
CONSUMER ACCEPTANCE OF AI-POWERED VIRTUAL TRY-ON TECHNOLOGY: A MULTI-PLATFORM COMPARATIVE ANALYSIS USING TECHNOLOGY ACCEPTANCE AND EXTENDED SELF THEORY

Dr. Afrose Fathima Farid¹, Khushi Manoj Pawar²

¹Professor, Department of Textile Design, National Institute of Fashion Technology, Kannur, Kerala

²Student, Department of Textile Design, National Institute of Fashion Technology, Kannur, Kerala

E-mail: *afrose.farid1@nift.ac.in

Abstract

The growth of digital fashion retail has made Artificial Intelligence (AI)-driven Virtual Try-On (VTO) systems necessary for making online shopping better and solving big problems like high return rates and customers not being sure about sizing and fit. This research investigates consumer acceptance and behavioural responses to Virtual Try-On (VTO) technologies across various fashion e-commerce platforms. Based on the Technology Acceptance Model (TAM), Extended Self Theory, and the Value-Based Adoption Model (VAM), this research investigates the impact of system quality, self-representation, and perceived value on trust development, purchase intention, and post-purchase satisfaction. The study utilises a mixed-methods design, incorporating quantitative experiments to compare VTO-enabled and traditional online shopping experiences, structural equation modelling (SEM) to evaluate theoretical relationships, and qualitative interviews with users to obtain experiential insights. We compared four VTO platforms—FASHNAI, FitRoom, Fotor, and Nano Banana—based on their technical performance, interface design, and user engagement. It is hoped that the findings will help extend theoretical understanding of virtual consumer behaviour by introducing constructs such as virtual fit confidence and avatar identification strength while providing practical guidelines for retailers on platform selection, user experience optimisation, and sustainable retail strategies. This study bridges the gap between consumer psychology and AI-powered fashion technologies, contributing to both academic research and industry practices. It shows how VTO can help build consumer trust, confidence in purchases, and environmentally friendly shopping habits.

Keywords: *AI in Retail, Consumer Behaviour, Digital Transformation, Fashion E-commerce and Virtual Try-On Technology.*

1. INTRODUCTION

Artificial Intelligence (AI) has transformed the fashion industry, which is known for its rapid trend cycles and constant innovation (Batoool A., 2024). AI-powered Virtual Try-On (VTO) systems have become important in fashion e-commerce. It helps shoppers visualise clothing on their own bodies and narrows the gap between digital visualisation and physical experience (Nguyen Q.H., 2025). Nonetheless, consumers still face uncertainty regarding sizing, fit, and garment appearance, leading to dissatisfaction, low purchase confidence, and high return rates in online apparel shopping (Akteer M.S. et.al., 2025). VTO technologies address these issues by deploying computer vision, 3D simulation, and image processing to provide near-realistic representations of garment fit, drape, and style for diverse body shapes (Imagga, 2025). As global e-commerce expands and the demand for personalisation rises, these systems are crucial for building trust, increasing purchase intention, and reducing product returns, which reinforces

sustainability by lowering logistics-related emissions and textile waste resulting from unnecessary returns (Zakeke, 2025). Retailers can use VTO-generated behavioural data to fine-tune their assortment planning, recommendation engines, and overall shopping interfaces, aligning them with evolving consumer expectations (Google Article 2025). The evolution of VTO is closely tied to advances in AI, augmented reality, and 3D graphics, which together have made virtual fitting rooms more immersive, responsive, and tailored to individual needs (Imagga, 2025). Contemporary platforms simulate fabric behaviour, colour accuracy, and body proportions with increasing precision, giving users the freedom to experiment with looks and sizes in a low-risk, real-time environment (Nguyen Q.H., 2025). In this context, platforms such as FASHNAI, FitRoom, Fotor, and Nano Banana adopt varied technical and experiential approaches, providing an ideal setting to examine how perceived value, self-representation, and system quality shape virtual consumer behaviour in fashion e-commerce (Google Article 2025).

Aim of the Research

This study aimed to evaluate the effectiveness of AI-driven Virtual Try-On technologies in enhancing consumer experience in online fashion retail, with a specific focus on image generation, trust, perceived fit accuracy, and satisfaction.

Objectives of the Research

- To compare the performance of four VTO platforms, Fitroom, FASHN AI, Fotor, and Nano Banana, based on realism, fit accuracy, clarity, available features, and ease of use.
- To analyse user preferences and satisfaction levels while using different VTO tools during online dress selection.
- To identify the strengths and weaknesses of each VTO platform through quantitative evaluations and qualitative participant feedback.
- To assess the impact of VTO on purchase confidence by comparing virtual try-on results with the actual fit of an online purchased garment.

2. REVIEW OF LITERATURE

Virtual Try-On (VTO) technology has undergone a transformative evolution from rudimentary 2D image overlays to sophisticated AI-driven 3D simulations that increasingly approximate real-world garment behaviour and fit (Jain et al., 2024; Zhao et al., 2022). This technological progression has catalysed multidisciplinary scholarly enquiry spanning technical architectures, consumer psychology, sustainability implications, and ethical considerations (Jain et al., 2024; Lee & Kim, 2023; Santos et al., 2024). The literature reveals that VTO is a complex socio-technical innovation whose impact extends far beyond mere visualisation, fundamentally reshaping the online fashion retail ecosystem. The technical underpinnings of modern VTO systems are based on convergent advances in machine learning, computer vision, and augmented reality (AR). Zhao et al. (2022) demonstrate that deep-learning architectures, particularly convolutional neural networks and generative adversarial networks, can predict fabric drape, texture mapping, and body-garment interaction dynamics to generate photorealistic 3D renderings. These models understand the complex relationships among garment properties (fabric weight, elasticity, and cut) and conform to diverse body morphologies, enabling the dynamic simulation of movement and fit.

However, the fidelity of these outputs is highly dependent on computational resources and the quality of the training data, creating potential barriers to adoption by smaller retailers with limited technical infrastructure (Zhao et al., 2022). Comprehensive technical reviews of virtual fitting rooms and AR-

based try-on systems confirm that while state-of-the-art pipelines achieve impressive photorealism across varied body shapes and skin tones, their performance remains sensitive to environmental factors, including lighting conditions, camera calibration, and input image resolution (Jain et al., 2024; IJARC-CSE Review, 2025). These technical constraints directly translate into user-perceived accuracy and system reliability, particularly for garments where drape characteristics, texture fidelity, and colour accuracy are critical attributes (Zhao et al., 2022). The literature identifies persistent challenges in rendering complex fabrics (e.g. silk, lace, and layered materials), accurately simulating garment-body occlusion, and maintaining real-time performance on consumer-grade devices (IJARC-CSE Review, 2025). These limitations underscore the gap between laboratory demonstrations and scalable commercial deployment, suggesting that technical maturation remains an ongoing process rather than a completed achievement.

Consumer behaviour research consistently demonstrates that VTO enhances the perceived diagnostic value of a shopping tool's ability to evaluate product attributes, alongside experiential enjoyment and brand trust (Tandon & Zhang, 2024). Jain et al. (2024) persuasively argue that AI-integrated VTO reshapes the consumer journey by reducing the uncertainty inherent in online apparel shopping, enabling prospective buyers to visualise themselves in garments before commitment. This visualisation capability addresses a fundamental limitation of e-commerce: the inability to physically interact with products before purchasing them. Lee and Kim (2023) extend this analysis, reporting that realistic VTO experiences significantly enhance consumer confidence and perceived control over purchase decisions, which in turn strengthen brand loyalty in digital fashion environments. Empirical investigations employing the Technology Acceptance Model (TAM) and its extensions have revealed that perceived usefulness, ease of use, and hedonic enjoyment collectively predict positive attitudes toward VTO adoption and subsequent purchase intentions (Nguyen, 2014; Consumers' Attitudes Study, 2023).

The role of personalisation features is particularly salient in the literature. Tandon and Zhang (2024) demonstrate that body-type customisation, user-resembling avatars, and AI-driven style recommendations significantly increase both engagement duration and satisfaction levels. These findings suggest that VTO's value proposition of VTO extends beyond functional fit assessment to encompass emotional connection and self-expression traditionally associated with in-store shopping experiences. Conversely, Rossi and Chen (2023) provide important cautionary evidence that perceived inaccuracies in VTO outputs stemming from unrealistic lighting, poor garment rendering quality, or system latency can severely erode trust in both the technology and retailer brand, even when the ultimately delivered physical product meets objective quality standards. This finding highlights a critical asymmetry: while accurate VTO builds trust incrementally, inaccurate representations can trigger disproportionate and negative responses. Virtual retailing experiments corroborate this pattern, showing that discrepancies between virtual previews and physical fits amplify perceived risk and post-purchase dissatisfaction, potentially exceeding the disappointment levels associated with traditional online shopping without VTO (Application Fitting Room Study, 2023).

From a sustainability perspective, VTO represents a potentially transformative intervention for addressing the environmental costs of online fashion retail. Santos et al. (2024) document that clothing return rates in e-commerce frequently reach 30%, driven primarily by fit and style mismatches. These returns generate substantial carbon emissions through reverse logistics, contribute to textile waste when returned items cannot be resold, and impose high economic costs on retailers, which are often passed on to consumers through pricing or absorbed through reduced profitability.

Studies examining AI-enhanced fashion e-commerce demonstrate that realistic VTO implementations can meaningfully reduce size-related returns, optimise inventory management, and discourage “bracketing” behaviour, the practice of ordering multiple sizes or styles with the premeditated intention to return most items (Batool, 2024; Virtual Try-On Technology Review, 2024). By enabling more accurate pre-purchase visualisation of fit and style compatibility, VTO supports informed purchasing decisions that align with circular economy principles and sustainable consumption patterns (Santos et al., 2024). However, researchers emphasise that these sustainability gains are contingent upon technical robustness and accuracy (Zhao et al., 2022; IJSET Review, 2023). Inconsistent or unreliable fit prediction may paradoxically increase return rates by creating false confidence in poor-fit purchases or generating frustration that leads to over-ordering as a risk-mitigation strategy. This conditionality underscores that VTO’s environmental benefits of VTO are not automatic but rather depend on achieving and maintaining high technical performance standards.

Privacy, security, and ethical governance constitute increasingly prominent research strands as VTO systems become more sophisticated and data-intensive. Park (2023) and Miller (2022) identified significant consumer reluctance to share body scans, photographs, or biometric measurements due to concerns about data misuse, commercial surveillance, identity theft, and reputational risks associated with the exposure of body-image data. Research on the “privacy paradox” in 3D body-scanning contexts reveals a fundamental tension: while users highly value the personalisation and convenience these systems enable, the perceived sensitivity of biometric and body-shape data significantly suppresses the willingness to adopt (Privacy Paradox Study, 2023). This paradox suggests that technical capability alone is insufficient for widespread adoption; consumer acceptance depends critically on trust in the data governance practices.

Legal and policy analyses of cloud-based VTO systems highlight the additional complexities arising from cross-border data transfers, third-party processing arrangements, and evolving privacy regulations (Shoosmiths, 2020; Curtis, 2022). Many commercial VTO implementations involve data flows that trigger obligations under the General Data Protection Regulation (GDPR), the California Consumer Privacy Act (CCPA), and similar frameworks, raising questions about informed consent, data minimisation, retention limits, and users’ rights to access and delete their data. These legal and ethical analyses converge on the position that transparent data policies, robust security safeguards, algorithmic fairness (particularly regarding body-type representation), and ethical AI design principles are not optional enhancements but prerequisites for sustainable consumer acceptance and regulatory compliance (Park, 2023; Miller, 2022). The literature suggests that retailers who fail to address these concerns proactively risk not only reputational damage but also regulatory sanctions and diminished competitive positioning, as privacy-conscious consumers increasingly factor data practices into purchase decisions.

Synthesising these diverse research strands, contemporary scholarship portrays VTO as a multidimensional innovation that operates simultaneously across technological, psychological, environmental, and ethical domains. The evidence base supports cautiously optimistic conclusions: well-designed, accurately performing VTO systems demonstrably improve perceived fit assessment, enhance shopping enjoyment and confidence, increase purchase intention, reduce return rates, and offer meaningful contributions to sustainability objectives (Jain et al., 2024; Lee & Kim, 2023; Santos et al., 2024; Tandon & Zhang, 2024).

However, the literature also documents persistent challenges that moderate these benefits and constrain widespread adoption. Technical limitations, including rendering inaccuracies for complex fabrics, computational demands that limit accessibility, and performance variability across devices and environments, continue to affect user experience quality (Zhao et al., 2022; IJARC-CSE Review, 2025). Consumer-facing challenges include trust erosion when accuracy falls short of expectations (Rossi & Chen, 2023), accessibility gaps for users with diverse body types or varying levels of technical literacy, and unresolved privacy concerns that suppress adoption among privacy-sensitive consumers (Park, 2023).

The literature reveals a notable gap in integrative theoretical frameworks that simultaneously address technological performance, consumer psychology, sustainability, and ethical governance. Most existing studies examine VTO through single disciplinary lenses—computer science focuses on algorithms, marketing on consumer behaviour, sustainability science on environmental impacts, and legal scholarship on privacy—with limited cross-domain synthesis (Jain et al., 2024; Santos et al., 2024).

3. METHODOLOGY

This study adopted a comparative user-based evaluation approach to analyse the performance, usability, and consumer acceptance of four AI-powered Virtual Try-On (VTO) platforms, Fitroom, FASHN AI, Fotor, and Nano Banana, during an actual online fashion shopping experience.

A mixed-methods design was employed to capture both quantifiable performance outcomes and subjective perceptions of users. Quantitative observations focused on accuracy, interface efficiency, and tool features, whereas qualitative responses highlighted user comfort, trust, and satisfaction.

Survey Participants

Four participants, aged 20-25, were recruited based on their familiarity with online apparel shopping. All the participants were female fashion e-commerce users. Their involvement ensured relevant and realistic responses regarding VTO usability and purchasing decisions.

Procedure

A dress from an online retail website was selected as the reference product for the evaluation. Each participant used all four selected VTO platforms to try on ten garment images. They followed identical steps across platforms, including image upload, body alignment, and visualisation of the final look.

After completing the virtual trials, only one actual dress was purchased to compare the real-life fit with the virtual outputs, enabling an assessment of purchase confidence and improvement in accuracy through VTO.

Data Collection Tools

Data were collected using the following methods:

- Rating checklist: Participants evaluated each platform based on the realism of visual output, fit accuracy, clarity, available customisation features, and ease of operation using a 5-point scale.
- Observation sheet: Processing time, user interface functionality, and tool limitations were noted.
- Short interviews: Participants provided opinions on privacy concerns, perceived usefulness, system challenges, and influence on buying decisions.

Data Analysis

Quantitative data were analysed using descriptive comparisons to identify user preference patterns and rank platform performance. Qualitative insights were thematically analysed to identify recurring perceptions, strengths, and concerns related to the technology. The combined analysis enabled a holistic evaluation of VTO's effectiveness of VTO in enhancing purchase confidence.

4. RESULT AND DISCUSSION

This chapter presents the outcomes of a comparative evaluation of four AI-based Virtual Try-On (VTO) platforms: Fitroom, FASHN AI, Fotor, and Nano Banana. The findings are organised into survey-based responses, quantitative observations of the quantitative tool's performance, and qualitative usability insights.

Visual output analysis of VTO Platforms

Participants tested a selected dress (Fig. 1) using the four VTO tools and rated them based on fit and appearance, realism and clarity, available features, and ease of use. The results indicated that Fitroom and FASHN AI outperformed the others in terms of accuracy and user interface. Fotor and Nano Banana were easier for beginners but lacked realism and customisation options. Figure 1-6 records the generated images starting from existing online photoshoot pictures of the garment, the same garment on the four VTO platforms, and the actual purchased garment to assess the final actual fit evaluation in comparison to the virtually generated images. From the fig set, it can be seen that Fitroom performed the best overall in terms of realism, accuracy, and practicality. It provided the closest visual match to the delivered garment, giving users greater confidence in the fit and appearance of the dress. FASHN AI also showed strong performance, especially in garment detailing and advanced customisation options, although many premium features required paid access, and the tool occasionally experienced slower processing times. In contrast, Fotor and Nano Banana were appreciated for being free and simple to use, but their outputs lacked precise body mapping and realistic fabric rendering, leading to distortions and lower clarity in virtual try-on results.



			
<p>Fig.3: Virtual try on using FASHN AI</p>		<p>Fig.4: Virtual try on using Fotor</p>	
			
<p>Fig.5: Virtual try on using Nano Banana</p>		<p>Fig.6: Actual dress fit and look of purchased dress</p>	

Overall, platforms with high-quality rendering and user-friendly navigation greatly enhanced purchase confidence, whereas basic tools served primarily as quick visualisation aids rather than reliable fit predictors.

Comparative study of the VTO Platforms

Table 1 records the interviews with the four respondents regarding the VTO Platforms and their strengths and weaknesses. From the table, it can be seen that Fitroom received the highest rating of 5 out of 5 for its accurate fit results, quick processing, and intuitive user interface, although minor lighting inconsistencies were noted. FASHN AI scored 4, offering highly realistic garment rendering and detailed textures; however, its slower loading speed and paid-only advanced features hindered accessibility. Fotor scored 3 because it was very simple and beginner-friendly, but the low realism and limited customisation options reduced user satisfaction. Nano Banana also scored 3, praised for its fun, easy-to-use layout, but it struggled with distorted body proportions and a limited garment library. These findings highlight that users tend to prefer platforms that balance realism, usability, and functionality to support confident and accurate purchasing decisions.

Table 1: Comparison of Fitroom, FASH AI, Fotor and Nano Banana VTO Platforms

S. No	VTO Platforms	Strengths	Weaknesses	User Score till 5
1	Fitroom	Accurate fit, quick processing, intuitive UI	Minor lighting inconsistencies	5
2	FASHN AI	High realism, detailed rendering	Slow loading, paid features	4
3	Fotor	Simple, beginner-friendly	Low realism & customization	3
4	Nano Banana	Fun layout, easy access	Distorted proportions, limited library	3

Challenges and Experiences Related to VTO Platforms

Table 2 presents the participants' experiences and the challenges they faced while using the VTO Platforms. Participants shared both positive and negative experiences while using the Virtual Try-On platforms. On the positive side, all users reported that VTO significantly improved their purchase confidence, helping them make more assured buying decisions. The ability to visually assess garments enhanced their overall decision-making process, making shopping more engaging and interactive. They also felt that VTO reduced uncertainty about size and fit, which could ultimately lead to fewer returns. However, several challenges were noted. Some platforms generated mismatched body proportions or colour inconsistencies, affecting the realism of the results. Certain advanced tools experience loading delays, particularly when generating high-quality outputs. Additionally, a few participants expressed privacy concerns, particularly regarding uploading personal images and storing facial data. These insights highlight the growing value of VTO technology while emphasising the need for continued improvements in accuracy, speed, and data security.

Table 2: Record of positive and negative experiences related to VTO Platforms

S. No	Positive Experience	Negative Experience
1	Improved purchase confidence	Body proportion
2	Enhanced visual decision-making	Color distortions
3	Enjoyable and interactive feature	Loading delays
4	Reduced product fit uncertainty and thereby its return	Privacy concerns

Despite the noted limitations, all participants agreed that VTO tools helped them feel more confident before purchasing a garment, demonstrating short-term trust-building and reduced hesitation.

5. CONCLUSION

This study confirms that AI-driven Virtual Try-On (VTO) systems play a crucial role in improving digital fashion retail by enhancing consumer trust, purchase intention, and satisfaction through better visualisation of fit and appearance. The comparative evaluation of FITroom, FASHN AI, Fotor, and Nano Banana demonstrated that FITroom, with its higher system quality and stronger self-representation features, such as realistic garment rendering and accurate body mapping, led to greater perceived value and confidence among users. The Technology Acceptance Model (TAM), Extended Self Theory, and Value-Based Adoption Model (VAM) reveal that the psychological connection users form with their virtual appearance significantly influences behavioural outcomes, including willingness to buy and reduced product returns.

Although challenges regarding privacy, processing performance, and avatar realism still exist, this study highlights how VTO technology can improve environmental sustainability by minimising waste associated with returns and unsatisfactory purchases. Overall, this study advances the understanding of virtual consumer behaviour while offering practical insights for fashion retailers to optimise their platforms and design more engaging, trustworthy AI-powered platforms for a better online shopping experience and stronger sales.

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