IMPACT OF AUGMENTED REALITY ON E-COMMERCE

Abstract

Due to how quick and easy it is to purchase, an increasing number of people are using online shopping. The utilization of the AR, or Augmented Reality, feature is one illustration of the more diverse technologies being employed for e-commerce advances in the modern day. The emergence of augmented reality (AR) technology has completely changed the e-commerce sector by bridging the gap between the actual and virtual aspects of shopping. Consumers may interact with virtual goods in actual locations thanks to augmented reality (AR), which improves product engagement and overall customer happiness. This essay analyzes the advantages and disadvantages of augmented reality for both businesses and consumers as it relates to e-commerce. The results demonstrate how augmented reality (AR) is redefining the e-commerce market, boosting sales, and altering how people shop online.

Keywords: E-commerce, Augmented Reality, Online, Shop.

Authors

Siddhartha Ghosh
Ph.D. Research Scholar
Department of Management Sciences
Mahatma Gandhi Central University.

Rohit Gupta
Ph.D. Research Scholar
Department of Management Sciences
Mahatma Gandhi Central University.

Prof. Pavnesh Kumar
Head of the Department
Department of Management Sciences
Mahatma Gandhi Central University.

Dr. Svati Kumari
Assitant Professor
Department of Commerce
Delhi University.

I. INTRODUCTION

E-commerce players pay attention to the role that customer engagement plays in generating a positive consumer experience in today's highly dynamic and interactive business environment. Consumers are encouraged to use technology in their daily lives, especially while making purchases, as a result of our society's growing reliance on it Technology developments and shifting consumer preferences have propelled the e-commerce sector's rapid growth over the past couple decades. Among these technical advances, augmented reality has become a potent tool that allows customers to virtually experience things prior to making a purchase. The transformational potential of augmented reality (AR) in e-commerce is examined in this article along with how it affects user experience, conversion rates, and overall business success. Augmented reality has arisen as a quickly developing technical trend throughout the previous ten years. While developing augmented reality (AR) technology has produced a range of applications in many industries, including gaming. Example: Pokoman Go, Education and E- retail. example clothing (e.g. J.C. Penney, Uniqlo, ASOS), footwear (e.g. Converse), accessories (e.g. Speedo goggles, Specsavers glasses) and cosmetics (e.g. Sephora, L'Oreal), as good as showing what items look like in customers' homes (e.g. IKEA, Dulux). Tech behemoths like Apple, Microsoft, and Google recently made large investments in augmented reality technologies. According to, "Augmented Reality is one of the cutting-edge technologies that will influence the future of retail. Customers can engage in novel virtual interactions with goods thanks to augmented reality (AR) interactive features, which also provide new, immersive purchasing experiences. The perceived gap between shopping in brick-and-mortar establishments and online experiences is filled by augmented reality (AR). With its improved shopping experience and potential to influence customers' preferences for the shops, augmented reality is an interactive technology that can improve the retail process. Based on a consumer AR survey by Google found that 66% of people are interested in using augmented reality technology to view products in real-time while shopping online. According to Google's Director of Product Management, Jennifer Liu, the use of augmented reality technology in e- commerce is crucial. Customers can feel confidence in their purchase decisions thanks to augmented reality's ability to bring e-commerce products to life with detailed information. Customers have the rare chance to test before they purchase thanks to augmented reality technology, which delivers an immersive experience with 3D representations, virtual try-ons, and product demos Because customers can make informed decisions, augmented reality technology helps counteract high return rates by lowering those rates in the long run. As a result, consumers may engage in real time with products while still in their environment thanks to the application of augmented reality in e-commerce. Additionally, businesses may use augmented reality to reach out to customers, interact with them, and keep them engaged even after they've made a purchase. A bibliometric analysis, which comprises analysis by quantitative indicators like the number of citations, most highly ranked authors, prime publication, and so on, is used to evaluate the knowledge structure and the growth of research through the analysis of linked publications. This is a very helpful method for keeping track of any field's development and productivity over time and in any location. Similar to that, this essay seeks to investigate the use of augmented reality in e-commerce based on academic articles.

II. AUGMENTED REALITY IN E-COMMERCE

1. **Definition and Functionality of Augmented Reality:** In order to enhance and augment the user's experience of reality, augmented reality (AR) technology superimposes digital

information, such as pictures, videos, or 3D models, onto the physical environment. AR incorporates virtual aspects into the current physical world, in contrast to virtual reality (VR), which generates fully immersive virtual environments. This enables users to interact with both real and virtual things at the same time. Smart glasses, smartphones, tablets, or headgear that use cameras and sensors to detect their surroundings are the most common ways that AR is used today. The user's perspective is then overlaid with computer-generated content, resulting in a seamless transition between the actual world and the virtual world. Augmented reality (AR) permits the real-time integration of content created on a PC with a live visual display with the help of a number of technological improvements. Augmented reality, which merges the virtual and physical worlds, surrounds the real world with computer-generated virtual objects. One of the most widely used definitions of augmented reality (AR) describes it as a cutting-edge strategy that satisfies three key criteria: merging real and virtual elements in a real environment, changing real and virtual objects in relation to one another, and real-time interaction. Thanks to adaptable AR, innovation now includes the insertion of cutting-edge components to this current reality using a cell phone camera. We are starting to comprehend this incredibly original and energizing form of human-PC connection that was seen as a developing creative technology in 2007 thanks to modern smartphones and AR applications. If an application satisfies all three of the following requirements—it can employ virtual content in a 3D environment, is continuous and intuitive, and can integrate real and virtual content in a real environment—it is said to be an AR framework. An application is officially categorized as an AR framework if it fits the following three criteria: it must combine virtual and real substance in the real world, be realistic and user-friendly, and have the ability to use virtual substance in 3D environments.

2. The Following are the Main Elements of Augmented Reality:

- Actual-time interaction makes sure that virtual items are in line with and realistically interact with the actual world by allowing AR systems to react in real-time to changes in the physical environment.

- **Tracking and Calibration:** To continuously monitor the user's position and orientation in relation to their environment, AR gadgets employ cutting-edge tracking algorithms. As a result, the system can precisely position virtual items in the user's range of view.

- **Computer Vision:** To recognize and understand the physical environment, AR systems use computer vision algorithms. This enables them to comprehend and interact with real-world items.

- **Rendering and Display:** To provide a smooth integration of virtual elements into the real world, AR content must be generated and shown in a way that corresponds with the user's perspective and the physical environment.

Numerous industries, including gaming, education, healthcare, retail, architecture, and marketing, have found numerous uses for augmented reality. In the digital age, augmented reality is becoming more and more prominent due to its capacity to improve user experiences, learning outcomes, and offer creative solutions

to real-world issues. The potential of augmented reality (AR) technology to change how we interact with the world around us is only anticipated to increase as it develops.

III. IMPLEMENTATION OF AR IN E-COMMERCE

Using augmented reality (AR) in e-commerce has given companies new opportunities to communicate with customers, improve product display, and increase conversion rates.

Here are a Few Prominent E-Commerce Applications using Augmented Reality;

1. Customers may digitally try on things like clothing, accessories, eyewear, makeup, and even furniture thanks to augmented reality (AR). Customers can make a more educated buying decision by using the camera on their device to see how the goods will look on them or fit into their surroundings.

2. Product Visualization: AR makes it possible to view products in 3D, which gives users a more engaging and dynamic experience. They may simulate the sensation of physically inspecting things in a brick-and-mortar store by rotating, zooming in, and inspecting products from different perspectives.

3. AR can be used to create interactive product catalogs on e-commerce websites and mobile applications. Customers only need to point their device at the product image or barcode to obtain more details, product specifications, and reviews.

4. Virtual Showrooms: Customers can view and interact with a variety of products in a simulated physical environment using AR-enabled virtual showrooms. This is especially helpful when displaying large items like furniture or appliances.

5. Advertisements that use augmented reality (AR) give viewers intriguing and interactive experiences. A user may scan an advertisement, for instance, to view a 3D representation of the item and investigate its characteristics, inspiring them to learn more and possibly make a purchase.

6. In-Store Navigation: To make it easier for customers to discover certain products or areas in physical stores, some e-commerce businesses have integrated augmented reality navigation functions into their apps. This improves the whole purchasing experience and boosts foot traffic to physical stores.

7. By superimposing virtual measurement tools on the user's body, augmented reality (AR) can assist customers in choosing the appropriate size and fit for apparel, shoes, or accessories. This ensures a more accurate fit and lowers return rates.

8. Gamification and Rewards: AR can be used to gamify the shopping experience by enabling users to take part in challenges, games, or tests that are directly relevant to the things they are purchasing. This not only boosts participation but also presents potential for bonuses and savings.

9. User-Generated Material: Online retailers can encourage customers to produce and distribute augmented reality (AR) material, such as product reviews or AR filters. User-

generated AR content can help brands market their goods and foster a feeling of community.

10. Customer Support Driven by AR: AR can be used in customer care to help users troubleshoot problems or put goods together. Customers can use remote AR instruction through video chats to solve issues without requiring physical assistance.

E-commerce businesses may improve the whole buying experience, forge closer bonds with customers, and gain a competitive edge in a quickly changing digital market by utilizing AR technology in these ways. The use of AR in e-commerce is likely to become more common and sophisticated as the technology develops.

IV. AR DEVICES AND PLATFORMS

There were a variety of AR platforms and devices on the market that catered to user preferences and use cases. It's vital to keep in mind that since then, new devices and platforms may have been released, and the AR environment may have changed. Here are some prominent augmented reality (AR) products and platforms:

AR Devices

1. **Smartphones and Tablets:** A lot of contemporary smartphones and tablets are AR-capable. They support AR applications and experiences by utilizing their integrated cameras, sensors, and processing capability.

2. **AR Glasses:** Wearable gadgets called AR glasses project digital information onto the user's field of vision. Several well-liked AR glasses include

- Microsoft HoloLens is a cutting-edge mixed reality device used for business applications, research, and development.
- magic Leap One: An AR headset with spatial computing features targeted for developers and business customers.
- A portable augmented reality headset designed for hands-free professional tasks, Google Glass Enterprise Edition

3. The form size and intended uses of AR headsets, which are specifically made for delivering augmented reality experiences, may be different from those of AR glasses. They are frequently utilized in sectors like gaming and entertainment because they frequently offer a more immersive experience.

- Oculus Quest: An all-in-one VR headset that, thanks to its cameras and software features, can allow some AR experiences.
- Nreal Light is an augmented reality device that resembles a pair of sunglasses and offers more user-friendly AR experiences.

AR Platforms

1. A platform for building augmented reality (AR) applications for iPhones and iPads was

developed by Apple and is called ARKit (iOS). It offers a number of capabilities like scene comprehension, surface identification, and motion tracking.

2. Google's augmented reality (AR) development platform for Android devices, ARCore, is comparable to ARKit but is designed specifically for Android smartphones and tablets. It enables creators to create AR experiences utilizing the Android ecosystem.

3. Unity 3D: Unity is a well-known game engine that facilitates the creation of augmented reality content for a variety of devices, including mobile phones and AR glasses. It offers a variety of tools for producing interactive augmented reality content and experiences.

4. Vuforia: Vuforia is an AR development platform with a focus on marker-based AR, wherein real-world items or markers are used to activate digital content. It is widely utilized in a variety of fields, including marketing, education, and industrial applications.

5. Create AR experiences for Facebook and Instagram with the help of the Facebook-developed Spark AR Studio. For making AR filters and effects for social media sites, it is frequently employed.

6. Snapchat Lens Studio is a website that enables users to create and publish augmented reality (AR) lenses for Snapchat, providing a creative platform for the development of AR content within the Snapchat ecosystem.

7. Please keep in mind that the augmented reality (AR) market is continuously developing and that new platforms and devices may have appeared since my previous update. For the most recent information about AR platforms and devices, it's critical to carry out additional study and consult current sources.

V. LITERATURE REVIEW & AR WITH E-COMMERCE

The car sector was the first to use the term augmented reality in advertising. By combining augmented reality with it, e-commerce can undergo a significant transformation. 77% of consumers prefer to utilize augmented reality (AR) technology to preview products and explore variations including color, size, style, and differences. AR marketing and advertising is a key concept that integrates computerized (digital) data or things into the subject's perception of the actual world, frequently in conjunction with other media, to reveal, communicate, or demonstrate consumer benefits to achieve hierarchical objectives. In 2015, the market worth of augmented reality was 640.4 million, and by 2020, it must generate $120 billion in revenue. In that capacity, AR is gaining a lot of traction with businesses and customers.

AR is used in a wide range of industries, including manufacturing, correspondence, healthcare, retail, transportation, the military, education, gaming, and online commerce. This evaluation is based on the use of augmented reality in online commerce, taking into account its amazing capacity for delivering an in-store buying experience. The tool can modulate 3D objects in many locations, enabling users to interact with ease and advanced delivery to their own location. Companies like IKEA and converse are using augmented reality to let customers gradually visualize household items in their homes using mobile applications. The apparent benefit and satisfying experience of the buyer can be attributed to the growth in the

development of AR apps. Measurements showing that over a billion Web users purchased goods through online retail websites in 2013 demonstrate the rapid growth of e-commerce. In actuality, retail internet business transactions totaled $1.85 trillion in 2016 and are projected to reach $4.50 trillion by 2021. This emotional shift in the fast-growing customer base of the advanced retail industry has given internet business companies a strong incentive to stand out from their competitors and build creative strategies that consider their customers. When it comes to implementing augmented reality (AR) in online businesses, E-commerce companies must upgrade their mechanical proficiency by developing 3D item models using 3D modeling software and programming tools, as well as having a strong innovative team.

VI. MOBILE AUGMENTED REALITY

New portable, wearable, and unavoidable computing applications are soon becoming realistic, offering people access to online resources constantly and everywhere as computers get more powerful and smaller. This enhanced adaptability opens up a potential new class of uses that exploit the user's immediate environment. Currently, augmented reality offers an especially. amazing user interface for creating thoughtful figuring conditions. AR frameworks integrate virtual information into a person's actual state such that they perceive it as existing in their surroundings. Portable AR systems provide this aid without requiring the person's location to be in a specially prepared area. In recent years, augmented reality on smartphones has emerged as a very alluring platform. As was done before AR was implemented in smartphones, research had been done on portable AR to replace the original rucksack and head-mounted exhibition setups. These modern devices are referred to as super portable PCs. This development was then preceded by the transition from UMPCs to PDAs, and finally to the modern PDA. According to research by, when compared to the underlying lengthy lengths of UMPCs, advanced mobile phones are concentrating on a different market in AR. The startlingly potent and silly-check AR execution of the smart mobile phones is designed for a vast and wide range of clients. Because most PDAs are equipped with a camera, modern users may take full advantage of augmented reality. However, the camera and the basic picture sensor characteristics, such as casing size, update rate, or focus point mutilation, continue to have a significant impact on the quality of computer tracking.

VII. TOOLS AND METHODOLOGY USED

The methodology can be implemented by using various tools described below;

The open-source Blender-3D 3D creative package supports the integrity of the 3D pipeline by demonstrating (modeling), repairing, animating, simulating, delivering compositing, and movement tracking for video editing and game development. Another platform that functions equally well on Linux, Windows, and Macintosh PCs is Blender. Blender supports the 3D work measure in this evaluation, including demonstration, fixing, liveliness, reenactment, video editing, and gaming turn of events. This designing can be done in the viewport window. Specifically, the Blender application's features make it easier for architects to complete the planning cycle, which makes it simpler for designers and developers to complete the designing. Blender was chosen because it is programming that subverts Open Source logic rules, making it more flexible, extensive, and moderate. It doesn't depend on the reason for use and uses GNU General Public Licensing for completely free software agreements. Based on the Python programming language, Blender is a general programming tool for creating programs and rendering 3D computer graphics. It includes

features for animations, recognition of movement frameworks in understanding material science, and other things.

1. **Unity-3D:** It is a 3D gaming engine that is cross-platform compatible and was developed by Unity technology Co.Lt. With some augmented reality capabilities, it can superimpose the virtual on reality and recognize human-computer communication. It creates AR applications and games and enables Vuforia SDK augmentation modules to recognize and adhere to the corresponding ports. It provides a wealth of progression box methods for the creation of games and other clear 3D content. Solidarity 3D may enhance the virtual scene with additional physical elements like as sunlight, mist, wind, skybox, water, and more. It can also add ambient sound and enlivened video. After that, you can explore, test, and modify 3D application scenarios. Furthermore, it can be delivered to the required stages, such as Windows, iOS, Android, etc. Create scale-capable applications that may be operated for several stages with the same codebase by using the illustration and material science engine Unity. The client can select the designed API of their choice using Solidarity as well

2. **Vuforia AR SDK:** This platform for business augmented reality is comprehensive and adaptable. With its comprehensive solution, it can guarantee that it can offer the appropriate. augmented reality methods to each and every client depending on their company requirements. Vuforia is an SDK that handles the identification and following of picture targets or fiducial markers, simplifying AR applications. Vuforia is an SDK that uses highlight detection to give the location and subsequent image focus. Any point in an image that borders several colored sections is considered an element. The decision of where to begin using Vuforia with AR approaches depends on knowing where you'll gain the quickest, most significant ROI. These use cases stand out because they provide a straightforward reception, clear returns, undeniable benefits, and a scaling guide. Vuforia provides industrial enterprise customers with the quickest, easiest, and most amazing AR content development solutions, assisting them in addressing work-force possibilities and difficulties as well as achieving their business goals.

3. **Visual Studio Code:** This is a cross-stage code manager for creating cutting-edge web and cloud apps that run on Windows, OS X, and Linux. As Microsoft highlighted in the current Build featured topic, the composer will contain comprehensive code help and routes for these dialects. It provides developer in-built support for a variety of dialects. Designers of ASP.NET 5, JavaScript, and Node.js will also receive a ton of additional tools.

VIII. WORKING PROCEDURE

The 3D modeling software Blender, which is free to use, is used to create 3D models. Blender3D also allows for coloring and texture, which may then be exported in the specified file format or extension. Any required file type, including.obj. fbx. blend, can be used to export the desired 3D model. Now the Unity 3D game engine can manage the exported assets. To do the augmented reality task, Unity 3D uses a combination of Vuforia, Visual Studio, and game assets. Composting produces an Augmented Reality experience and product.

IX. RELATIVE ADVANTAGE & OVERHEAD COST ANALYSIS

The relative amount of space is how much progress is seen as more beneficial than competition. The apparent benefits of AR will encourage the uptake of new ideas. Previous research demonstrates a positive relationship between appropriating IS advancements and the seeming degree of latitude for using the innovation over rivals (relative favored position). Customers can benefit from AR reality's advantages, which enhance the purchasing experience. Shopping is made easier for online clients by AR, which saves the time required to browse the products and try them out when appropriate. Data innovation is well known as a force tool to boost the realistic advantage. the current particularly.

X. RESULT

Before making a purchase, a customer can evaluate goods or services based on the reasonable look of the item in their daily lives thanks to augmented reality implementation in e-commerce. Implementing the ideas in this paper can create a creative marketing strategy to capture the client's interest, impact, attitude, and behavior. This can draw attention to the mark credits and provide customers the chance to actually experience the benefit of those traits for themselves. Through legitimate web interfaces, customers can do more than just browse products; they can also test them out. Retailers may overcome physical limitations and provide access to each item's components, thereby bringing more customers into the sales funnel for higher conversion.

XI. CONCLUSION & FUTURE SCOPE

Accurately utilizing augmented reality can help customers make the best decision while purchasing goods. Additionally, customers will have the ability to obtain in-depth information like surveys and related products, which is useful to the merchant in terms of persuading their target interest group. More importantly, AR in particular may give customers an in-store purchasing experience, regardless of their zone service can superimpose 3D items in different areas, allowing customers to interface with advanced delivery to their own place with comfort. Shorter runs in this industry's current environment of more items greatly speed up product diversity and heighten competitiveness. Even defining top-down manufacturing policy as a heuristic about future customer wants might benefit from the beneficial feedback provided by data collected from the implementation of AR approaches in marketing. The ability to impart an intelligent, quick, and effective decision-making thought process in the mind of the application user, who may not even be technically sound about the usage of the product and its relations with other elements in its vicinity after being procured, is what gives the aforementioned AR-based marketing method its resilience. In the future, a dynamic framework made up of various stakeholders, including users of an e-commerce interface who may or may not be potential customers, professionals, and concerned business owners from a variety of domains, including manufacturing, R&D, customer support, logistics, and supply chain, can be proposed, simulated to hypothetical conditions, and responses given by them can be recorded and studied for a variety of desired objectives.

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