized, interactive experience that physical stores often lack due to limitations in time, options or availability, enabling online shopping brands to stand apart in a competitive landscape.

However, there remains a scope for further understanding the long-term impacts of AR and VR on consumer retention and loyalty, as well as the potential of incorporating artificial intelligence for deeper personalization. Cross-cultural differences in adoption and engagement with these technologies should also be explored in future to enable a more comprehensive understanding of the technologies' impact.

In conclusion, AR and VR represent transformative innovations for the cosmetics retail industry, improving customer experiences, building consumer perceptions and directing purchase decisions. By creating dynamic and interactive digital environments, these technologies not only convert into immediate sales opportunities but also become the backbone for sustained customer relationships and ongoing digital advancement in the cosmetics sector.

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Appendix 1: Search Log

Database	Search Strings/ Keywords	Coverage Period	Records retrieved	Filters applied	Final Studies included
Scopus	("Augmented Reality" OR "Virtual Reality" OR AR OR VR OR "Virtual Try-On") AND ("Cosmetics" OR "Beauty Products") AND ("Perceived Ease of Use" OR "Consumer Attitude" OR "Purchase Intention")	2010-2025	120	Peer-reviewed business management, Social sciences	40
Web of Science	("Augmented Reality" OR "Virtual Reality") AND ("Cosmetic Industry" OR "Beauty Retail") AND ("Consumer Behaviour" OR "Technology Acceptance")		95	SSCI/SCI indexed journals	32

Pubmed	("Augmented Reality" OR "Virtual Reality") AND ("Cosmetic Industry" OR "Beauty Retail") AND ("Consumer Behaviour" OR "Technology Acceptance")	65	Full text	18
ScienceDirect	("Augmented Reality" OR "Virtual Reality") AND ("Online Shopping" OR "Cosmetics Retail") AND ("Ease of Use" OR "Purchase Behaviour")	70	Research articles – business & management	20
IEEE Xplore	("Augmented Reality" OR "Virtual Reality") AND ("Retail" OR "E-commerce" OR "Virtual Try-On")	85	Journal, Conference papers	25
Springer Link	("Augmented Reality" AND "Cosmetics") OR ("Virtual Reality" AND "Beauty Retail")	40	Peer-reviewed	15
Google Scholar	("Augmented Reality" "Cosmetics" "Purchase Intention") OR ("Virtual Try-On" "Beauty Products")	25	First 100 results screened	10
Others	("Augmented Reality" AND "Consumer Behaviour") OR ("Virtual Reality" AND "Retail Experience")	20	Peer-reviewed	10
		500		180 (18 included in meta-analysis)

Source: Authors Compilation.

Appendix 2: Prisma Check List

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title page
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Section 1 - Introduction
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Section 2 - Research questions
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Section 54 – Inclusion and Exclusion criteria
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Section 5.2 Literature Search
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Section 5.3 – Search Strategy
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Section 6.1 – Study Selection; Figure 1 – PRISMA Flow Diagram
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Section 5.3 & 5.4 PICO, PRISMA, MMAT
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Table 4.1 -4.4 – Table 1 – Study Characteristics
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Section 5.4– Eligibility Criteria; Table 1
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Section 6.3 Quality assessment using MMAT framework
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Section 6.4 – Findings of the Study
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Sections 6.1 & 6.4
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Section 5.3 – Data Extraction
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Tables 1-2 Figures 1
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Section 6.4 – Narrative Synthesis
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Section 7 - Discussion
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Section 6.3 –MMAT Quality Assessment
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Section 6.3 – Quality Assessment
RESULTS			

Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Section 6.1; Figure 1 – PRISMA Flow Diagram
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Section 6.1 – Study Selection
Study characteristics	17	Cite each included study and present its characteristics.	Table 1 – Study Characteristics
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Table 2 – MMAT evaluation
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Section 6.4 – Findings of the Study
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Section 6.3 – Quality Assessment
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Section 6.4 – Findings
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Section 7 – Discussion
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Section 6.3
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Section 6.3 & 9 – Conclusion
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Section 7 – Discussion
	23b	Discuss any limitations of the evidence included in the review.	Section 7 – Discussion
	23c	Discuss any limitations of the review processes used.	Section 7 – Discussion
	23d	Discuss implications of the results for practice, policy, and future research.	Section 8 – Suggestions
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Section 5.1 – Type of Study
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Section 5.1
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not Applicable
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Acknowledgement Section
Competing interests	26	Declare any competing interests of review authors.	Competing interest section
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Data Availability Statemebt

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. This work is licensed under CC BY 4.0. To view a copy of this license, visit https://creativecommons.org/licenses/by/4.0/

Appendix 3: Search Strings

(Consumers OR "Cosmetic shoppers" OR "Beauty consumers" OR "Retail customers" OR "Makeup users" OR "Digital shoppers" OR "Online beauty buyers" OR "Tech-savvy consumers" OR "E-commerce users" OR "Personal care consumers") AND ("Augmented Reality" OR AR OR "Virtual Reality" OR VR OR "Immersive technologies" OR "Virtual try-on" OR "Digital makeup application" OR "3D beauty visualization" OR "Virtual cosmetic sampling" OR "AI-powered beauty tools" OR "Mixed reality shopping" OR "Cosmetic technology innovations") AND ("Traditional shopping" OR "Physical store experience" OR "In-store cosmetic trials" OR "Manual product testing" OR "Non-digital shopping" OR "Brick-and-mortar retail" OR "Paper-based beauty catalogues" OR "Standard e-commerce platforms" OR "Conventional beauty marketing" OR "Traditional consumer engagement") AND ("Perceived ease of use" OR "Consumer attitudes" OR "Purchase intentions" OR "User engagement" OR "Brand perception" OR "Shopping satisfaction" OR "Customer experience" OR "Trust in AR/VR shopping" OR "Brand loyalty" OR "Consumer decision-making").