Journal of Advances in Developmental Research (IJAIDR)
E-ISSN: 0976-4844 ● Website: www.ijaidr.com ● Email: editor@ijaidr.com

E-Commerce Website with Integrated Virtual Try-On Feature

Mr. S. Gunasekaran[1], D. Blessy Christrus[2], Mrs. P. Latha[3], M. Afrin[4], C. Brindha[5]

[1,3]Assistant professor, Department of Computer, Science and Engineering,
V.S.B Engineering College, Karur, Tamil Nadu
[2,4,5] Department of Computer, Science and Engineering,
V.S.B Engineering College, Karur, Tamil Nadu

Abstract

The phenomenal emergence of e-commerce has made shopping a digital-first place, which gives the customer unparalleled convenience and diversity. Despite this, one of the biggest challenges in online retail is the inability to physically interact with products before purchase. Customers often hesitate to buy clothing, shoes, jewellery, or furniture because they cannot visualize how these items would look on them or fit within their personal spaces. This uncertainty not only lowers customer confidence but also contributes to high product return rates, creating difficulties for both buyers and sellers. To address this problem, our project introduces an e-commerce platform integrated with Augmented Reality (AR) powered Virtual Try-On (VTO). By using a mobile or web camera, customers can preview products in real time, similar to the way AR filters work on social media. Whether trying on outfits, checking how a piece of jewellery complements their look, or seeing how furniture appears in their room, users gain a realistic and immersive shopping experience. This bridges the gap between traditional in-store shopping and online retail, helping customers make more informed decisions.

Though integration, the platform not only improves customer satisfaction and reduces return rates but also enhances user engagement by making shopping more interactive and enjoyable. Ultimately, the project demonstrates how AR-based Virtual Try-On can redefine online shopping by combining convenience with real-world visualization.

Keywords: E-commerce, Virtual Try-On (VTO)Augmented Reality (AR), Online Shopping, Web based Application, Customer Experience, Interactive Shopping, Digital Retail, 3D Visualization, Product Simulation, User Engagement, Personalized Shopping.

1. Introduction

E-commerce has become one of the most transformative forces in the modern digital era. Over the past decade, online shopping has evolved from a convenience for a few tech-savvy individuals into a mainstream way of purchasing goods and services. The convenience of shopping anytime and

anywhere, combined with a wide variety of products, competitive pricing, and doorstep delivery, has made online retail an integral part of everyday life. Global retail e-commerce sales are continuously reaching new heights, and this trend is expected to grow even further with advancements in technology and increasing internet penetration across the globe.

The growing popularity of online shopping, it is not without challenges. One of the major limitations of e-commerce is the lack of physical interaction with products. Unlike traditional in-store shopping, customers cannot touch, feel, or try out items before making a purchase. This uncertainty often affects buying decisions, especially for products like clothing, shoes, jewellery, and furniture. Questions such as *"Will this outfit fit me correctly?"*, *"Does this sofa match my room's decor?"*, or *"Will these earrings suit my style?"* often arise in the customer's mind. Such doubts can lead to hesitation, abandoned carts, and increased return rates, which negatively impact both customer satisfaction and business revenue.

Virtual Try-On technology implementation in e-commerce sites has been one of the effective solutions to these challenges. VTO uses the Augmented Reality (AR) to give customers a 3D experience in shopping. Users can get a sense of what products would look like in real life, in real-time by superimposing the digital representations of the products onto a real camera feed. Customers can virtually test products, be it clothing, footwear, jewellery, or furniture, through this technology, which gives some form of certainty and interaction that was not possible with the online shopping landscape before.

The aim of this project is to develop a web-based ecommerce platform that incorporates VTO for specific product categories, including furniture, outfits, footwear, jewellery, and electronics, while intentionally excluding groceries and food products. The site will have a Virtual Try-On button next to each product, which will allow the customer to engage with the products in an artificial and realistic way. This service is aimed not solely at the promotion of the shopping experience, but also at decreasing the rate of returns, increasing customer confidence, and enhancing the level of satisfaction, in general.

In the last decade, the e-commerce industry has experienced significant growth due to technological innovation, increases in internet access and changing consumer habits. Online shopping emerged as the primary option for consumers with a priority of convenience, product selection, and invested time. However, despite the convenience, a common disadvantage to online shopping is that the consumer cannot try or experience the product prior to purchase. When customers cannot feel or touch a

product, they are often unsure of size, colour, fit, and appearance leading to high apprehension and increased return products.

Virtual Try-On (VTO) systems can help alleviate this concern. VTO systems employ augmented reality (AR) and computer vision technology, in real-time, show the consumer an authentic interactive view of the product overlaid on the image of the user or the live video stream. VTO technology across e-commerce sites allows for an opportunity to provide a form of digital trial specifically for clothing and clothing accessories or cosmetics to help consumers become more accurately attuned to the fit of the product. User experience can be improved to create trust and achieve greater engagement with online brands and consumers become even more strongly motivated to act.

Besides VTO, the platform has focused on user friendly platform, whether using a mobile or desktop platform so that their customers have access to the platform and remain comfortable. Being able to integrate AR-driven VTO does not only duplicate the offline shopping experience but even enhances it. Instead of having to travel to stores and sit around and try designs, customers can now explore the possibilities of different styles, pairing furniture with room layouts, or test how electronics fit into their personal rooms without ever leaving their houses. This immersive experience is what is filling the gap between offline and online shopping since the platform delivers personalized, interactive, and enjoyable shopping experiences that build trust and create brand loyalty.

2. Related Work

Researchers, developers and retail companies have over the years experimented with various forms of incorporating the concept of Augmented Reality (AR) into the realm of ecommerce as a means of filling the disparity between the physical and the digital shopping process. Whereas some programs have delivered positive outcomes, the majority of the solutions have been localized to concentrate on particular categories or have been independent applications rather than being included in web platforms harmoniously.

The past ten years online retail and augmented reality (AR) based visualization systems have been studied extensively. Most traditional e-commerce websites relied on two static means to help potential buyers make a purchase decision: product images and customer reviews, which provided some assistance, but these options did not constitute an interactive or individualized shopping experience for the user and negatively affected consumer confidence.

Previous virtual fit-on apps have mostly been implemented as mobile-only applications rather than e-commerce websites. Early systems would simply take product images and place them on a static user photo using a method called image overlay. However, these systems did not provide any real time interaction, allow real time depth accuracy, and did not use a real-time basis for the users movements, which left the user with a very rudimentary preview of the product or item that they may be interested in purchasing.

Virtual Fitting Rooms (VFRs): Fashion retailers like Zara, H&M, and other industry leaders have experimented with AR-based fitting rooms that allow customers to visualize how clothes would look when worn. These solutions reduce the uncertainty associated with online fashion shopping by giving customers a sense of fit and style. However, their implementations are usually restricted to apparel alone and do not extend beyond fashion into other major e-commerce categories. In addition, many virtual fitting room solutions require sophisticated hardware or dedicated applications, limiting their accessibility for the average online shopper.

AR in Furniture Shopping: One of the most well known examples in this domain is IKEA's AR application, which enables customers to place virtual furniture within their physical living spaces. This gives buyers a realistic idea of size, colour coordination, and compatibility with room decor. While this approach has proven effective for furniture visualization, most such solutions are mobile app-based

rather than being integrated into e-commerce websites. This distinction creates a barrier since customers often need to download and install external apps, which can discourage immediate engagement.

Gadget and Accessory Visualization: Virtual try-on technology has also been adopted in specific segments like eyewear, watches, and jewellery. For instance, Lens kart offers a virtual try-on feature where users can test how frames look on their face, and brands like Titan have applied similar technology to showcase watches and jewellery. These tools are useful in reducing purchase hesitation for accessories but are category-specific. They often operate in isolation, meaning customers still have to visit different platforms for different needs.

Gap in Existing Systems: While these innovations have contributed significantly to the growth of AR in e-commerce, they remain fragmented. Most current solutions are either app-based, focused on a single product category, or developed for a specific brand. This fragmentation limits the overall adoption of AR across the broader e-commerce industry.

3. Proposed System Architecture

The proposed system is designed as a comprehensive e-commerce website that integrates Virtual Try-On (VTO) technology with traditional online shopping features, creating an advanced, interactive, and user-friendly platform. Unlike existing solutions that are fragmented or category specific, this system aims to provide a unified experience where customers can explore a wide range of products, visualize them in real-time using Augmented Reality (AR), and make informed purchase decisions confidently**.**

The system under review is intended to provide a connected e-commerce experience with VTO (virtual try on) across categories. The system is designed to allow for an omnichannel augmented reality experience in terms of real time visualization, browsing and purchasing capabilities, and across different channel applications.

Product Categories: The system will focus on five major categories that are often associated with hesitation in online shopping due to style, fit, or compatibility concerns.

Furniture – allowing customers to visualize sofas, chairs, tables, and other pieces in their living spaces.

Outfits (Men, Women, Kids) – enabling users to virtually try on clothes and evaluate fit, style, and appearance.

Shoes/Footwear – helping customers see how shoes would look on their feet through AR overlays.

adaptation layer, (7) quality evaluation system, and
(8) continuous learning mechanism. Each component functions synergistically to provide career guidance that is actionable, relevant, and adaptive to student aspirations and workforce requirements.

Virtual Try-On (VTO) Button: Each product page will include a Virtual Try-On button that, when clicked, activates the user's mobile or web camera. This feature will enable customers to place digital overlays of the selected product onto themselves (for fashion and jewellery) or into their environment

(for furniture and electronics). The integration of VTO creates an immersive and interactive shopping experience, reducing doubts and helping customers make confident purchase decisions.

AR Overlays and Real-Time Visualization: The system will leverage AR overlays to provide real time visualization of products. For example, users can:

A. Check how a sofa looks in their living room by virtually placing it in their space.

B. See how a dress fits their body type.

C. Preview how a pair of earrings or a necklace complements their face.

D. Place a television on their wall to evaluate its size. These AR features bridge the gap between physical and online shopping by offering a realistic, hands-on feel to products without the need for physical trials.

Web-Based Accessibility: Unlike many existing AR solutions that require downloading a dedicated mobile application, this system will be entirely web based. Users can access the platform directly through their browser on desktop or mobile devices, making it more convenient and inclusive. This eliminates additional barriers to adoption and ensures that customers can start interacting with products instantly without extra installations.

Additional E-Commerce Features: Beyond
Virtual Try-On, the platform will also integrate core e-commerce functionalities that customers expect, such as:

Product search and filtering options for quick discovery. Wishlist and cart management for seamless shopping flow. Product ratings, reviews, and recommendations to enhance trust and decision making. Order tracking and history for transparency and convenience.

This project is set to create a web-based ecommerce platform which integrates VTO with a given type of products such as furniture, outfits, footwear, jewellery and electronics but without including groceries and food items.

The product listing of the site will include a.

Virtual Try-On button, which allow customers to

have a natural interaction with products.

manner. This is an attribute that is meant to improve.

the shopping experience as well as to minimize the return.

interest rates, increase customer confidence and better.

satisfaction on the whole, This provides buyers with a realistic perception in terms of size, colour coordination, and match with room decor.

The virtual application of the AR overlays can enable customers to virtually apply the products on their bodies or position the products in their environments so that they can have realistic perceptions of size, shape, and aesthetics. The quality of decisions is also increased by enhanced consumer involvement, and this is likely to increase the confidence of consumers to buy. Although some of the initiatives have yielded good outcomes, the majority have been small in scale, targeting a particular category or needing to be used as a separate application rather than being integrated into web platforms.

This allows the user to connect to the software without anything to be programmed to be downloaded and can access the software through the internet, even with a smartphone, tablet, or even laptop.. It also removes functionality barriers for new users, removing device-specific user experiences and allows for a broader distribution among new users. Most current solutions are either app-based, focused on a single product category, or developed for a specific brand. This fragmentation limits the overall adoption of AR across the broader e-commerce industry.

4. Block Diagram

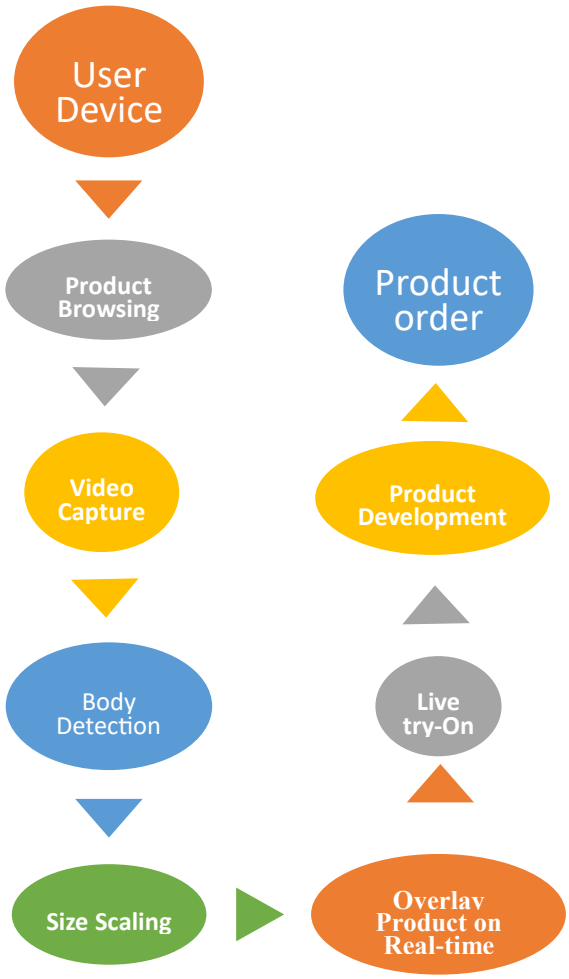

Fig. 1. System Architecture of Proposed E-commerce Website with Virtual Try-On Feature

5. Methodology

Frontend Development: The frontend is the main point of connection between the system and the user. It will be visually appealing, responsive and intuitive.

Technologies Utilized: The front end will be developed in HTML, CSS, JavaScript, and this is going to be compatible with all browsers and devices. CSS structures and JavaScript programs will be employed to make it more responsive and provide an engaging experience with smooth animations.

User Interface: The user interface will consist of home page, product catalogue, search bar, filters, shopping cart, and checkout pages. The product pages will have high-quality images, full descriptions, prices, and customer reviews, and a special button called Virtual Try-On.

Responsive Design: The site will be a full-fledged responsive one, changing perfectly across the desktop, tablets, and mobile screens. This will make sure that the users can have a consistent shopping experience irrespective of the device that is in use.

Backend Development: The backend is the heart of the system, and it handles product information, user information, and enhancing the transactions.

Database: DB will be created that is either Relational (MySQL) or NoSQL (MongoDB) to store structured information such as product information, inventory, and pricing and unstructured information in the form of user reviews and feedback.

Data Processing: CRUD operations (Create, Read, update, delete) will be implemented to be able to handle the product listing, the customer profile, and the order process effectively using the database.

Virtual Try- On (VTO) Module: The most innovative and unique module of the system is the Virtual Try- On module. It offers users with the opportunity to engage in interaction with products in a three dimensional, virtual way.

Camera Integration: With the WebRTC (Web RealTime Communication), the system will gain access to the users mobile or web camera. This will enable live streaming of the picture of the user or the surrounding in which one can visualize products.

Performance Optimization: Due to the resource-intensive nature of features of AR, optimization methods will be employed to ensure a high-quality real-time interaction without delays that includes model compression, adaptive rendering and efficient image recognition algorithms.

Additional Modules and Enhancements: Recommendation System: Individualized product recommendations out of the browsing history and preferences.

Order Management: The order status can be monitored in real-time and the order history can be accessed easily.

Customer Reviews: Customers are able to leave a review, rating and pictures that enable them to make better decisions.

Admin Panel:An administrative control panel allowing the management to add products, inventory, and the analysis of customer data..

6. Results and Analysis

The AI-assisted career advice system was experimented using a variety of student profiles, and predictions were made against those made by expert counsellors. The model was found to have a general accuracy of 88 which shows that it is reliable in the determination of appropriate career domain. The suggested system will provide a groundbreaking online purchasing experience by overcoming the major shortcomings of the conventional ecommerce systems. The system combines Virtual Try-On (VTO) with the application of Augmented Reality (AR), which means that the platform is not based on mere product lists and it does not consist of a set of a few photos on the side, but provides the customer with a real and engaging shopping experience.

Expected Outcomes:

Decreased Product Returns: Return rates are a significant problem in the e-commerce market, particularly with products that have problems with size, fit, or compatibility, such as clothing, footwear, and furniture. Virtual Try-On will aid the customers to make well-informed purchasing decisions by displaying the products in a real-life scenario. This does not only ensure that customers do not get disappointed, but it also helps the sellers to save on reverse logistics expenses and wastage caused by the frequent returns.

Scalability and Future Expansion: The system is built with an aspect of scalability in mind and will be capable of supporting future categories such as cosmetics (lipstick, eyewear, hairstyles) or home decor (paintings, wallpapers, lighting). The structure is modular thus new categories can be added without affecting the structure. This flexibility makes the platform a future-proofed platform, which can be flexible to adapt to the changing customer expectations and technological changes.

7. Discussion

State of the art shopping experience, which is founded on augmented reality (AR) and virtual try-on (VTO) ability can close the discrepancy between physical and online retailing. This isn't just another e-commerce platform with boring, static images and text. This platform creates a now-time context in virtual space, with the products, for the customer. Once the virtual space has been created, a customer will see themselves in context of how the products would look like or fit. This component builds more

trust to the customer towards an online retailer or seller and will be reliable and provide convenience to the customers.

Closing the Gap Between Physical vs. Online Retailing: In essence, it will close the gap between retailed physical vs. online retailing. AR technology would allow for the customer to be able to see products and/or try-on products or visually see products in context in the physical environments. An example would be whether a piece of furniture would fit into their living room or how a watch would fit on their wrist. To take this added component of visualizing products (even in a more real world capacity) would create a phenomenon in e-commerce.

Cross-Device Accessibility: Similar to numerous AR applications requiring a separate mobile app, this application operates on a web browser rather than a downloadable application. This enables the user to access the software directly through the internet, from any mobile device such as a smartphone, tablet, or even laptop, without having to download anything. It also allows easy functionality access to new users that removes device specific user experiences and enables a wider distribution among new users.

Business Implication and Long-range Value: In the business perspective, customer interaction/engagement, loyalty, and trust will be a result of the utilization of AR and VTO on e-commerce websites. Customers that have a realistic or interactive shopping experience would tend to make repeat purchases. Over time, the platform will use AI to suggest products, analyse impression of consumer preferences, and enable users to share AR try-on with their friends. Each of these innovations will not only enhance the experience of the user, but it will also make it harder to continue using a platform as compared to their competitors in the digital environment.

8. Conclusion

The suggested e-commerce platform will feature a new Virtual Try-On Feature (present in various categories of products), which is unusual to the traditional ones. The system increases confidence and minimizes returns by providing customers with a visualization option in order to see the products prior to purchase thereby increasing satisfaction.

The proposed online retailing platform involves an exclusive Virtual Try-On Feature in a variety of product lines unlike other e-retail settings.In providing the ability to visualize a product before purchase, the system enhances confidence, reduces returns, and improves satisfaction. Some potential future enhancements include:

Artificial Intelligence to recommend size. Virtual avatars for camera-less offline viewing. Machine learning for individualized product recommendations. Mobile app version with AR Kit (iOS) and AR Core (Android).

Decrease in Product Returns: One of the more significant difficulties in e-commerce is the amount of product returns, particularly for clothing, shoes, and furniture. When the customer is unsure about sizing, fit, and general appearance, they may become dissatisfied and send the item back. By having VTO, users can engage with products virtually and in real-time to determine if it is an appropriate fit

before purchasing. This not only saves sellers costs, in terms of both returns, reverse logistics costs, and reduced inventory waste resulting from returns, but helps customers feel slightly more confident in the selection of an order they have placed.

Future Growth and Scalability: The system is built with a modular and extensible architecture, meaning that it is scalable to more categories than the intended initial categories. For future growth, it may include cosmetics like lipstick, eyewear, or hairstyles, but for the categories outside of apparel, more home décor items would include paintings, wallpaper, and lighting fixtures. Because of the modular architecture, any new category can be added easily, and no other functionality will be affected. Because of this, the platform is futureproof and the company can grow while customer demand for products in AR continues to grow and the technology also improves within AR and ecommerce.

Improved Customer Engagement and Experience: Expanding on the development of an interactive virtual space, the system transforms the online shopping experience from a relatively passive action of browsing to a meaningful process of decision-making. Retailers give their customers an opportunity to see products in real life situations, visualize multiple product options, and receive recommendations catered to their selections. By increasing the level of engagement, companies can anticipate customer satisfaction, loyalty and repeat purchase behaviour situations which foster platform sustainability and competitiveness.

Operational Efficiencies and Insights: The retailers will also have access to rich user interaction data on top of the VTO technology that allows them to engage in their targeted interaction and data collection. The experiences of the customer during interaction with preferences, trials and engagement may be used to assist the retailers in controlling the products to maintain the inventory, target marketing strategy and product development. The data capture behavior of data analytics will be exercised in combination to support Inform operational processes and continue maintaining data driven business decisions.

In short, the proposed system offers an extensive and innovative view of online shopping that enhances the existing problems concerning customer satisfaction and efficiency in operations and establishes a versatile model of implementing new technologies in the future. All in all, the immersive AR visualization combined with the modular design and the insights-driven by data make it a potentially groundbreaking solution to the ongoing transformation of e-commerce.

9. Future Improvements

Improvement of Technology: In the future the system could be enhanced by utilizing Artificial Intelligence (AI) to provide customized product suggestions based on the user's preferences, body113 measurements and shopping history. Enhanced use of 3D body and environment scanning could assist in a more precise size prediction and more accurate realistic space for placing things like furniture and décor. To enhance visual realism users could be provided high specification 3D graphics, real-time light and shadowing for a more engaging experience. Additionally, devising voice and gesture technology

would make the platform easier and more engaging to use. Furthermore, cross device and browser compatible AR payment can provide with an easier and more convenient shopping experience.

***User level engagement and market growth*:** To further enrich users there could be a multiuser/social try-on option to experience shopping with a friend or gain instant feedback prior to purchasing. This experience could be fully converted into a virtual store through latest technology VR. To further understand and improve customer purchasing through customer online behaviour, it would prove valuable to include data analytics.

References:

1. Laudon, K.C., & Traver, C.G. E-Commerce 2022: Business, Technology, and Society. Pearson Education, 16th Edition, 2022.
2. Azuma, R. T. "A Survey of Augmented Reality." Presence: Teleoperators & Virtual Environments, vol. 6, no. 4, pp. 355-385, 1997.
3. Javornik, A. "Augmented Reality: Research Agenda for Studying the Impact of Its Media Characteristics on Consumer Behaviour". Journal of Retailing and Consumer Services, vol. 30, pp. 252261, 2016.
4. Schmalstieg, D., & Hollerer, T. Augmented Reality: Principles and Practice. Addison-Wesley, 2016.
5. Kim, J., & Forsythe, S. "Adoption of Virtual Try-On Technology for Online Apparel Shopping." Journal of Interactive Marketing, vol. 22, no. 2, pp.
6. 45-59, 2008.
7. Pantano, E., & Gandini, A. "Exploring the Forms of Sociality Mediated by Innovative Technologies in Retail Settings." Computers in Human Behaviour, vol. 77, pp. 367-373, 2017.
8. Poushneh, A., & Vasquez-Parraga, A. Z. "Discernible Impact of Augmented Reality on Retail Customer's Experience, Satisfaction and Willingness to Buy." Journal of Retailing and Consumer Services, vol. 34, pp. 229-234, 2017.
9. Yim, M. Y.-C., Chu, S.-C., & Sauer, P. L. "Is Augmented Reality Technology an Effective Tool for E-commerce? An Interactivity and Vividness Perspective." Journal of Interactive Marketing, vol. 39, pp. 89-103, 2017.
10. Flavián, C., Ibáñez-Sánchez, S., & Orús, C. "The Impact of Virtual, Augmented and Mixed Reality Technologies on the Customer Experience." Journal of Business Research, vol. 100, pp. 547-560, 2019.
11. Javornik, A., Rogers, Y., Moutinho, A., & Freeman, R. "Revisiting the Consumer Experience in Digital Retail: Toward a Systematic Research Agenda." Journal of Business Research, vol. 91, pp. 540–548, 2018.
12. Hilken, T., de Ruyter, K., Chylinski, M., Mahr, D., & Keeling, D. I. "Augmenting the Eye of the Beholder: Exploring the Strategic Potential of Augmented Reality to Enhance Online Service Experiences." Journal of the Academy of Marketing Science, vol. 45, no. 6, pp. 884–905, 2017.
13. Verhagen, T., Vonkeman, C., Feldberg, F., & Verhagen, W. "Presenting in Virtual Worlds: Towards an Understanding of the Effects of Virtual Reality.