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# EXPLORATION OF AUGMENTED REALITY AND VIRTUAL REALITY IN THE RETAIL INDUSTRY

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**Abstract**

Augmented Reality (AR) is a technology that integrates the real and virtual world with information through digital media. It encapsulates the real world and the digital world by showing how they intersect and interact with the global world. Virtual technology, as a modern form of contact with the actual environment, incorporates sensory features such as simulated representations or sound effects, sounds, or feelings. On the other hand, virtual reality creates and pulls apart a computer-generated world. Advertising, locations, incentives, and discounts are essential factors of this system in the context of AR / VR integration, personalization, communication, adoption, experience with users, and privacy. In the retail sectors, the combined analysis of AR and VR needs to be quite relevant. The new COVID 19 scenario has rendered it better than current retail schemes, especially in e-commerce. On comparing with the traditional system for retailing the new AR and VR based application very much convincing. This current COVID 19 scenario has also rendered it better than established retail structures, especially in e-commerce. Such emerging trends can affect how consumers select platforms, select products, and make purchasing decisions. The real and synthetic worlds are already mixing. In these two parallels, what is unique and comparable is how innovations will influence each other and therefore determine the future of retail business. Changes would potentially benefit individuals with good judgment or increase trust and confidence with their purchase decisions. Retailers will also consider these current and upcoming trends that help keep their buyers more and more drawn that shops (both online and offline) while promoting their own lives as retailers. This paper discussed different dimensions and opportunities of AR and VR using secondary research that implies the changing trend towards newer technologies. The research also highlights the advantages of retail companies by implementing AR and VR systems to improve sales and maintenance in the existing system properly. This article examined different aspects of AR with VR and its prospects, especially in terms of revenue growth worldwide. Study shows that the ever-growing segment of the consumer sector is an integral part of the economy. It is high time to build on the evolving retail fusing modern technology to help consumers make purchase decisions. This article has presented how Augmented reality and Virtual reality come into play to change the retail industry's current trend.

**Key words:** Augmented Reality, Virtual Reality, Retail Industry, E-Commerce.

## Introduction

The Current scenario of marketing or purchasing of a product is very dependent on the Mobile through e-commerce platforms and digital ads. The technology allows the introduction of lean and backward processes from inventory management information and customer relationship management through social media, to marketing and virtual stores. Sales personnel use digital technology to communicate better with customers, affecting purchasing decisions when shopping online or from physical stores (Grewal et al., 2017). Retailers began using enhanced technology in physical stores and online stores in the early 2000s to improve the store environment and shopping experience. (Bonetti et al., 2018). The application also enhances the consumer-oriented businesses, particularly the case where the technology and equipment (such as touch screens, digital displays, RFID tags, magic mirrors, and mobile apps) came into play to enhance the customer experiences for sale purchasing. (Bonetti & Perry, 2017; Bonetti et al., 2018). Furthermore, an augmented reality (AR) and virtual reality (VR) came as a very new concept in retails industries. (Bonetti et al., 2018; Javornik, 2016). These progressions have created a ton of eagerness, rising out of their limited influence as revolutionary developments in various settings such as retail, gaming, prescription, route, and instruction settings. The retail

industry must know the actual user experiences and adaptability of new technology to take full advantage of AR and VR's emerging technology.

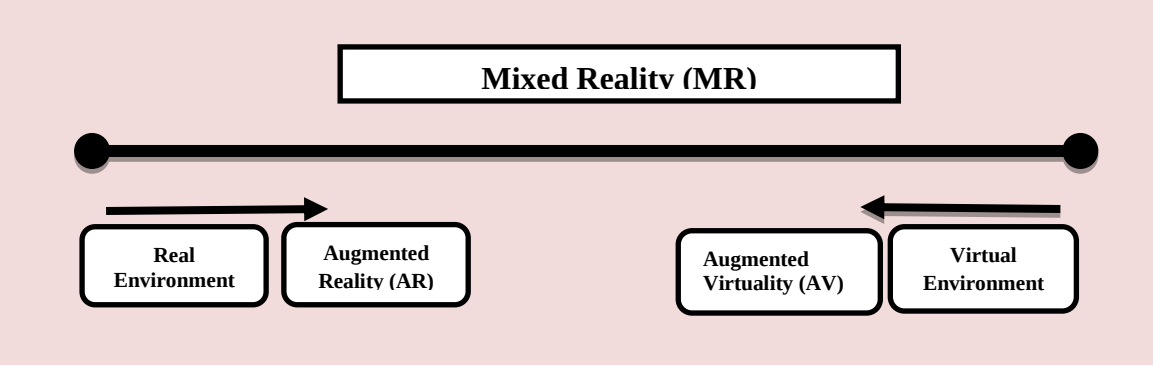
Further visual display and merchandise offer decisions, consumption and engagement, robots, drones, and driverless vehicles to enhance the capabilities of retailing of the future (Grewal et al., 2017). The present buyers are raided with millions of products & offers. It is thus imperative to look at how these offerings are presented in front of the buyers. By understanding this, retailers can derive upon designing and presenting these offers in different scenarios, thereby making them stand apart from its nearest competition. (Grewal et al., 2017)

This paper is an in-depth exploration of the changing scenario of the retail industry compared to the technological upliftment with AR and VR. The present form of retails and its infrastructure has been continuously changing with trending demand and needful enhancement in the driven technology. In the retail, applications like VR and AR-based enhancement seem to be very drastic changes before user experience to enhance the retail pattern. As per the research, this paper has reinvestigated the whole scenario, including the accountability of the impact of COVID

**Augmented and Virtual Reality**

AR and VR are enhancing the present technology in retail in a very different manner. This emerging technology, based on Augmented and Virtual Reality, improve the visual presentation of goods and improvise consumer engagement (Grewal et al., 2017; Poncin & Mimoun, 2014). VR technology has brought the retail industry development, which allows suitable environments to visualize real objects. Recently, virtual reality technology has experienced significant improvements in the field of retail customer experience. VR has become more accessible, up-to-date, and adaptability. Also, the minimal cost VR hardware turned VR into a more popular and accessible technology. Simultaneously, the quality of the virtual environment is improving rapidly, presenting realistic images and being fully immersed in the existing system, while overcoming the many skill shortages in the past and breaking the boundaries of following social platforms (Boletsis, 2017). VR industry uses High Definition Displays (HDD) and smartphones to improve customer experience. Technological advancements allow retailers to bring consumers into a customized virtual world, combining traditional online shopping with 3D objects to boost customer engagement, promote sales, and increase brand loyalty (Pantano, 2015).

Figure 1. The reality virtuality continuum (Milgram & Kishino, 1994).




On the other hand, the AR technology is closer to virtual reality (Figure 1), because its technical features support the expansion of virtual reality (Milgrum & Kishino, 1994). Advances in the mobile industry over the past decade have rendered AR features, enabling consumers to unforgettable AR experiences through their smartphone screens. Augmented reality has become an emerging trend technology in retailing, generally developed in the form of smartphone applications (Javornik, 2016). AR can incorporate the virtual world via digital artifacts (such as images, video, audio). They can communicate in real-time with virtual reality, creating unique possibilities for information distribution to users (Javornik, 2016). As a consequence, AR can

revolutionize other market functions like knowledge discovery and testing of goods (Javornik, 2016). AR can also improve the reliability of online shopping by allowing consumers to carefully assess the products they need to watch before buying decisions.

**The motivation for a review of AR and VR in retail innovation**

AR and VR technology are necessary to hold a position in the advertisement industry with different ways of creativity (Bonetti & Perry, 2017). The integrated system based on AR and VR technologies in the existing system promotes buyers through the ultimate experience through visualization of products in their own time. The effective use of an integrated mechanism promotes various companies to achieve sales and growth of products and services. Martínez et al. (2014), wrote an article on Drivers and Bottlenecks in the Adoption of Augmented Reality Applications. The main contribution is the perspective of the drivers and the challenges associated with AR & VR being adopted and implemented in different application domains like military sectors, education, and training, travel and tourism, medicine and sanitation, sales and commercialization.

**The problem with traditional retail marketing**

The higher technical advancement, especially in retail industries, causes increased competition. The traditional methods of advertisements must be changed to minimize competition. Various shopping centers are getting bigger; more people are pouring under one big roof. Here are a few points which contribute the most of the problem came out in traditional methods.

**Time of Spend-** Time of spending at one stage is directly proportional to the change of getting the infection through Covid-19 in the retails store. So, in the context of safety, time is a crucial factor in the retail marketing style**.**

**Insufficient Materials -**A significant disadvantage in the conventional retail industry is the shortage of products. This problem could be more disturbing in this pandemic.

**Cost-** Supermarkets are always expensive to set up whereas small and medium-sized markets, is quite less. This typed market for retails also needs very posh localities. So, the initial setup cost for retails markets for each category has to manage this burden. The running of these structures also needs a workforce that ultimately lifts the cost again. These two significant factors of the traditional method of retailing are problematic. (Zhu & Gao, 2019).

**How augmented retail solutions changed the Current Scenario**

AR-enabled technology has a massive impact on sales and has many advantages for the industry. The AR-based sale simplifies the process of making it easy for people to buy (both online and offline).

**Personalization of user content**

Retailers could initiate personalized choices based on their record of user data to offer or promote the products using these technologies. Marketers aim to reach consumer needs. One may see retailers selling content to a buyer without wasting time searching for the relevant content. This personalization could be done in a variety of ways. Together, they offer a comprehensive solution for AR and VR marketing.

**Ease of trials/tryouts**

It can be tiring and time-consuming to wait the turn outside the trail/test area in retail stores. AR and VR technology provides a platform to find the size of favorite clothes in the optical mirror and the digital screen in front of us, to see the final appearance of this cloth on the body. Suppose one could purchase a piece of cloth, then the app will scan the face to place a digital display of the person with choose item. These kinds of strategies play a significant role in accelerating the growth in sales.

**Combines traditional retailing and online shopping**

Shopping is considered a worthwhile activity. As we have many stores and people, buying the right stuff is sometimes painful. One of AR's critical advantages of e-commerce is that it retains conventional shopping's "friendly" feeling of charging for product costs, rather than offline.

**Connecting shoppers with printed content**

Printed goods are not likely to vanish in the future as they constitute a significant part of marketing for both as a user and retailer. The printed materials get available as a soft copy and a database of information, which could be accessed anytime, anywhere.

**Increasing brand presence and awareness**

AR is a fantastic tool that can promote the company's product information to a broader audience. A smartphone device with the new AR technology can enable the company to provide exclusive knowledge to consumers. The use of AR in supplier marketing campaigns is a critical explanation of why marketers search for new ways to communicate and have quicker answering platforms to users to resolve the queries.

**Dissipates barriers of language**

Globally, various languages use by humans. This scenario can get problematic in the expansion of retails stores to marketers internationally. The language barriers could some very problematic for users to choose the right products in the traditional retail store. To overcome this, Google introduced google translate into 40 international languages integrated with the AR-based system for retailing products.

**Improve the shopping experience**

In the current scenario, retail marketing adopts AR-based technologies. At the time of the pandemic, it is in a very trending situation. Whether this shopping online or offline, retailers should provide a very interactive way to get a valuable shopping experience and visit the store/site/app frequently. Experiencing digital/virtual screens in-store environment is a significant contribution to the development over time (Cruz et al., 2019).

**Ways Augmented Reality (AR) is Transforming retail**

- Virtually Try-On 3D Products3D Products in Home
- Gather In-Store Information
- Use Virtual Fitting Rooms
- Build Brand Awareness

**Objectives**

1. Explore problems with traditional retail marketing in the current scenario.
2. To investigate the current scenario of AR and VR adaptation.
3. To analyses the critical benefits of Augmented Reality in Retail.
4. To study the future adaptation of AR in Retail.

**Significance**

Newer technology has been a dominant & efficient way to drive customer's purchase decisions in today's world. AR and VR technology enables consumers to play with the goods of retailers to see if they would feel to function in space or on themselves. Digital products allow customers to capture and share content. The user-generated content promotes knowledge of the brand and begins discussions about their new purchases before the products arrive.

**Purpose of study**

For years AR & VR has been applied in retail sectors. Observational research demonstrates that both innovations help enhance learning performance and satisfaction across various ways to find significance in retail. AR and VR are commonly applied to the architecture of training, studying, and guidance in a quite effective way in a retail setup.

**Research Methodology**

The paper explores conceptual, empirical, and case-based manuscripts, research papers, concise statistics, and reliable websites to explain the current and future prospective of AR and VR. Since there is no adequate data on a granular basis, the retail industry demands fluctuate with various factors. Many of the turnaround strategies have been formulated dependent on the new Augmented reality & Virtual reality developments. The integration of AR and VR in the retail industry has drastically\y change the user experience. It seems to be a very different platform as compare to the traditional method of retailing. It is observed that there is a significant gap in technological knowledge in the current scenario and future retailing. This research aims to bridge the knowledge gap and create modern solutions to the current retail sector. The investigation performed through survey papers, and web articles would help understand the different aspects of the industrial trends in current scenario through this study and finally help in creating a value addition to the retailers who wish to benefit from technological advancements of AR and VR setups.

**Literature Review**

Augmented Reality (AR) is a technology that integrates the real and virtual world with information through digital media. These digital media might be videos, 3D models, or other formats superimposed continuously by the camera's view on our smartphones, PCs, or tablets. In this way, the virtual and real world get merged on the screens of our devices. Although this seems to be a turning point, the technology can be traced back to 1962, when filmmaker Morton Heilig released Sensorama, a victim of vision, sound, vibration, and smell. Virtual technology, as a modern form of contact with the actual environment, incorporates sensory features such as simulated representations or sound effects, sounds, or feelings (son and smell).

On the other hand, virtual reality creates and pulls apart a computer-generated world. Users experience virtual reality via their heads or handheld devices. Within a futuristic space, apart from the physical world, the workstation helps users track and execute their movements. On the other hand, on mobile devices like laptops, smartphones, and tablets, virtual reality can run smoothly. It encapsulates the real world and the digital world by showing how they intersect and interact with the global world.

The truth is that this is a multinational consumer interaction. They can put the product at home or even inside the body. AR technology helps consumers use the supplier's goods to display their design, suit the layout of the space, or build their own. Customers catch and exchange information with interactive items. User-generated content can spread awareness about the brand and discuss new purchases before the goods come in. Even if customers do not buy, by sharing UGC (User Generated Content) photos and videos with salespeople, they can still help provide free advertising. Marketers determine the preferred items from consumers to tailor their online shopping experience. Marketers help attract each client. Implementing better advice offer a smoother buying experience for consumers and improve the delivery time for vendors.

Francesca (2018), Review, Synchronization, and Research Agenda: Increased and Virtual Reality in Physical and Internet Marketing. In physical and online shopping, virtual reality (AR) and virtual reality (VR) have

emerged as a rapidly growing technology to enhance the retail environment and shopping experience. Nevertheless, AR and VR sales are still fragmented in scientific research and practical application, and this situation is controversial because of the origin of a single title. This article is based on a comparative case study of market environment research and AR and VR, combined with current discussions to provide the latest perspectives, including those related to marketers' goals, use and implementation of AR and VR, and consumer acceptance Questions-and for the future research agenda.

Gary (2014), studied The Pedagogical Potential of Augmented Reality Apps. In suspension, handheld computers, and connected systems, the report analyzes the present status of imperfect augmented reality. They should explicitly identify fields of substantial impact in the world of education and include a shortlist of excellent applications. They describe much of the Augmented Reality software technologies. By adhering to a lucid educational dream, emerging technology can become more successful. It discusses several obstacles to genuine non-academic integration. Finally, they use our perception of educational technologies as a lens which indicates the future aspects of controversial pedagogical issues. They concluded that in many subjects, unpleasant facts have proven effective. This technology will soon be expanded not just in the field of education but also in society. Experimental work in the field of unfavorable reality has risen in recent years. The same is true of education sector funding and value.

Mana (2018), virtual reality check (AR), virtual reality check (VR), and mixed reality check (MR) businesses. Not surprisingly, managers find similar IT-based voices, such as augmented reality and virtual reality, hard to distinguish. All of these constructions are virtually the same, and they are widely used phrases. This confusion hinders those willing to explore the opportunities offered by this new technology.

Martijn (2001), presented a research survey on Virtual Reality. This survey offers a summary of the most recent work in this varied field. It starts with the most common concepts and theories, several of which demonstrate the specific function of the visual space cognitive processes and mental models. A study of these abstract aspects of nature suggests that no scientific data remains for the connection between life and existence and circumstances (such as subjective reactions to physical causes). This topic is very much in need of analysis. The study reveals that thorough work has been carried out to establish strategies for assessing attendance and researching factors influencing attendance. Understanding such implants may play a significant role in creating new VR applications, but essential knowledge tools have not yet been discovered.

Katrin (2014), studied on Augmented Reality in Retail. This paper brings together leading German customers and one of the leading AR companies to research the use of AR systems in-field testing. The findings demonstrate that AR can boost data analysis in the marketplace (PoS, i.e., Point of Sale). This paper also reveals that AR systems need to include both apparent consumer advantages and associated entertainment functionality to ensure consumers' approval. Augmented Reality (AR) is one of the most thought about consumer trends at the moment embraced by brands, including Adidas and Lego. However, apart from observable findings, little is known about the factors that drive users' acceptance and ability to present information related to the products.

**Research gap**

Augmented Reality is to build an ecosystem in which the consumer cannot say the difference between the physical environment and simulated environment. In today's time's virtual reality is used in movies, military training, computer design, robots, electronics, and other fields. As per the literature mentioned above, the integration of AR and VR in retail has already been explored, but the trend and expected growth have not been explored in depth. This paper aims to bridge the gap of understanding the implications of using AR & VR in the retail industry.

**Benefits of Augmented and Virtual Reality in Retail**

As the production market grows larger and larger, customer needs and difficulties also increase. Any expert must acknowledge these new challenges. Companies will understand not just whether to communicate with customers but also how to reduce costs. The following are the key events that AR can bring to any business; the first is the retail, service, and retail industries. AR is providing a compelling experience for users. Before the advertisers rely on the terms 'information is king' recently, the situation has changed, because, with the AR function, customers can become content buyers and content creators. AR allows users to execute offline interactions online or online products for AR scanning technology. Using the AR function, users can change colors, styles, look, and feel of the products. Further, the virtual reality (VR), along with AR, makes the whole system more robust and user friendly. At the same time, users can learn more about shooting products at retail prices or in nearby stores.

**AR removes language barriers**

When it comes to trying to enter new markets, multinational companies face new challenges. There is no doubt that the challenges of language demand, time, and money. However, AR offers many options to avoid lots of language issues. Today, Google has translated the AR mode to allow users to view any text in a local language in 40 countries. The AR material is not only a choice for language details and prompts in the written catalog. Atos and Opt's Paris Theatre introduces an AR system that makes subtitles to the theatre (Carmigniani et al., 2011).

**AR helps purchase decisions & increases returns:** Analytically speaking, as we have previously admitted, the AR options on the market provide more excellent purchasing opportunities for customers. People spend more time in the store and increasing their interaction with each brand. At the same time, customers said AR could save time and help decision making.

**Advertisement:** When users download AR apps for sale, it is interesting to get information from the company regarding their new products. From newly added products and related details to discounts and other transactions, clients will need everything. Different marketing strategies can be applied to printed posters to catalogs, display screens, or other products in this case. It can be found in-store at the top, or top of a particular product box.

**Localizing:** It accounts for 90% of all offline sales. People still like to see how much they should payout with the naked eye. As time goes on, the AR and VR situation can improve, but now it is better to provide information to consumers about the stores around them. GPS sales staff can easily guide users through the use of GPS devices to find products (nearest retailers, products, delivery locations, and many more) or to advertise their current location offers.

**Incentives and discounts:** It is no secret that exclusive deals in the stores can attract potential customers. Sending gifts or discounts will inspire new users and could increase the traffic in the store.

**Personal approach:** Like any other program, any compliant business application will enable users to customize their needs. The history of filtering and purchasing analytics can satisfy these needs and provide users with content that they would like.

**Interaction**: Giving customers as many choices as possible (size, color, style, accessories, similar products, and many more) is best. It stimulates the interest of people in products and enables users to verify purchases. Interactions with the AR model of the product to see how it looks, functionalities, & use in the real-world help provide a good user experience through mobile or computer.

**Discoverability:** Most customers do not know how to interact with newer technology like AR based retail system. Not every user of the app knows how to buy the products, take services via smartphones or tablets. The adaptation of newer technologies also considerable in the context of the AR system.

**Safety and privacy:** AR developer implementations consider different ethical situations, privacy laws, and encourage users to manage the spread of information about them in the social ecosystem.

**Simple interface:** Most new users never know how to interact with the products or services using their mobile devices or smartphones. There are a lot of short-term needs to be addressed, from local information to comfortable UX functions.

**Current Trend in AR and VR**

In recent times everything has been substituted by computers today, and human contact is no exception. AR development has developed through markets, despite the humongous popularity of Pokemon Go game. The breakthrough has hit retailers' hearts, allowing virtual reality to offer an exciting customer environment to draw their customers and dramatically improve the consumer buying environment. Tractica estimated that the number of augmented reality devices currently used would rise to 2.2 billion by 2019. This observation reflects the AR & VR based retail and e-commerce sectors are the best-suited platform for users.

Figure 2. The installed base of actively used mobile AR Apps in the world market

**Source:** (Mobile Augmented Reality App Downloads to Reach 1.2 Billion Annually by 2019 | Omdia | Tractica, 2020)

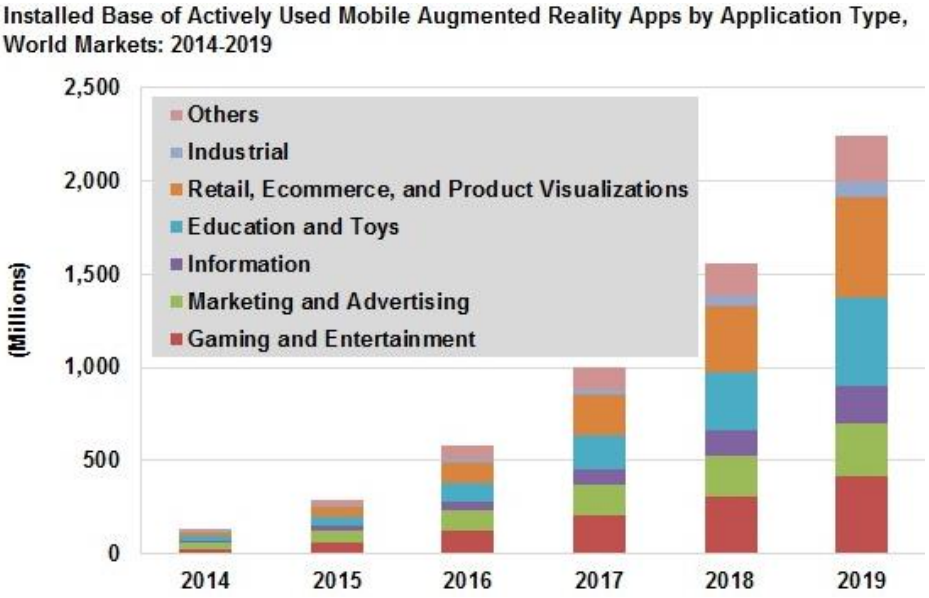
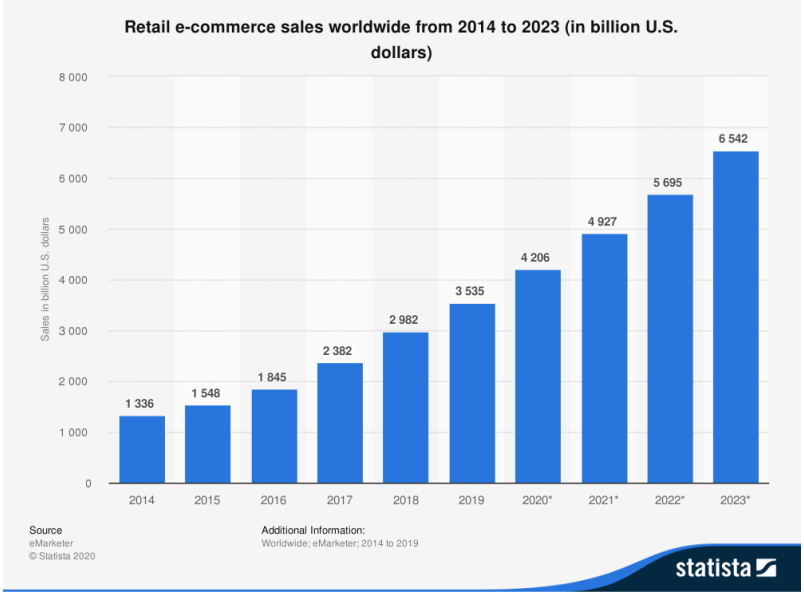



Figure 2 presents the application of augmented reality in various sectors. The world maker survey in the period of 2014 to 2019 reflects the AR used in industrial, retail, e-commerce, product visualization, education and toys, information, marketing, advertisement, gaming, entertainment, and many more. Significant growth has been recorded in each sector.

Figure 3. Retail e-commerce sales forecast worldwide

**Source:** (Clement, 2020)




As the above graph demonstrates, the predictive growth of 2023 for retail e-commerce sales is about 6.542 trillion in USD, whereas, in 2014, it was only 1.336 trillion in USD. The growth in retail is estimated almost six times in just ten years. According to Digital Bridge, more than 41% of customers access to AR for shopping.

As per the above two figures 2 and figure 3, it has been concluded that e-commerce growth has been significantly growing substantially, the same as the trend of the AR-based application. The trend of the AR & VR is interlinked with the growth of e-commerce. E-commerce has been one of the earliest trends in the digital era & the adaptation of newer technologies will only heighten its growth. Sambamurthy and Zmud (2000), wrote an article on Research Commentary: The Organizing Logic for an Enterprise's IT Activities in the Digital Era A Prognosis of Practice and a Call for Research, which stated that "the contemporary digital economy is characterized first and foremost by convergence across the computing, communication, and content industries. This convergence presents unparalleled business opportunities for redefining the nature of customer relationships, products and services, business partnerships, and economic markets within and outside the enterprise." It can only imply that business growth is a definite outcome when higher technology is involved.

Figure 2 suggests the significant growth of users in each successive year from 2014 onwards. In 2014 the retailing based on AR was less than 500 million dollars, which turned up significantly and reached a forecast estimate of above 2000 million dollars with a compound annual growth rate (CAGR) of 76%. This valuation has almost five-time growth in just five years, reflecting the adaptability of AR and VR in retail. Further, figure 3 represents the simple demand forecast with a significantly high growth of e-commerce adaptability from the year 2014 to 2023.

**Impact of COVID 19 in Retail**

The pandemic Covid-19 has flipped the world upside down. Furthermore, the virus has probably triggered the first step in the improvement of behavior. The lockout in effect is remarkable, but its timing is fortuitous. Working with technology such as AR and VR lets users use these immersive tools to browse, chat, and socialize. These apps are inexpensive and readily accessible. Although people can't satiate their social impulses for them, they can practically satisfy them.

The retails sector covers both types of production as new and used. This sector has touched almost all people around the world. The worker in this sector comprises one of 12 workers in all sectors. In Indian economy participation, it constitutes 5 %, which is significantly contributed to GDP impact. After the impact of COVID, these sectors were also hugely affected. (Source: OECD, 2020)

As per Alexey Vasilchenko's article on "7 Post-Pandemic Technology Trends To Reshape The Future Of Retail Industry "Reported about 100 million consumers. Who indicated in a 2019's predictions report that by 2020 up to 100 million consumers are expected to use augmented reality in their shopping experiences, was right. The isolation due to COVID-19 quarantine has rapidly increased the demand for AR systems. Guided by the "try-before-you-buy" approach, augmented shopping attracts customers by allowing them to interact with products online & improve purchase decisions. Thus, creating a seamless customer buying journey in the era of the pandemic.

**Conclusion & Future of AR and VR in Retail**

In the retail industries, buyers can only trust AR if the application can deliver timely, accurate, and insightful performance. Retailers can set up VR based systems or AR apps that provide shoppers with reliable and realistic data that can allow them to use AR shops and make product promotions accessible. Virtual technology also displays shoppers with product promotions. The user enters a supermarket application through phones or computers to access simulated product details and latest advertisements and order the need once through the app. AR and VR have reached every corner of the market for shopping. However, in the context of E-commerce, virtual reality must aim to attract more buyers and maintain current buyers. The study concluded that the adaptation of AR and VR in retailing, advertising, communication, user experience, time, and privacy is a significant impact on customers to promote the buying from the online store. The overall study of AR and VR must be very influential for the retail industries. This present scenario of COVID 19 has also made it more preferable to existing retails systems, especially in e-commerce. These new forces will impact how customers select channels, pick items, and make purchase decisions. The universes of physical and virtual are merging as one now. Comprehending what is unique and comparable in these two parallels is how innovations are going to affect one another and will thus, decide the future of retailing. Changes are probably going to assist people with sound judgment or enhance satisfaction and fulfillment with their choices. Thus, retailers need to grasp these new and upcoming advances to make their clients more & more drawn towards stores (both online and offline) while making their own lives easier as sellers. This paper explored various aspects and prospective of the AR along with VR. This study also highlights the benefits of retails through the implementation of AR and VR systems to enhance the sale and maintenance in the existing system properly. This adaptation in retailing will help the consumer save time, analytical judgments of products, enhanced reliability through visual presentation of products in 3-D (3 Dimension), and the search for products, safety, and privacy.

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