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The New Realm of Digital Advertising: Unveiling the Impact and Opportunities of Augmented Reality and Virtual Try-Ons Title

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ABSTRACT
The retail and advertising sectors have significantly transformed in recent years, mainly owing to the seminal introduction of augmented reality (AR) and virtual try-ons. These technologies have transformed the shopping landscape. They have introduced immersive and interactive platforms that enhance virtual engagement with products. The present study deeply explores these pivotal technologies, scrutinizing their role and impact on digital advertising. It seeks to unravel the complex nuances associated with these technologies and their profound influence on various aspects, including consumer behaviour, economic frameworks, societal norms, and environmental sustainability, all the while emphasizing a shopping experience that is both inclusive and sustainable. The research uses a structured methodology to explore core digital advertising and AR theories. It reviews extensive literature to identify gaps and suggest future research directions. The study leverages a comprehensive case study analysis focusing on IKEA's AR application, IKEA Place. This example illustrates how successfully these technologies have been integrated into the retail industry. It highlights how AR and virtual try-ons enhance the shopping experience, making it richer and more satisfying. Consequently, these technologies have emerged as powerful drivers for economic growth, inclusivity, and environmental sustainability, heralding a promising future for digital advertising.
Keywords: *Augmented reality, Virtual try-ons, Digital advertising, Consumer behaviour, Retail industry*

1. Introduction

In a world inundated with information, digital advertising emerges as a central strategy for seizing consumer attention and nurturing business growth. By leveraging a spectrum of practices, advertisers utilize various online platforms to promote products or services, extensively using search engine optimization, pay-per-click advertising, and social media marketing to pinpoint and reach targeted audiences (Huang et al., 2018). This sphere has dramatically evolved over centuries, morphing from basic word-of-mouth recommendations to sophisticated digital campaigns orchestrated with artificial intelligence and big data analytics. The inception of the internet heralded a pivotal shift, unveiling a wealth of unprecedented channels and instruments that allow advertisers to engage consumers on a more personal and interactive level (Nyström & Mickelsson, 2019).

Virtual try-ons and Augmented Reality (AR) are at the forefront of this digital revolution. They allow customers to virtually 'try' products or experience services before purchasing. These technologies have transformed the shopping experience, offering a personalized touch by enabling consumers to visualize products in real-life settings, mitigating the uncertainties often associated with online shopping. AR further enriches this experience by overlaying virtual objects onto the physical realm, achievable through the lens of smartphone cameras or AR glasses, and creating a novel interaction pathway with products and services (Poushneh & Vasquez-Parraga, 2017).

Diving deeper into the contemporary digital panorama reveals the profound impact of integrating virtual try-ons and AR in the digital advertising milieu, revolutionizing marketing approaches and significantly influencing consumer behaviour. These innovations foster a rich, interactive, and captivating platform, successfully bridging the gap between the digital and physical worlds and nurturing a holistic shopping journey aligned with the dynamic expectations of today's digital-savvy consumers. They have nurtured a generation of informed

and empowered buyers and signal a promising future characterized by enhanced consumer engagement and fortified business-consumer relationships, laying a solid foundation for exploring the vibrant landscape of digital advertising in the subsequent sections of this discourse (Javornik, 2016).

Having introduced the central role of digital advertising in the modern marketplace, we now turn to a detailed literature review to trace how emerging technologies like AR and virtual try-ons have evolved within this dynamic field.

2. Literature Review

2.1 Digital Advertising

Digital advertising began in the early 1990s with the advent of the Internet for commercial use. The first banner ad appeared on HotWired.com in 1994, marking the inception of digital advertising (Pritchard, 2020). Initially, digital ads were simple and direct, primarily aiming to gain viewers' attention through essential interactive elements. As the Internet evolved, so did advertising techniques, incorporating more sophisticated graphics, targeted content, and interactive features. The early 2000s saw the rise of search engine advertising, social media marketing, and mobile advertising, which broadened the scope and effectiveness of digital campaigns (Cho & Park, 2019).

The progression of digital advertising is closely tied to technological advances and changes in consumer behaviour. Retailers began to leverage data analytics to understand consumer preferences and behaviour, which led to more personalised advertising. Programmatic advertising emerged as a significant breakthrough, using algorithms to buy and display ads in real-time. The approach allowed for more efficient use of advertising budgets and improved targeting of potential customers (McGuigan, 2019). Omni-channel marketing became crucial as retailers sought to provide a seamless customer experience across multiple platforms.

In recent years, the digital advertising landscape has incorporated cutting-edge technologies. Artificial Intelligence (AI) and machine learning have been game changers (Park et al., 2023), nabling predictive analytics to forecast consumer behaviour and optimise ad performance. Augmented Reality (AR) and Virtual Reality (VR) have started to transform engagement strategies by creating immersive shopping experiences (Kushnarevych & Kollárova, 2023). Chatbots and voice search have also begun to play pivotal roles in personalised customer interaction and service (Shanahan & Kurra, 2011).

The future of digital advertising in the retail sector will likely be shaped by further technology integration with a strong emphasis on data privacy and ethical advertising. The advent of 5G and improved internet connectivity will enhance real-time data transmission and ad delivery. Blockchain technology could revolutionise transparency in ad buys, combating fraud and ensuring that advertisers pay only for genuine engagements. Furthermore, as consumers increasingly value sustainability and corporate responsibility, digital ads will likely focus more on aligning brand values with consumer expectations.

Digital advertising has undergone substantial transformations from its inception to the present day. For retailers, staying ahead in digital advertising means adopting new technologies and anticipating changes in consumer expectations and regulatory environments. Continuously innovating and adapting strategies will be crucial for success in an increasingly competitive digital marketplace.

2.2 Augmented Reality in Digital Advertising

Augmented Reality (AR) has emerged as a transformative technology in digital advertising (Simon et al., 2023). It provides innovative ways for retailers to engage with consumers by overlaying digital information in the real world. This technology enhances physical environments through interactive and immersive experiences, revolutionising how consumers interact with brands (Chehimi et al., 2007).

One of the critical applications of AR is in product visualisation and interactive marketing campaigns. For instance, furniture retailers like IKEA allow customers to visualise how products would look in their homes via AR apps, which helps reduce uncertainty and return rates. Similarly, cosmetic companies use AR filters on social media to let users virtually try on makeup, enhancing the shopping experience and increasing the likelihood of purchase. These interactive campaigns encourage users to share their experiences on social media, boosting brand visibility and engagement (Kiu et al., 2018; Mauroner et al., 2016).

AR can provide digital overlays of product information such as nutritional facts, user reviews, or even videos when consumers point their smartphones at products in physical retail environments. This capability not only aids in making more informed decisions but also improves the overall shopping experience. AR-driven navigations help customers locate items in large stores, enhancing customer satisfaction. Moreover, AR enables retailers to set up virtual pop-up stores accessible anywhere through smartphones or AR glasses, broadening their reach and allowing for innovative, engaging shopping experiences without needing a physical store presence (Singh & Pandey, 2014).

Additionally, AR is beneficial for training and supporting store staff and customers. It offers real-time information overlays for on-the-job training and interactive troubleshooting or assembly instructions for customers, thus enhancing post-purchase support and employee efficiency (Kiu et al., 2018).

Augmented Reality in digital advertising represents a significant shift towards more engaging, interactive, and personalised consumer experiences. As AR technology continues to advance and become more widespread (Gupta et al., 2023), its role in enhancing customer engagement and conversion rates in retail is expected to grow, offering fresh and innovative ways for brands to connect with their customers.

2.3 Virtual Try-Ons is a Digital Innovation

Virtual try-ons are a digital innovation in retail that leverages Augmented Reality (AR) and sometimes Artificial Intelligence (AI) to allow customers to see how products like clothes, accessories, cosmetics, and eyewear would look on them without physically trying them on. This technology offers convenience and enhances online and in-store shopping experiences, and it is becoming increasingly popular (Marelli et al., 2022).

Virtual try-ons utilise a customer's camera to capture real-time images or video, applying AR to overlay digital images of products on the user. The real-time visualisation adjusts products like glasses to fit the user's head movements or facial expressions, providing a realistic view of the items' appearance. Additionally, these systems offer extensive customisation options, letting users experiment with different colours, styles, or sizes. This visualisation is helpful in cosmetics for trying out various makeup shades directly on their actual features, aiding confident purchasing decisions (Balamurugan et al., 2022).

The accessibility enhanced by virtual try-ons allows people to explore and evaluate products from anywhere, which benefits those far from physical stores or with limited mobility. This technology increases customer satisfaction by offering a fun, engaging product interaction that reduces the likelihood of returns due to improved product understanding and enhances operational efficiency. Retailers can reduce the need for physical samples and demo products, cutting inventory and logistics costs. Additionally, virtual try-ons can streamline the sales process, reduce staff burden, and minimise physical product handling, a notable advantage highlighted during health crises like the COVID-19 pandemic (Pantano et al., 2017).

Moreover, the data collected from these interactions offers valuable insights into customer preferences and behaviour, valid for targeted marketing and product offering improvements. Retailers can analyse which products are frequently tried on and purchased, optimising stock and marketing strategy (Imran et al., 2023).

Virtual try-ons are transforming retail by providing immersive digital experiences that enhance customer interaction with products. As this technology evolves, it is expected to become a standard in retail, significantly affecting consumer habits and expectations and offering retailers a competitive edge and stronger customer relationships through more personalised and satisfactory shopping experiences.

3. Research Methods

3.1 Underlying Theories Supporting Digital Advertising

The digital advertising landscape leans heavily on various theoretical frameworks to design strategies that effectively influence consumer perceptions and behaviours. Recent developments in this sphere highlight the significance of the Communication-Persuasion Matrix, elucidating pathways from message exposure to behavioural change, thereby guiding the creation of digital advertising strategies grounded in persuasive communication principles (Percy & Rosenbaum-Elliott, 2020). Furthermore, the theory of Uses and Gratifications has evolved to explain the active seeking of specific digital media to satisfy individual needs, a cornerstone in crafting personalized advertising strategies (Whiting & Williams, 2013).

3.2 Theories Explaining Consumer Behaviour in Online Shopping

Understanding consumer behaviour in online shopping is paramount for effectively leveraging technologies like AR and virtual try-ons. The Technology Acceptance Model (TAM) remains central, advocating that a user's acceptance of technology is primarily influenced by its perceived usefulness and ease of use. This model can explain why consumers might prefer AR-enhanced shopping experiences, as these technologies often simplify the decision-making process and enhance product interaction, making them appear more useful and easier to use (Do et al., 2020).

Furthermore, the Theory of Planned Behaviour has been adapted to the digital context to study how subjective norms and perceived behavioural control influence online shopping behaviours. This theory is especially relevant when considering how social influence and ease of control over the technology can affect a consumer's decision to use AR for shopping. For instance, if consumers feel that using AR is a socially accepted and encouraged behaviour, and if they find the technology accessible to control and interact with, they are more likely to engage with it and ultimately make a purchase (Turan, 2012).

Recent studies have also begun to apply the Stimulus-Organism-Response (SOR) model in online shopping contexts to understand how specific stimuli provided by online platforms, like AR and virtual try-ons, can affect the internal state of the consumer and lead to a specific response—such as making a purchase. This model highlights the role of AR in providing stimuli that can lead to positive emotional reactions (Organism) from consumers, thereby increasing their likelihood of purchasing (Response) (Do et al., 2020).

Lastly, the concept of Cognitive Absorption has been pivotal in understanding consumer engagement with immersive technologies. This theory suggests that when consumers are deeply engrossed in an activity (high cognitive absorption), they are more likely to find the experience satisfying, which AR and virtual try-ons can significantly facilitate. The immersive nature of AR can captivate consumers' attention fully, leading to a deeper connection with the product and a higher likelihood of purchase (Wang et al., 2010).

By integrating these theories, we can gain a nuanced understanding of how augmented reality and virtual try-ons modify traditional online shopping behaviours and enhance consumer engagement through improved interactivity and personalized experiences.

3.3 The Role of Virtual Try-Ons and AR from a Theoretical Standpoint

Navigating further into the intricacies of AR and virtual try-ons, it is essential to note the contemporary adaptation of the Stimulus-Organism-Response (SOR) model in the digital realm.

Recent studies apply this model to understand how stimuli facilitated by AR and virtual try-ons influence consumers' internal states, guiding their purchase intentions (Parboteeah et al., 2008). Additionally, research in online shopping leverages theories such as Cognitive Absorption to explain how immersive technologies like AR can create rich environments that engross users, fostering a deeper connection with the advertised products (Agrebi & Jallais, 2015).

In the subsequent section, we will examine virtual try-ons closely. To facilitate a comprehensive comprehension of the transformative impacts of augmented reality (AR) and virtual try-ons in the realm of digital advertising, we will rely on contemporary theoretical frameworks. These frameworks provide valuable guidance and contribute to a nuanced understanding, drawing upon established theoretical perspectives.

Equipped with a solid methodological framework, we present the findings from our case studies and discussions, showcasing the direct impacts of AR and virtual try-ons on consumer engagement and the retail experience.

4. Results and Discussions

4.1 Virtual Try-Ons

Virtual try-ons refer to the digital simulation of trying on products, such as clothing or accessories, using computer-generated imagery (CGI) or augmented reality (AR) technology. This innovative approach allows users to virtually experience the look and fit of various items. Virtual try-ons have emerged as a significant advancement in the digital realm, enabling consumers to engage in the virtual simulation of product trials using immersive technology, all within the confines of their residences. By utilising augmented reality (AR) and computer vision technologies, virtual try-ons facilitate the creation of a simulated environment. This environment allows consumers to visualise the appearance of various products, such as garments and furniture, in real-life settings. Consequently, this technology promotes a more informed and confident purchasing decision (Bonetti et al., 2018).

Various technologies that provide virtual try-on

The virtual try-on ecosystem is facilitated by diverse technologies collaborating to provide users with a seamless experience. At the core of this phenomenon lie augmented reality (AR) and artificial intelligence (AI), which, by use of advanced algorithms, facilitate the accurate identification of tangible attributes and surroundings, hence allowing for the seamless integration of digital components in a lifelike manner (Yim et al., 2017). In addition, the progress made in 3D modelling and computer vision has contributed to improving the virtual try-on experience. The result is achieved by enabling a more accurate depiction of products, which provides users with comprehensive information on many aspects, including texture and fit (Poushneh & Vasquez-Parraga, 2017).

Case studies: Exemplary instances of brands employing virtual try-ons to achieve success

Numerous firms, such as IKEA, Warby Parker, L'Oréal, and Nike, have intelligently used virtual try-on technology to augment the consumer experience and stimulate sales.

IKEA Place and the Technology Acceptance Model: The IKEA Place app is a practical application of the Technology Acceptance Model (TAM). This model suggests that users are more likely to adopt a technology if they perceive it as valuable and easy to use. IKEA Place allows customers to visualise furniture in their homes using AR, directly enhancing the perceived usefulness by solving the common dilemma of spatial compatibility. The app's intuitive interface contributes to its ease of use, encouraging broader acceptance and integration into shopping habits. This case study exemplifies how AR can bridge the gap between technology acceptance and consumer behaviour in a retail context (Koufaris, 2002).

Warby Parker and the Theory of Planned Behaviour: Warby Parker's use of AR technology for virtual eyeglass try-ons aligns with the Theory of Planned Behaviour, emphasising the influence of perceived behavioural control and social norms on behaviour. Warby Parker

enhances consumers' control over their purchasing decisions by providing a tool that lets them quickly try on glasses virtually. Moreover, as social norms evolve to endorse technological solutions in shopping, consumers are more likely to buy online, reflecting this theory's principles (Turan, 2012).

L'Oréal's Modiface and the Stimulus-Organism-Response Model: L'Oréal's acquisition of the AR company Modiface and the subsequent integration of virtual makeup try-ons is a relevant example of the Stimulus-Organism-Response (SOR) model. The AR try-on acts as a stimulus that modifies the consumer's internal state (Organism) by providing a fun and interactive way to experiment with different looks. This positive engagement leads to a favourable response, evidenced by increased consumer satisfaction and a higher likelihood of purchase. This case study demonstrates how AR can create engaging stimuli that lead to positive consumer responses (Do et al., 2020).

Nike and Cognitive Absorption: Nike's implementation of AR to help customers find the perfect shoe fit can be seen through the lens of Cognitive Absorption. This theory suggests that profoundly immersive and engaging experiences can lead to greater satisfaction. Nike's AR feature captures consumers' full attention, allowing them to interact with the product in a novel way that enhances their shopping experience and satisfaction. This approach not only shows the application of AR in creating engaging user experiences but also underlines the impact of immersive technologies on consumer behaviour in line with the Cognitive Absorption theory (Wang et al., 2010).

4.2 The Application of Augmented Reality in The Retail Industry

Augmented Reality (AR) has emerged as a transformative phenomenon within the retail industry (Simon et al., 2023). It fundamentally alters how consumers engage with their shopping experiences by seamlessly integrating digital information into the physical world. According to Yim et al. (2017), this sophisticated technology allows individuals to interact with digital overlays of merchandise via mobile devices or augmented reality glasses. The results are a very immersive shopping experience surpassing traditional retail practices' conventional limitations. The advancement of various advanced technologies has played a crucial role in facilitating the integration of augmented reality (AR) in the realm of shopping, hence leading to a revolutionary trip. The utilisation of 3D modelling in technology is significant, as it involves the creation of realistic digital replicas of objects, enabling consumers to view items from various perspectives. This capability enhances the overall shopping experience (Javornik, 2016).

Moreover, augmented reality (AR) is constructed upon the fundamental principles of computer vision, spatial computing, and depth tracking. These tools possess a high level of proficiency in seeing and evaluating the tangible environment. According to Olsson et al. (2013), incorporating digital components into real-world settings promotes a smooth and uninterrupted integration, resulting in a heightened user experience characterised by enhanced realism and interactivity.

Case studies are a prevalent research method in various academic disciplines. They involve in-depth examination and analysis of The Efficacy of Brand Success and the use of Augmented Reality (AR) technology in shopping.

Brands on a global scale are increasingly adopting augmented reality (AR) technology to transform the shopping experience. As an illustration, IKEA has implemented the "IKEA Place" application, which enables customers to employ an augmented reality interface to see the appearance and spatial compatibility of furniture within their residences. This strategic initiative has been observed to augment customer engagement and satisfaction significantly. In addition, Nike's implementation of augmented reality (AR) technology within its application allows customers to utilise AR to determine their ideal shoe size. This feature enhances the shopping experience by tailoring it to individual preferences and lowering the frequency of

returns. It also exemplifies the successful integration of technology and customer service within Nike's operations.

As we prepare to examine the broader societal implications of these groundbreaking technologies in the subsequent section, we must recognise the revolutionary influence that augmented reality (AR) exerts on the current shopping environment. As mentioned earlier, the phenomenon has altered how consumers engage with products and establish a foundation for a future characterised by inclusivity, accessibility, and environmental consciousness. The subsequent section will thoroughly explore these facets and analyse the broader implications on society.

4.3 Impact on Society

Virtual try-ons and augmented reality (AR) inside the retail sector signify a significant shift in customer behaviour and the larger cultural framework. These technologies augment the shopping experience and significantly impact purchase decisions. The utilisation of realistic environments for visualising products has decreased uncertainty and promoted confident purchasing, guiding consumers towards making more informed decisions (Poushneh & Vasquez-Parraga, 2017).

The retail industry has experienced a significant increase in sales and revenue due to the enhanced customer involvement made possible by immersive technologies when viewed from an economic perspective. According to Javornik (2016), there is evidence to suggest that brands that have adopted augmented reality (AR) and virtual try-on technologies have observed increased conversion rates. This phenomenon can be attributed to the unique opportunities these tools provide for customers to interact with items, resulting in heightened satisfaction and strengthened brand loyalty.

Furthermore, these technological improvements prioritise the values of inclusion and accessibility, accommodating a wide range of customers, including those with disabilities. According to Bonetti et al. (2018), the shopping process is democratised by eliminating geographical constraints, resulting in a standardised purchasing experience that promotes inclusivity in the global retail ecosystem.

In addition to its positive attributes, augmented reality (AR) and virtual try-ons have emerged as viable solutions for promoting environmental sustainability within the retail industry. Providing consumers with a more precise virtual representation of products reduces the frequency of returns and the resulting waste, mitigating adverse environmental effects and guiding the sector towards a sustainable path (Joerß et al., 2021).

As society progresses in exploring the difficulties and potential benefits arising from these technological developments, it is crucial to maintain focus on their diverse and far-reaching effects on society. The following part explores the significant potential of these technologies, examining the challenges and opportunities they present in transforming the digital advertising industry and society.

4.4 Challenges and Opportunities

Although augmented reality (AR) and virtual try-ons have significantly transformed the shopping experience, they face technical obstacles. According to Rese et al. (2014), contemporary technologies occasionally require assistance in accurately replicating textures and colours, resulting in diminished realism in portraying objects. In addition, the substantial expenses associated with development and the requirement for robust computational resources might present considerable obstacles, hence limiting the ability of small and medium firms to exploit new technologies fully (Yim et al., 2017).

The subject of opportunities is a multifaceted concept encompassing a range of potential circumstances or Future Developments and Trends in the Field.

Despite the current constraints, the future presents favourable prospects for augmented reality (AR) and virtual try-on technologies. Artificial intelligence and machine learning are expected to enhance the user experience, creating a more immersive and lifelike environment (Javornik, 2016). In addition, the incorporation of haptic technology has the potential to enable consumers to perceive tactile sensations associated with objects, introducing a novel aspect to the virtual shopping experience and creating opportunities for revolutionary advancements in the retail industry (Bonetti et al., 2018).

Examining ethical considerations is of paramount importance in this context. The topic of concern is the preservation of privacy and the safeguarding of data.

Using customer data in AR and virtual try-ons raises notable ethical problems like those associated with other technologies. The issue of privacy and data security is of utmost importance concerning these technologies, as they frequently necessitate the acquisition of personal information and have the potential to be misused for unauthorised data collection (Taddicken, 2014). Therefore, it is imperative to implement stringent data protection protocols and cultivate transparency in data utilisation as crucial measures to cultivate customer confidence and facilitate responsible utilisation of these technologies.

In the subsequent part, we examine a case study, utilising secondary data to provide a complete analysis of the augmented reality (AR) landscape. We must contemplate the problems and opportunities arising from AR and virtual try-ons.

The following section aims to establish a pragmatic basis for the theoretical discussions and analyses, offering a nuanced perspective on the transformative influence of these technologies on digital advertising and the enhanced autonomy they provide to consumer.

4.5 Case Study: Augmented Reality in The Latest Shopping Phenomena

Recently, there has been a significant transformation in the retail industry, characterised by enterprises adopting augmented reality (AR) technology to provide customers with a unique and engaging shopping experience. One notable pioneer in this field is the renowned Swedish furniture corporation IKEA, which has effectively employed augmented reality (AR) technology to revolutionise the furniture retail experience with their inventive smartphone application, IKEA Place. The initiation of this endeavour, based on a comprehensive comprehension of customer apprehensions regarding furniture acquisitions, constituted a crucial juncture in the retail industry, offering a resolution to the substantial obstacle encountered by consumers - the ambiguity regarding integrating a furniture item with their preexisting domestic arrangement.

The IKEA Place app uses Apple's ARKit framework to enable users to visualise furniture items in their homes through virtual means. This technology enables the accurate scaling of objects, achieving an impressive level of precision at 98%. The introduction of this innovation has not only initiated a period of well-informed consumer buying decisions but has also received recognition for the engaging and immersive shopping experience it promotes. This sentiment is reflected in the significant increase in app downloads and the excellent customer feedback (Pandolph, 2017).

The application has demonstrated a notable decrease in product returns, indicating a mutually beneficial outcome for the company and its customers. The increase in consumer interaction following the launch of the app serves as evidence of its success, leading the company towards a decrease in product returns and cultivating a mutually advantageous environment.

As we analyse the lessons and insights derived from this undertaking, it is indisputable that IKEA Place is a prominent example, showcasing the limitless possibilities of augmented reality (AR) in transforming the retail industry. The statement underscores the need to comprehensively comprehend consumer pain points, a fundamental basis for leveraging augmented reality (AR) to augment the purchasing experience, providing a satisfying and

participatory user trajectory. This case study emphasises the importance of ongoing innovation, emphasising the need for merchants to stay updated with technological breakthroughs to provide a constantly developing and enhanced shopping experience. It establishes a model for the retail industry to adopt.

Our results and discussions explored the extensive applications and transformative potential of AR and virtual try-ons. We now conclude by synthesising these insights and forecasting the future directions of these technologies in digital advertising.

5. Conclusion

This study has thoroughly explored the transformative impact of augmented reality (AR) and virtual try-ons within the digital advertising landscape, underscoring how these technologies enhance consumer engagement and significantly reshape retail experiences. Beginning with examining the evolution of digital advertising, we set the stage to deepen our understanding of AR and virtual try-ons as pivotal advancements. Our analysis revealed that these technologies improve the shopping experience by providing immersive, interactive platforms and significantly influencing consumer behaviour. Technologies such as IKEA Place and Warby Parker's virtual try-ons have demonstrated the ability to increase consumer confidence and decision-making, leading to higher sales and enhanced customer satisfaction.

By integrating theoretical frameworks such as the Technology Acceptance Model and the Theory of Planned Behaviour, our study contextualized the consumer's acceptance and the psychological impacts of AR on shopping behaviours. Practical applications seen in companies like L'Oréal and Nike have illustrated the success of these technologies in real-world settings, supporting our findings. In addressing our initial research questions, we confirmed that AR and virtual try-ons substantially benefit the retail and advertising sectors by enhancing user engagement and providing a richer, more personalized shopping experience, thereby serving as powerful tools for economic growth, inclusivity, and environmental sustainability.

This research contributes significantly to both academic and practical understandings of the future of digital advertising, particularly highlighting how immersive technologies can revolutionize consumer interactions and business outcomes. It provides a comprehensive view of the current capabilities and suggests future directions for AR and virtual try-ons, underlining their role as catalysts for innovation in digital marketing. Integrating advanced machine learning algorithms and the potential use of haptic technology could further refine AR experiences, making them even more engaging and realistic. These advancements deepen our understanding of digital consumer behaviour and open new avenues for research and application in digital advertising.

In conclusion, as we navigate the digital age, the strategic application of AR and virtual try-ons will undoubtedly play a crucial role in defining the following digital marketing era. By continually embracing these technologies, businesses can ensure they meet and exceed their customers' evolving expectations, fostering an innovative and user-centric digital environment.

References

Agrebi, S., & Jallais, J. (2015). Explain the intention to use smartphones for mobile shopping. *Journal of Retailing and Consumer Services*, *22*, 16-23. https://doi.org/https://doi.org/10.1016/j.jretconser.2014.09.003

Balamurugan, S., Ganesh, K. J., Reddy, M. R., Teja, S. A., & Suganya, M. J. (2022, 18-19 Nov. 2022). Development of Augmented Reality Application for Online Trial shopping. 2022 International Interdisciplinary Humanitarian Conference for Sustainability (IIHC), Bengaluru, India. https://doi.org/10.1109/IIHC55949.2022.10060473

Bonetti, F., Warnaby, G., & Quinn, L. (2018). Augmented Reality and Virtual Reality in Physical and Online Retailing: A Review, Synthesis and Research Agenda. In T. Jung & M. C. tom Dieck (Eds.), *Augmented Reality and Virtual Reality: Empowering Human, Place and Business* (pp. 119-132). Springer International Publishing. https://doi.org/10.1007/978-3-319-64027-3_9

Chehimi, F., Coulton, P., & Edwards, R. (2007, 9-11 July 2007). Augmented Reality 3D Interactive Advertisements on Smartphones. International Conference on the Management of Mobile Business (ICMB 2007), https://doi.org/10.1109/ICMB.2007.20

Cho, C.-H., & Park, J. S. (2019). Introduction to the special issue: new trends in digital and social media advertising. *International Journal of Advertising*, *38*(6), 821-823. https://doi.org/10.1080/02650487.2019.1644137

Do, H.-N., Shih, W., & Ha, Q.-A. (2020). Effects of mobile augmented reality apps on impulse buying behavior: An investigation in the tourism field. *Heliyon*, *6*(8), e04667. https://doi.org/10.1016/j.heliyon.2020.e04667

Gupta, N., Bansal, A., Khan, I. R., & Vani, N. S. (2023). Utilization of Augmented Reality for Human Organ Analysis. *International Journal on Recent and Innovation Trends in Computing and Communication*, *11*(8), 438–444. https://doi.org/10.17762/ijritcc.v11i8s.7224

Huang, R., Ha, S., & Kim, S.-H. (2018). Narrative persuasion in social media: an empirical study of luxury brand advertising. *Journal of Research in Interactive Marketing*, *12*(3), 274-292. https://doi.org/10.1108/JRIM-07-2017-0059

Imran, S., Chaudary, R., & Reshma, C. R. (2023). Advanced Virtual Fitting Rooms: A Review of Underlying Artificial Intelligence Technologies and Augmented Reality. *International Journal of Science and Research*, *12*(10), 412-416. https://doi.org/10.21275/SR231003234825

Javornik, A. (2016). Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behaviour. *Journal of Retailing and Consumer Services*, *30*, 252-261. https://doi.org/https://doi.org/10.1016/j.jretconser.2016.02.004

Joerß, T., Hoffmann, S., Mai, R., & Akbar, P. (2021). Digitalization as solution to environmental problems? When users rely on augmented reality-recommendation agents. *Journal of Business Research*, *128*, 510-523. https://doi.org/https://doi.org/10.1016/j.jbusres.2021.02.019

Kiu, C. C., Andrew, K. W. N., Lee, B., & Chan, C. W. (2018, 26-28 Oct. 2018). Augmented Reality Technology in Digital Advertising. 2018 Fourth International Conference on Advances in Computing, Communication & Automation (ICACCA), https://doi.org/10.1109/ICACCAF.2018.8776686

Koufaris, M. (2002). Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior. *Information systems research*, *13*(2), 205-223. https://doi.org/10.1287/isre.13.2.205.83

Kushnarevych, A., & Kollárova, D. (2023, Sep 2023). AR and VR as a Shaping Trend in Consumer Behaviour. Reading. https://www.proquest.com/conference-papers-proceedings/ar-vr-as-shaping-trend-consumer-behaviour/docview/2878849554/se-2?accountid=46437

Marelli, D., Bianco, S., & Ciocca, G. (2022). Designing an AI-Based Virtual Try-On Web Application. *Sensors*, *22*(10), 3822. https://doi.org/10.3390/s22103832

Mauroner, O., Le, L., & Best, S. (2016). Augmented reality in advertising and brand communication: an experimental study. *International Journal of information and communication engineering*, *10*(2), 422-425. https://doi.org/10.5281/zenodo.1338858

McGuigan, L. (2019). Automating the audience commodity: The unacknowledged ancestry of programmatic advertising. *New Media & Society*, *21*(11-12), 2366-2385. https://doi.org/10.1177/1461444819846449

Nyström, A.-G., & Mickelsson, K.-J. (2019). Digital advertising as service: introducing contextually embedded selling. *Journal of Services Marketing*, *33*(4), 396-406. https://doi.org/10.1108/JSM-01-2018-0043

Olsson, T., Lagerstam, E., Kärkkäinen, T., & Väänänen-Vainio-Mattila, K. (2013). Expected user experience of mobile augmented reality services: a user study in the context of shopping centres. *Personal and Ubiquitous Computing*, *17*(2), 287-304. https://doi.org/10.1007/s00779-011-0494-x

Pandolph, S. (2017). Ikea set to debut an augmented reality app. *Insider*. Retrieved 17 August 2023, from https://www.businessinsider.com/ikea-set-to-debut-an-augmented-reality-app-2017-9

Pantano, E., Rese, A., & Baier, D. (2017). Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets. *Journal of Retailing and Consumer Services*, *38*, 81-95. https://doi.org/10.1016/j.jretconser.2017.05.011

Parboteeah, D. V., Valacich, J. S., & Wells, J. D. (2008). The Influence of Website Characteristics on a Consumer's Urge to Buy Impulsively. *Information systems research*, *20*(1), 60-78. https://doi.org/10.1287/isre.1070.0157

Park, S., Jung, S., Lee, J., & Hur, J. (2023). A Short-Term Forecasting of Wind Power Outputs Based on Gradient Boosting Regression Tree Algorithms. *Energies*, *16*(3), 1132.

Percy, L., & Rosenbaum-Elliott, R. (2020). *Strategic advertising management*. Oxford University Press.

Poushneh, A., & Vasquez-Parraga, A. Z. (2017). Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. *Journal of Retailing and Consumer Services*, *34*, 229-234. https://doi.org/https://doi.org/10.1016/j.jretconser.2016.10.005

Pritchard, M. (2020). Commentary: "Half My Digital Advertising Is Wasted…". *Journal of Marketing*, *85*(1), 26-29. https://doi.org/10.1177/0022242920971195

Rese, A., Schreiber, S., & Baier, D. (2014). Technology acceptance modeling of augmented reality at the point of sale: Can surveys be replaced by an analysis of online reviews? *Journal of Retailing and Consumer Services*, *21*(5), 869-876. https://doi.org/https://doi.org/10.1016/j.jretconser.2014.02.011

Shanahan, J. G., & Kurra, G. (2011). Digital Advertising: An Information Scientist's Perspective. In M. Melucci & R. Baeza-Yates (Eds.), *Advanced Topics in Information Retrieval* (pp. 209-237). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-20946-8_9

Simon, J., Gogolák, L., Sárosi, J., & Fürstner, I. (2023). Augmented Reality Based Distant Maintenance Approach. *Actuators*, *12*(7), 302. https://doi.org/10.3390/act12070302

Singh, P., & Pandey, M. (2014). Augmented Reality Advertising: An Impactful Platform for New Age Consumer Engagement. *IOSR Journal of Business and Management*, *16*, 24-28. https://doi.org/10.9790/487x-16222428

Taddicken, M. (2014). The 'Privacy Paradox' in the Social Web: The Impact of Privacy Concerns, Individual Characteristics, and the Perceived Social Relevance on Different Forms of Self-Disclosure*. *Journal of Computer-Mediated Communication*, *19*(2), 248-273. https://doi.org/10.1111/jcc4.12052

Turan, A. H. (2012). Internet Shopping Behavior of Turkish Customers: Comparison of Two Competing Models. *Journal of Theoretical and Applied Electronic Commerce Research*, *7*(1), 77-93. https://doi.org/10.4067/S0718-18762012000100007

Wang, J., Gu, L., & Aiken, M. (2010). A Study of the Impact of Individual Differences on Online Shopping. *International Journal of E-Business Research (IJEBR)*, *6*(1), 52-67. https://doi.org/10.4018/jebr.2010100904

Whiting, A., & Williams, D. (2013). Why people use social media: a uses and gratifications approach. *Qualitative Market Research: An International Journal*, *16*(4), 362-369. https://doi.org/10.1108/QMR-06-2013-0041

Yim, M. Y.-C., Chu, S.-C., & Sauer, P. L. (2017). Is Augmented Reality Technology an Effective Tool for E-commerce? An Interactivity and Vividness Perspective. *Journal of Interactive Marketing*, *39*(1), 89-103. https://doi.org/10.1016/j.intmar.2017.04.001