

How AR Technology is Changing Consumer Shopping Habits: from Traditional Retail to Virtual Fitting

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Abstract: This paper examines the profound influence of augmented reality (AR) technology on consumer shopping behaviors, specifically the transition from conventional retail to virtual try-on encounters. The retail industry has undergone substantial transformation as a result of the emergence of e-commerce, which has brought forth both obstacles and prospects for retailers. Online shopping, although convenient, lacks the direct engagement and ability to physically examine products that are inherent in traditional retail. This has led to the development of augmented reality (AR) technologies to address this disparity. The study examines specific instances where augmented reality (AR) has been used in the context of custom furniture, virtual reality (VR) shopping experiences such as PaRUS, and improving accessibility for individuals with visual impairments. Findings suggest that augmented reality (AR) improves the shopping experience by providing virtual try-on capabilities and detailed product displays. The paper provides an analysis of the increasing adoption of augmented reality (AR), its impact on consumer decision-making, and suggestions for future research areas.

Keywords: Augmented Reality, AR Technology, Virtual Try-on, Consumer Shopping Behaviors, Retail Industry, E-commerce, Case Studies, VR Shopping, Accessibility, Recommender Agents, Future Research Directions.

1. Introduction

In recent decades, the retail industry has experienced significant transformations, transitioning from conventional physical stores to online shopping platforms. This shift has had profound effects on sales channels, shopping preferences, consumer behaviors, and retailers' operational strategies. Conventional retail has consistently been distinguished by brick-and-mortar stores and in-person customer service, offering consumers a tactile experience of directly interacting with and testing products. Nevertheless, due to the widespread availability of the Internet and the increasing prominence of e-commerce, consumers are progressively shifting towards online shopping to attain enhanced convenience and a broader selection of options. This transformation has not only influenced consumer purchasing patterns, but has also generated novel obstacles and prospects for retailers. The advent of e-commerce has facilitated unrestricted access for consumers to peruse and acquire merchandise at their convenience, irrespective of geographical constraints, thereby significantly enhancing the efficacy of the shopping process. The convenience has transformed the operational frameworks of retailers, leading to an increase in digital and electronic services. Retailers must adjust to this phenomenon by constructing robust online platforms to fulfill consumer demands and offer a more convenient and tailored shopping encounter.

Nevertheless, despite the convenience that online shopping provides, it also has certain limitations, particularly in regards to product presentation and overall experience. E-commerce restricts consumers from physically interacting with or testing products, potentially resulting in ambiguity and diminished contentment when making a purchase. Consumers' reservations regarding the quality, comfort, or appearance of a product may arise due to their inability to physically interact with it, thereby raising the probability of product returns. The

inability to physically perceive the product may impact the shopping experience, particularly for consumers with a strong emphasis on the intricate details and texture of goods. In order to overcome the constraints of conventional online shopping in terms of product display and user experience, augmented reality (AR) technologies have emerged in recent years to transform the retail industry. In their study, You et al. (2023) observe that AR and VR technologies are augmenting the user's online shopping experience by enhancing the contextual correlation between the product presentation and its actual usage scenarios. In addition, Xu et al. (2022) showcased the application of augmented reality (AR) technology in aiding shopping choices within physical stores in their study titled 'AR Shopping'. Their findings underscore the significant capacity of AR in furnishing comprehensive product details (Xu et al., 2022). Utilizing this nascent technology enables consumers to acquire a more extensive comprehension of products within a virtual setting, particularly through virtual try-on and 3D product demonstrations. Augmented reality (AR) not only addresses certain drawbacks of online shopping, but also offers consumers a more engaging and immersive shopping experience. AR technology allows consumers to virtually try on clothing and view furniture arrangements at home, enhancing the shopping experience and boosting confidence in purchasing choices.

The objective of this research is to acquire understanding of how augmented reality (AR) technology is revolutionizing the retail experience. Specifically, it aims to explore the shift from conventional retail to a novel shopping approach that incorporates virtual try-on capabilities. Our aim is to offer a comprehensive examination of the core principles and real-world uses of augmented reality (AR) technology in the retail industry. Through this, we seek to enhance the comprehension of retailers and consumers regarding their actions in the digital era, ultimately assisting them in adapting and

innovating more effectively.

Augmented reality (AR) technology enhances the shopping experience for consumers by overlaying virtual information onto the user's actual surroundings. The utilization of augmented reality (AR) technology, specifically through virtual try-on and 3D product display, is significantly altering consumers' shopping behaviors within the retail industry. This technology has not only triumphed in surpassing certain constraints of conventional online shopping, but also offers a more engaging and immersive shopping experience. Consumers can now utilize augmented reality (AR) technology to virtually try on clothing and preview furniture placement in their own homes. This enhances the shopping experience and boosts confidence in making a purchase. This customized and engaging shopping experience provides retailers with a cutting-edge method to effectively cater to consumers' demands and motivate them to make more assured and gratifying purchase choices.

2. Literature Review

The Internet and e-commerce have led to substantial changes in consumers' shopping habits. The objective of this review is to examine pertinent research regarding consumer purchasing behaviors, e-commerce, and augmented reality (AR) technology. The study conducted by Kooti et al. (2016) established a correlation between online shopping behavior and demographic attributes, highlighting the substantial influence of age and gender on the frequency of online shopping and the total expenditure made. In addition, they examined the temporal patterns of shopping behavior, including weekly and daily shopping cycles. These findings are essential for comprehending the online shopping habits of consumers. Furthermore, Nalchigar and Weber (2012) investigated the correlation between Internet browsing patterns and online purchasing behavior through the analysis of a substantial volume of user data. Their research demonstrated that even fundamental browsing behaviors can forecast users' shopping inclinations, a crucial aspect in comprehending how consumers discover and purchase products on the internet. The retail industry is experiencing significant effects due to shifts in consumer shopping behavior in the era of digitalization. Due to the widespread presence of the Internet, shopping is no longer limited to physical stores, but has become integrated into online platforms. This alteration has posed a certain degree of challenge to the conventional retail business model and presented prospects for the implementation of novel technologies. Simultaneously, the advent of augmented reality (AR) technology has introduced fresh opportunities for e-commerce. AR technology enables consumers to gain a more thorough comprehension of products in a virtual setting, particularly through virtual try-on and 3D product demonstrations. The implementation of this technology not only enhances the shopping experience, but also boosts confidence in the decision to make a purchase.

AR and VR technologies are reshaping consumers' online shopping experience in the field of AR technology. You et al. (2023) introduced PaRUS, a virtual reality (VR) shopping method that emphasizes the connection between a product and its real-life usage context. Their research demonstrates that PaRUS, through its enhanced visual representation of product suitability, effectively enhances users' trust and satisfaction in making purchases, while also minimizing the

gap between their expectations before and after the purchase. This study emphasizes the significant capacity of augmented reality (AR) and virtual reality (VR) technologies in the retail industry. Through the implementation of virtual reality, consumers can gain a comprehensive and instinctive comprehension of the correlation between a product and its real-life application, thereby enabling them to make a more precise evaluation of the product's appropriateness. This not only enhances the level of engagement in the shopping experience, but also empowers consumers to make more assured purchasing choices. With the ongoing innovation of AR and VR technologies, it is anticipated that the future will witness an increase in similar technological applications, which will further propel the evolution of the retail experience.

Recommender agents (RAs) have a notable influence on consumer shopping behavior in online marketplaces. Zhu et al. (2015) examined how the use of RAs affects consumers' attitudes using the stimulus-organism-response (SOR) model. They also explored how these attitudes can influence their behavioral outcomes, specifically impulse buying. Their research indicates that the utilization of RAs plays a significant role in fostering impulsive purchasing behavior within online marketplaces. This study emphasizes the significance of recommender agents in directing and impacting consumer purchasing choices. Through the utilization of personalized product recommendations that take into account consumer preferences and behaviors, RAs have the ability to not only impact consumer attitudes, but also directly influence their shopping behavior, particularly in stimulating impulsive purchases. With the ongoing advancement of recommender systems and artificial intelligence, it is anticipated that recommendation algorithms (RAs) will have a growing significance in the realm of online retail. This will lead to further modifications and enhancements in the consumer shopping experience.

The study conducted by Nagy and Hajdu (2012) investigated consumer receptivity towards the utilization of artificial intelligence (AI) in the context of online retail. The researchers discovered that trust plays a crucial role in shaping consumer attitudes towards AI. Additionally, they found that perceived usefulness has a greater impact on attitudes and behavioral intentions compared to perceived ease of use. These findings are significant for online shop owners seeking to enhance customer acceptance. The findings underscore the importance of establishing and strengthening user confidence when integrating AI technologies. Furthermore, it was underscored that prioritizing the utility of the AI system for the user takes precedence over the system's user-friendliness. Hence, while developing and executing AI solutions in e-commerce, it is crucial to prioritize not only the user-friendliness of the user interface, but also to guarantee that the system provides genuinely valuable functionalities to gain user trust and contentment.

3. AR Technology and the Evolution of Shopping Habits

The implementation of augmented reality (AR) technology in the retail industry has initiated a transformation in consumer shopping behaviors, particularly in the transition from conventional retail practices to virtual try-on experiences. The fundamental concept of this technology involves merging physical reality with virtual information, resulting in an augmented reality encounter through the

overlay of digital images and data onto the user's actual surroundings. This technology offers the capability to showcase 3D models and engage in virtual interactions. Additionally, it improves environmental perception, resulting in a more immersive and interactive shopping experience. The conventional retail strategy centers on brick-and-mortar stores and in-person customer assistance, prioritizing a multisensory encounter where customers can physically interact with and test products. Nevertheless, due to the emergence of the Internet and e-commerce, consumers are progressively shifting towards online shopping in search of enhanced convenience and a wider range of options. Although online shopping provides convenience, it also has limitations in terms of product display and experience. For instance, customers are unable to physically touch or try on products, which can result in uncertainty and decreased satisfaction when making purchase decisions.

The retail industry has been revolutionized by the implementation of Augmented Reality (AR) technology, which aims to tackle this problem. AR technology enhances the user's real environment by superimposing virtual information, offering consumers a distinctive shopping experience. The technology not only addresses certain constraints of online shopping, but also offers consumers a more immersive and dynamic shopping experience. Users can utilize augmented reality (AR) technology to virtually try on clothing or visualize furniture placement in their own homes. This enhances the shopping experience and boosts confidence in making purchase decisions. This transformation demonstrates that the utilization of augmented reality (AR) technology is not solely altering consumer shopping behavior, but also compelling retailers to reconsider their business models in order to accommodate the evolving needs and expectations of consumers in the digital era.

AR technology has played a significant role in enhancing the shopping experience, especially in the apparel and accessories sector. The virtual try-on feature allows consumers to preview a product without physically trying it on, enhancing the convenience and enjoyment of shopping (You et al., 2023). Through the use of augmented reality (AR) technology, this feature enables consumers to visually assess how the product will appear on themselves on the screen. This offers a more intuitive and informative point of reference for making shopping decisions. Furthermore, AR technology offers three-dimensional product displays that surpass conventional two-dimensional images, enabling consumers to gain a more comprehensive understanding of a product's appearance and intricacies (Khalil, 2015). In conventional online shopping, consumers are limited to perceiving products solely through two-dimensional images, whereas augmented reality (AR) technology offers users a more immersive product experience by superimposing virtual elements. This three-dimensional display has the capability to showcase multiple perspectives of the product, as well as demonstrate the product's impact in different settings, thereby augmenting the authenticity and inclusiveness of the shopping experience. AR technology is crucial in improving the shopping experience by offering consumers a wider range of interactive shopping options. This technology also creates a more competitive sales environment for retailers.

The influence of augmented reality (AR) technology on consumers' shopping decision-making process is undeniably significant. AR technology enhances consumer knowledge by offering detailed product information and user evaluations,

enabling more informed shopping decisions (Draws et al., 2021). By incorporating virtual try-on and 3D product display, consumers can gain a more comprehensive understanding of the product's visual attributes, dimensions, and color, thereby mitigating the issue of insufficient information or ambiguity during the shopping experience. AR technology streamlines the process of gathering information by overlaying visual data onto the user's physical surroundings, eliminating the need to navigate between multiple web pages or apps. This enhances the ease and efficiency with which consumers can make shopping choices. These enhancements not only improve the user's shopping experience, but also have the potential to positively influence consumer purchasing behavior and brand allegiance. AR technology enhances brand competitiveness by offering consumers improved shopping tools and experiences, fostering closer relationships between consumers and brands.

AR technology is indeed transforming consumers' shopping habits by facilitating a transition from conventional retail to a dynamic and customized virtual try-on experience. This shift not only enhances the convenience of shopping, but also provides consumers with a more engaging shopping experience. The utilization of augmented reality (AR) technology, specifically the virtual try-on feature in the fashion and accessories sector, empowers consumers to gain a more comprehensive preview of products, thereby surmounting certain constraints of conventional online shopping, such as the absence of physical interaction or the opportunity to physically try on items. With the ongoing advancement and enhancement of AR technology, we can anticipate more extensive and profound utilization in the retail sector in the coming years. This encompasses advanced virtual try-on technology, intelligent personalized recommendation systems, and other innovative features integrated with AR technology. These advancements are anticipated to augment the shopping experience, while simultaneously creating additional business prospects for retailers. The swift advancement of augmented reality (AR) technology will persist in molding the retail industry during the digital era, compelling retailers to consistently investigate novel methods to fulfill and surpass consumer anticipations.

4. Case Studies

To examine the utilization of AR technology in retail and its influence on consumer shopping behaviors, the subsequent distinct instances are taken into account:

In a study conducted by Yambao, Miranda, and Pelayo (2023), they created a markerless augmented reality mobile application specifically designed for the custom furniture and fixtures industry. By employing a combination of quantitative and qualitative research methods, as well as conducting interviews with knowledgeable individuals, the study ensured that the app's functionality aligned with the requirements and preferences of its users. The findings indicated a strong positive reception of markerless AR technology among customers, business owners, and IT professionals, highlighting its capacity to improve the customer shopping experience.

You, Lu, Zheng, Shao, Yang, Zhou, and Sun (2023) present a VR shopping method called PaRUS, which emphasizes the correlation between a product and its specific usage context. PaRUS aims to offer an intuitive visualization of product adaptation by creating a virtual representation of a product's real usage scenario. The study findings demonstrate that

PaRUS yields substantial improvements in enhancing the user's shopping experience. PaRUS had a notable impact on users' perception of performance risk, resulting in heightened trust in purchase outcomes and increased satisfaction. This indicates that incorporating virtual reality technology into the shopping experience, particularly by replicating the functionality of a product in a real-life situation, can greatly impact users' perceptions of the product and their purchasing choices. This case exemplifies a significant utilization of augmented reality (AR) technology in the retail industry, specifically to enhance users' comprehension of a product's appropriateness by means of virtual reality. PaRUS offers virtual fitting capabilities and goes beyond that by simulating the product's performance in real-life situations. This enhances users' perception and understanding of the product, leading to increased trust and satisfaction during the shopping process.

The study conducted by Herskovitz, Wu, White, Pavel, Reyes, Guo, and Bigham (2020) focuses on enhancing the accessibility of mobile augmented reality (AR) applications for individuals with visual impairments. The research team examined current iOS mobile AR applications and identified recurring AR tasks. They then developed accessible alternatives for these tasks. The findings demonstrate that blind users can enhance their utilization of mobile AR apps by creating accessible alternatives. This not only broadens the user demographic of AR technology, but also offers additional shopping and experiential choices for users with visual impairments. The findings of this study demonstrate that enhancing the accessibility of augmented reality (AR) technology enables a broader spectrum of users to engage and benefit from the convenience it offers. This case exemplifies the capacity of augmented reality (AR) technology to enhance accessibility by devising alternative solutions for visually impaired users, broadening the user base of AR technology, and enabling more individuals to engage in shopping and other activities.

Verma's (2020) study establishes a data-driven framework that employs e-commerce retail data to forecast whether a consumer will make a purchase within a specific period. The study utilizes a time-series data modeling methodology to uncover this correlation by generating time-series data on consumer-item pairings. The study showcases the strong and reliable performance of various neural network architectures, machine learning models, and their combinations in this prediction task. The research aims to enhance the precision of predicting shopping behavior by conducting a comprehensive analysis of the temporal correlation between consumers and products, utilizing a substantial volume of e-commerce retail data. The synergistic integration of neural networks and machine learning models offers novel tools and methodologies for forecasting consumer purchasing patterns. This research framework is anticipated to assist e-commerce retailers in gaining a deeper comprehension of consumer shopping behavior, as well as facilitating the development of more precise product recommendations and marketing strategies. This has the potential to positively enhance sales effectiveness and deliver a more tailored shopping experience.

Khalil (2015) introduced a novel e-commerce system that offers virtual environments on the internet using dynamic 3D models, enabling consumers to engage with products in a realistic physical setting. This system enhances customers' purchasing decisions by streamlining the shopping process and enabling users to manipulate 3D virtual models online.

This research stands out due to its ability to offer a highly engaging shopping experience through the introduction of dynamic 3D models that enable consumers to interact with products in a more instinctive manner. This interactive feature serves to close the divide between online and physical shopping by offering a more immersive product experience. The system's optimization of the shopping process may alleviate the cognitive load associated with shopping and enhance shopping convenience. Implementing this e-commerce system can offer retailers a distinct sales platform and enhance the shopping experience for consumers by making it more engaging and user-friendly. This has the potential to positively influence consumer engagement, enhance shopping satisfaction, and drive sales growth.

These case studies offer valuable perspectives on the various uses of augmented reality (AR) technology in the retail industry and its influence on consumer purchasing behaviors and experiences. In summary, these indicative studies showcase the capability of augmented reality (AR) technology in the retail industry and illustrate how it can enhance the shopping experience by making it more immersive and interactive. These case studies showcase the wide range of applications of AR technology in various sectors. They include markerless AR applications for the customised furniture and fixtures industry, VR shopping methods that emphasize the connection between products and real-life usage scenarios, and research on enhancing the accessibility of mobile AR applications for blind users. This diversity facilitates the fulfillment of various requirements of distinct retail sectors and consumer demographics, thereby enhancing the adaptability of the shopping experience. Studies on the application of data-driven frameworks for forecasting consumer buying patterns, along with the development of novel e-commerce platforms, also emphasize the potential influence of augmented reality (AR) technology in customizing services and shopping suggestions. These studies offer retailers insights into leveraging augmented reality (AR) technology to enhance sales strategies and services. These case studies offer valuable insights into the application of AR technology in the retail industry and serve as valuable references for future research and practical implementation.

5. Results and Discussion

Upon conducting an analysis of the utilization of augmented reality (AR) technology in the retail industry and its influence on consumer shopping behaviors, we have reached a set of conclusions. AR technology greatly improves the consumer shopping experience by offering virtual try-on capabilities and 3D product presentations. This technology allows consumers to acquire a comprehensive comprehension of a product's appearance and functionality without physical contact. The study conducted by You et al. (2023) demonstrated that the PaRUS system enhanced users' confidence and contentment in making purchases by enhancing the connection between products and their respective usage scenarios. Furthermore, AR technology significantly contributes to enhancing consumers' ability to make well-informed shopping choices. AR technology enhances decision-making efficiency by minimizing cognitive load through the provision of comprehensive product information and user reviews. Yambao, Miranda, and Pelayo (2023) conducted a study that illustrates the significant potential of their markerless augmented reality (AR)

application in improving customers' shopping experience.

Consumer adoption of AR technology is increasing as it continues to advance and gain popularity. According to a study conducted by Herskovitz et al. (2020), AR applications can be effectively utilized by user groups with special needs, such as the blind, through the implementation of suitable design and functionality enhancements. The implementation of augmented reality (AR) technology has compelled retailers to reassess and transform their conventional business models. According to Khalil's (2015) research, the implementation of 3D virtual environments and online interactions allows retailers to offer a more immersive and dynamic shopping experience, which effectively attracts and retains customers.

To summarize, the emergence of AR technology is transforming the way consumers shop, and the transition from conventional retail to virtual try-on represents a significant direction of progress for the retail sector. As technology continues to advance, it is anticipated that augmented reality (AR) will have a significant impact on the future of retail. This will be particularly evident in the areas of personalized shopping experiences and social shopping interactions.

6. Conclusions and Directions for Future Research

This paper examines the impact of augmented reality (AR) technology on consumer shopping behaviors, particularly the transition from conventional retail to virtual try-on experiences. The study demonstrates that the utilization of AR technology greatly improves the consumer shopping experience through the provision of virtual try-on and 3D product displays, resulting in a more immersive, interactive, and customized experience. This technology not only surpasses the constraints of conventional online shopping, but also enhances the enjoyment and effectiveness of the shopping experience. Furthermore, augmented reality (AR) technology enhances consumers' shopping experience by offering comprehensive product information and user reviews, thereby boosting their confidence and satisfaction when making purchase decisions.

Although this study offers a comprehensive comprehension of the influence of AR technology in the retail industry, it does have several constraints. This study heavily depends on pre-existing literature and case studies, potentially overlooking a thorough examination of consumer reactions in various regional and cultural settings. Given the ongoing rapid development of AR technology, the applications and impacts discussed in this paper may quickly become obsolete. Furthermore, this study neglects to explore the economic ramifications of augmented reality (AR) technology in the retail industry, including assessments of costs and benefits as well as return on investment.

To address the aforementioned constraints, future research endeavors could undertake comprehensive cross-cultural investigations to comprehend consumer receptivity and reaction towards augmented reality (AR) shopping technology across diverse geographical areas and cultural contexts. Conduct empirical research, such as consumer surveys and user experience tests, to gather primary data on the utilization of AR technology in the retail industry. Analyze the economic ramifications of augmented reality (AR)

technology in the retail industry, encompassing evaluations of costs and benefits as well as the influence on retailer effectiveness. The purpose is to monitor the most recent advancements in augmented reality (AR) technology, particularly in terms of hardware and software, and analyze their impact on the adoption of AR in the retail industry. Analyze the enduring effects of augmented reality (AR) technologies on consumer purchasing behaviors and the retail industry, and observe how these effects develop over a period of time. Exploring these future research directions will result in a more thorough comprehension of the utilization of augmented reality (AR) technology in the retail industry and its enduring effects on consumers, retailers, and the overall market.

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