

# Virtual Try-On to Post-Purchase Satisfaction: Exploring the Consumer Experience in Online Retail

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## Abstract

The rise of e-commerce has revolutionized the entire process of shopping globally as the increased rate has ensured consumers unprecedented ease, convenience, and accessibility to a plethora of products. Therefore, as suggested, one of the benefits of e-commerce has been its ability to allow consumers to access a plethora of products at anytime as online stores have removed boundaries in the form of geographical location, as may have been a constraint in traditional brick-and-mortar stores. However, as observed, a plethora of other attributes, such as increased internet, smartphone, digital payments, etc., have ensured that e-shops have become an integral part of consumer culture, especially younger generations globally.

Despite the aforementioned, there are certain challenges that the expansion of e-commerce poses to the satisfaction of consumer needs. Among the critical challenges facing the expansion of e-commerce is the lack of physical contact with the product before purchasing. Generally, when one intends to purchase a product, they touch the product and also get a better feeling for the quality of the product by trying and touching the product. Due to the lack of such opportunities when purchasing through the internet, there is a high risk or uncertainty regarding the product, especially experience-driven product categories such as fashion, beautifying, shoes, and lifestyle.

Such a condition often leads to consumer dissatisfaction after the service or product has been provided. Hence, the return rate increases. Within the fashion and beauty segment, return rates are very high due to factors such as the size or fitting of the garment, or differences in terms of color or style, and general consumer expectations. Return rates are a significant factor that causes inconvenience to the consumer as well as the retailers, which leads to considerable costs. Thereby, satisfying consumer uncertainty and ensuring high satisfaction after the purchase has become a major concern.

In order to overcome these challenges, the electronic commerce websites are increasingly adopting advanced technology to replicate the shopping environment within the stores. In this regard, Virtual Try-On technology using Augmented Reality technology is considered to be one of the innovative solutions to the challenges facing the electronic commerce stores. Virtual Try-On technology provides consumers with the capability to view the product virtually on themselves or even the environment before the actual purchase of the product. Virtual Try-On technology allows users to virtually “try on” the product, such as “trying on clothes, sunglasses, makeup, shoes, and other wearables.”

The goal of the Virtual Try-On technology is to bring online and offline shopping experiences closer by developing the shopping experience. The use of images does not allow the consumer to get an instant view of how the product will look on them. The use of the Virtual Try-On system helps the consumer get an instant view of how the product looks. The consumer can then get an accurate idea about the product. It is likely that the decision of the consumer may be influenced and may directly impact satisfaction levels.

The burgeoning use of Virtual Try-On in various e-commerce sites signposts the importance attached to VTO strategies. Notably, major organizations in the fashion industry, beauty products, and eyewear have incorporated VTO in both online and brick-and-mortar stores with the aim of increasing consumer engagement and cognizance. VTO facilitates decision-making in that the consumer gets to try products before buying them. However, despite the much-discussed implications in buyer intention and conversion rates, the relationship between VTO and buyer satisfaction warrants further empirical analysis.

This paper aims to explore the effect of the use of Virtual Try-On technology in shaping the level of post-purchase satisfaction, particularly in the area of e-business. Post-purchase satisfaction harbors great impacts in terms of generating loyalty, as well as through recommendations. It is important to warrant a situation where the performance of the product matches the expectations of the consumer. This situation has been a major hindrance, especially in an environment where there is a lack of a physical product. This situation is anticipated to be reduced through the use of the virtual try-on.

To fulfill the objectives of the study, primary data were collected through the administration of structured questionnaires to 219 respondents. The respondents were online shoppers who had previous experiences with Virtual Try-On aspects while shopping online. The primary data were used to represent the needs of the consumer and their perception about the Virtual Try-On technology. The questionnaire was developed to cover aspects such as demographic characteristics, online shopping habits of the respondents, the frequency of the use of Virtual Try-On technology, perception about the ease of use of Virtual Try-On technology, purchase confidence, satisfaction, and recommendations.

The research analysis was about gaining insight into the levels of adoption associated with Virtual Try-On among consumers and evaluating the impact of Virtual Try-On technology on the consumer's shopping experience. The adoption level refers to the level at which the consumer is knowledgeable and comfortable with Virtual Try-On technology while engaging in online shopping. The research would also assess perception levels associated with the ease of use, realism, and the efficiency of Virtual Try-On technology in alleviating purchase-associated uncertainties.

One of the major findings of the study was the increase of "Purchase Confidence." The study found that Virtual Try-On increased the purchase confidence among the users of the technology. The study mentions the increase of purchase confidence as one of the major advantages of Virtual Try-On. When the users of the technology felt more confident about the purchase, it enabled other users to feel confident about the purchase as well. Purchase confidence is an important factor for the purchase of fashion or beauty-related items.

Another finding that turned out to be important is that Virtual Try-On reduces the perceived risk connected with online shopping. Here, we refer to the 'perceived risk' as the consumer's concern about the negative outcome that can happen with the product they purchase. This effect often includes the fear that the product supplied does not match or look appropriate. On the other hand, the ability to remove the fear about the product directly affects the level of satisfaction consumers attain after purchasing the product.

Furthermore, the study reveals a positive link between the use of Virtual Try-On and post-purchase satisfaction levels. The study establishes that consumers who have previously used Virtual Try-On have higher levels of satisfaction compared to those who did not have the opportunity to use Virtual Try-On technology prior to the purchase of a good. Satisfaction levels are improved, thus creating a situation where there are lower levels of intention to return, which is beneficial to both parties.

Recommendation behavior is another key aspect of consumer behaviors also analyzed in this study. The vast majority of respondents showed their willingness to suggest Virtual Try-On features to other consumers. Recommendation behaviors demonstrate how much trust consumers have in these new technologies. Appearance of satisfaction from consumers on their experience using these services leads to other consumers being aware of this positive information through word-of-mouth and relying on these services more easily.

Moreover, the findings of the study altogether point toward the use of Virtual Try-On as a significant tool in strategy that will result in a better customer experience as a whole in the online retail industry. By increasing visualization, decreasing uncertainties, and increasing customer confidence, some of the basic limitations of internet retailing are addressed, which in turn signify advantages such as higher customer satisfaction, decreased probabilities of returns, and increased customer loyalty for retailers in the industry – which has become increasingly competitive in nature in the digital arena.

Nevertheless, it is vital to recognize the significance of the improvements made possible by Virtual Try-On technology depending on the precision and simplicity of the technology applied. For example, technical limitations such as inaccurate virtual size simulation and other visualization challenges may play an influential role in the success of the technology towards boosting consumer satisfaction. In this case, issues of consumer data privacy are also applicable with respect to the use of human images.

## 1. Introduction

Within the modern economic scenario, e-commerce is observed to have gained considerable ground and is considered one of the major drivers for retail business and development, thus contributing to a highly dynamic and competitive environment through enhanced and accelerated levels of digitalization, enhanced connectivity through the Internet, and the overall development and increased use of smartphone devices and services. As a matter of fact, during the past decade, technological shifts and lifestyle habits have resulted in considerable changes to the overall retail environment through an increasingly preferred mode for consumers to engage in e-commerce rather than traditional retail stores due to convenience and increased clarity and simplicity in terms of comparing and availing a wider range of products and services.

Nevertheless, it is important to point out that despite all these benefits that have arisen as a result of this transition from physical to digital retailing and marketing, this transition has created certain challenges that have had a significant impact on consumers' satisfaction levels. One of the greatest challenges facing consumers today when it comes to online retailing and marketing is the fact that consumers are unable to physically examine or inspect a product before actually making a purchase. In reality, it is important to point out that in a physical retail setting or store, consumers are in a position to physically interact or come into contact with a particular product before making their purchase decision. This interaction is probably significant when it comes to particular features of a particular product that consumers consider when making their purchase decision. For example, consumers can physically examine or come into contact with a particular product and know whether it has the appropriate size or quality. However, when it comes to online retailing and marketing, a consumer is only able to see or view an image of a product and expect it to have similar features to One of the biggest reasons for this lack of inspection creating a sense of perceived risk revolving around online shopping can be attributed to the lack of physical inspection of the products that the potential customer can inspect before they make their purchasing decisions. A potential customer would naturally have a sense of perceived risk concerning the products they would wish to buy online in the sense that they would wonder if the product fits well, looks the same as the image provided on the online shopping site, or even meets their expectations in quality when they receive the products they have purchased online. There are some online shopping product categories that would have a very low sense of perceived risk compared to other product categories, some of which include apparel products, eyewear products, footwear products, or even products in the category of cosmetics..

The hassle of constantly returning products has emerged as one of the central dilemmas of modern electronic commerce. A consumer perspective to product return would involve spending valuable time in rescheduling pickups, repackaging, and waiting for refunds or replacements. On the other hand, from the retailer's perspective, it increases operation costs associated with reverse logistics, inventory handling, quality checks, and restocking. Additionally, high frequency returns erode profitability by contributing to waste transportation and packaging, a concerning factor that also has serious environmental overtones. Thus, minimizing information uncertainty about products and reducing returns through this process stands out as a strategic imperative for an e-commerce company..

To face up to the mentioned challenges, online retailers often depend on innovative digital technologies that can deliver the in-store shopping experience in a virtual environment. Among the mentioned digital technologies is Augmented Reality (AR). This technology has received considerable attention from retailers because it has the feature of overlaying digital information in the real world. This feature has shown the potential for interactive shopping experiences beyond product image or videos shown online retailers. One of the most important applications of AR in e-commerce is VTO technology.

Virtual Try-On services provide consumers with an opportunity to “try” the product either on their bodies directly or even through their physical environment with the help of devices such as smartphones, tablets, and even computers. With the help of camera devices and VR software applications, Virtual Try-On services provide consumers with an opportunity to “try” the product prior to buying it. This may include trying out things such as “trying” eyewear such as glasses fitted onto their faces, “trying” beauty items such as lipsticks to see how well the color suits their complexion, “trying” clothing items to see how well the clothing items may fit their physical shapes and sizes.

The main idea behind the development of Virtual Try-On tech is to boost the level of decision-making confidence through giving an improved life-like image of the product prior to buying it. This is because by giving the consumer an idea of what to expect regarding the image of the product once it is acquired, the chances of disappointment based on the level of customization will be minimized. This will then be an improvement compared to another major limitation that is typically brought about by online shopping—that of not physically interacting with the product.

Virtual Try-On technology has gained momentum within industries such as fashion, cosmetics, and sunglasses, where the visual aspect of the product holds major importance for consumer satisfaction. Key e-commerce websites and brands have incorporated Virtual Try-On technology within their virtual interfaces to enhance consumer engagement and increase competition among themselves. The personalized consumer engagement provided through VTO technology not just helps to attract the consumer to the particular product, but also allows the consumer to browse through the product for longer durations of time.

Pre-purchase outcomes, particularly purchase intention and conversion rates, have been vastly discussed in academic and industry studies in the context of the impact Virtual Try-On creates. According to several studies, VTO increases consumers' willingness to buy a product since perceived risk is reduced and perceived usefulness of online product information increased. Consumers tend to make a purchase when they are more confident in their decisions. Moreover, the functional benefits of VTO (e.g., improved product evaluation) and experiential benefits (e.g., enjoyment and novelty) enlarge the overall degree of engagement.

Although the effect of Virtual Try-On on purchase intention is well documented, its effect on postpurchase satisfaction has garnered relatively less attention. Generally, post-purchase satisfaction is defined as a consumer's general evaluation after taking delivery and using the product. A consumer feels satisfied when the real performance of the delivered product meets or surpasses the expectations he or she had. In online shopping, expectation management has been particularly difficult due to the few instances of information available before purchase. Even after a consumer decides to purchase a product, dissatisfaction can occur when the delivered product fails to match what is expected from online representations.

Post-purchase satisfaction is of major significance as it has a direct effect on repeated purchase behaviors, loyalties, and positive word-of-mouth advertising. Another reason to consider this is that satisfied customers of a certain product will surely return to that source in search of more of that product type, whereas dissatisfied ones might convince others to avoid that product altogether by using negative word-of-mouth advertising methods.

As such, even though purchase intention is of major interest in e-commerce success, customer satisfaction must also come a close second to this in order to achieve success in this field.

The specific objective that is being explored in the study is to understand the level of satisfaction that consumers derive from a product upon its delivery, through an understanding of the effect that Virtual Try-On creates upon consumers. In understanding the level of satisfaction, the research on consumers would also be an assessment on the overall effect that Virtual Try-On would have on ensuring that consumers are satisfied with the products that are being delivered to them.

Another facet of the research is the extension of the effects of Virtual Try-On on customer loyalty. Generally, loyalty is developed over time on the back of predominantly positive experiences. Another factor is post-purchase satisfaction, which is central to customer loyalty. To start with, when the consumer feels the online retailer is offering the right

information to aid their decisions, loyalty is fostered. Virtual Try-On has the potential to contribute to the feeling of loyalty on the back of reduced uncertainty resulting from the retailer's efforts to improve the customer experience.

Additionally, the study examines the relevance of the role of VTO, considering the rise of competition in the e-commerce environment. It is worth understanding the e-commerce environment as becoming more saturated, with a need for differentiation indeed through more competitive pricing structures as well as wider product offerings, although the quality of the interaction with the consumer is an important factor, through the creation of a competitive advantage through the usage of VTO.

## 2. Review of Literature

The advancements in digital technologies have dramatically changed the face of online shopping, thus challenging academia and industry players to investigate new technologies that improve consumer experience through e-commerce innovation. Among the technologies identified in the new e-commerce innovation trends is immersive technology such as Augmented Reality (AR) and Virtual Try-On technology (VTO). Literature indicates the popularity of the above technologies in enabling online consumers to cope with one of the limitations of online shopping in their country or region.

Moreover, various research works are emphasizing the fact that there is a need to bridge the existing gap between virtual and physical shopping, where immersive technologies can play a key role in facilitating a sense of getting a richer experience through product visualization. Virtual Try-On, being an Augmented Reality technology, assists consumers in virtually "simulating" the act of interacting with various products such as apparel, eyewear, makeup, footwear, and other products, where, during a purchase, appearance is a major concern.

A considerable share of the literature concerning the adoption of Virtual Try-On Technology is predicated on the Technology Acceptance Model. The Technology Acceptance Model, presented by Davis, illustrates how people accept and adopt a technology. Perceptions of an individual, measured by Perceived Ease of Use and Perceived Usefulness, play a major role in influencing an individual's adoption intention. Perceived ease of use is how easily consumers perceive a Virtual Try-On Technology to use, and perceived usefulness is how important consumers believe it is to their shopping experience.

Numerous studies employing the TAM model on Virtual Try-On technology revealed the significant contribution of "perceived usefulness" and "ease of use" in the adoption of the technology by the consumer. A study revealed that when the consumer finds the Virtual Try-On technology "helpful," the consumer is likely to "adopt" the technology to a greater extent by incorporating it into the consumer decision process. Another study revealed that when the Virtual Try-On technology is "easy to use," the consumer demonstrates a greater "willingness to use." This revealed that the "technological design" is a major factor affecting the "effectiveness of Virtual Try-On."

Besides TAM, Virtual Try-On was examined from the perspective of perceived diagnosticity. Perceived diagnosticity is the level of information consumers perceive as instrumental in the evaluation of product features. Hilken et al. explained how perceived diagnosticity benefits greatly from AR-visualizations of the product. Virtual Try-On allows consumers to personally evaluate the product in terms of its appearance in real life. This creates an improved quality of information during the decision-making and purchase situation. This clearly allows the consumers to make their judgments about the product with much more certainty.

Besides its diagnostic benefits, another key finding is that the usage of VTO has a favorable effect on consumer attitudes toward online shopping platforms. For instance, several studies have found a positive effect on consumer "engagement," "time spent on the product pages," as well as "hedonic enjoyment." The hedonic value in this context is concerned with both the "pleasure," "fun," and "entertainment" aspects associated with the usage of technology in VTO.

At the same time, researchers have emphasized the utilitarian value of Virtual Try-On as well. Here, utilitarian values pertain to any functionality that Virtual Try-On may provide to the consumer, such as efficient decision-making, efficiency, and such aspects that help consumers function efficiently while choosing to use the service. This functionality is specifically observed in the context of choosing fashion and beauty items as well as clothing where incorrect decisions may affect the returns to the store by consumers.

Reports from the industry also confirm the research findings on the advantages of Virtual Try-On. Studies have pointed out several advantages to the industry if Virtual Try-On is incorporated as an added feature to online shopping websites. Some of the advantages reported by the industry following the implementation of VTO features on their websites include reduced rates of returns from customers, particularly when shopping online from the category of clothes and cosmetics. Better expectation management is also highlighted as one of the advantages VTO has to offer. VTO has the advantage of minimizing the disparity that may occur in the performance of the material purchased.

Lower Perceived Risk is another notable factor linked with the consumption of the product of the firm, namely, VTO. Perceived risk while engaging with e-commerce platforms includes risks of economic, performance, as well as social shame-related kinds. Several studies have revealed the fact that the formulation of VTO assists in successfully reducing the overall perceived risk, as it provides a better understanding regarding the product. If an individual feels secure with regards to the product, their purchase intentions increase.

Despite the numerous advantages emphasized in the literature, Virtual Try-On was not exempt from limitations in the minds of various scholars. One of the key limitations was the reality of the technology itself. Though improvements in the visualization of the product using AR-technology are tremendous, the technology was still challenged in the perfect simulation of product information such as fabric type, sizes, and product illumination. An imperfect simulation can often result in unrealistic expectations after product delivery.

A fifth constraint which is widely talked about in literature is that of technical complexity and performance. For example, low performance in relation to how long it takes to load or any technical glitches might have an adverse impact on users of VTO and reduce their perception of ease of use. There is a concern that when consumers encounter technical problems when using VTO applications, this might encourage them to completely shun VTO.

Similarly, privacy concerns can be viewed as another substantial hindrance in adopting the Virtual Try-On technology. It is an acknowledged fact that some of the virtual try-on technologies demand certain information related to cameras, images of faces, and body dimensions. There may be some consumer hesitations regarding the sharing of their personal visual images because of data security concerns. It is imperative to state here that some studies found that there is a moderating influence of privacy concerns on the relationship between the perceived usefulness and use of the virtual try-on.

Although existing research has contributed substantially towards an increased understanding of the effectiveness of 'Virtual Try-On's' contribution towards the pre-purchase experience, there has been a notable bias in the areas of research focus. The bulk of existing research has been found to focus on pre-purchase attributes of purchase intentions, consumer engagement, and conversion rates. The findings of the previous studies suggested a positive impact of 'VTO' on the purchase intentions of the consumer. However, there is a lack of research on the implications of 'Virtual Try-On' on consumer behavior after the purchase decision has been made.

The construct of post-purchase satisfaction, as an indicator of post-purchase behaviors concerning consumers' evaluations of the product after purchase and usage of it after delivery to them, is an underresearched construct in relation to Virtual Try-On. Satisfaction is an important driver of repurchases and loyalty. Even though some studies have pointed towards satisfaction indirectly based on low chances of returning goods and their potential impact on satisfaction levels of consumers, there is a need to link it to that of VTO usage and post-purchase satisfaction levels.

This is a clear research gap, as much of the work has not focused on the post-purchase stage. It is yet not clear whether the confidence evoked through Virtual Try-On will materialize into satisfaction once the product is delivered. In some

cases, VTO may raise expectations that are difficult to meet in reality, potentially leading to disappointment rather than satisfaction. In this light, it is essential to understand the relationship between purchases assisted by VTO and post-purchase satisfaction for the true evaluation of the effectiveness of this technology.

Most of the existing studies have small sample sizes or experimental settings and are hence not generalizable. There is a pressing need for research based on real consumer experiences and primary data collected directly from online shoppers who have actually used Virtual Try-On features. Such research will be able to provide practical insights into how consumers perceive VTO across different product categories and how these perceptions influence satisfaction outcomes.

To recapitulate, the research papers cited in the relevant research papers have established the significance of Virtual Try-on as an enhancer of pre-purchase experiences in online shopping. Basically, the research papers based on Technology Acceptance Model theory and Perceived Diagnosticity theory have established the cross-influences of perceived usefulness, perceived easy usage, visualization, etc., of Virtual Try-on. It has also surfaced the dual hedonic and utilitarian value of Virtual Try-on. There has also surfaced the usage of Virtual Try-on as an enhancer of low perceived risks of returns as well.

Most importantly, there is minimal empirical study on the effect of Virtual Try-On on post-purchase satisfaction. This, above all else, stresses the significance of exploring the possibility of Virtual Try-On not just affecting the purchase decision of the consumer but also increasing the satisfaction of the consumer. The significance of the above gap needs to be addressed so the real value of Virtual Try-On technology is understood, and this is the base of the study.

### **3. Objectives and Hypotheses**

Clear research objectives and hypotheses are the foundation that offer any form of research necessary direction and focus. This being said, the clear objectives framed in the course of this current study, which focuses on the application of VTO in existing online environments, are aimed at providing clear direction on the existing VTO awareness among consumers, their resultant behavior on the adoption of VTO capabilities, as well as the resultant effect on the consumer decision process—specifically the level of contentment following the purchase process, as this directly affects the loyalty extended to the online platform itself.

The prominence given to the integration of Virtual Try-On technology into online shopping systems offers an insight into the perceived importance of this factor for ensuring an improved consumer experience. Nonetheless, despite its widespread use and importance in ensuring an improved customer experience, limited research exists to provide an understanding of the effects of such an activity beyond the stage of the ultimate purchase. This study will focus on the setting of clear objectives to address the gap where few research studies have concentrated on similar aspects with regard to the 'post-purchase level'.

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#### **3.1 Objectives of the Study**

The primary objective of this study is to examine the role of Virtual Try-On technology in shaping consumer experience and satisfaction in online retail. To achieve this overarching goal, several specific objectives have been formulated. Each objective addresses a critical aspect of the consumer journey, from awareness and adoption to post-purchase evaluation.

##### *Objective 1: To analyze consumer awareness and adoption of Virtual Try-On technology*

The first objective is to determine the level of consumer awareness and the level of Virtual Try-On technology adoption by the end-consumer in online retail. Since awareness precedes actual adoption, for any consumer to adopt the VTO features, they must be aware of their existence and how they work. This objective, therefore, will determine the extent at which the online shopper is aware of VTO, how frequently they use it, and in what product categories they would most be likely to adopt.

Analyzing the adoption levels helps explain whether VTO has moved from being a novelty feature to a core part of the online shopping experience. It also pursues demographic differences in adoptions, including age and gender, which can give valuable insights on which segments of consumers are most open toward immersive technologies. Adoption patterns are important to understand for the retailer while intending to plan strategies targeting user groups and enhancement of accessibility of the technology.

#### *Objective 2: To examine the influence of Virtual Try-On on purchase confidence*

Purchase confidence plays a major role in online shopping in which consumers must face uncertainty due to their inability to see or touch a product before purchasing it. The second objective is the evaluation of how Virtual Try-On influences consumer confidence in making a purchase decision. Consumer confidence can be specified as a level of assurance that the desired product meets expectations in terms of size, look, etc.

As a result, consumers will have the ability to picture how the products look when worn, thus eliminating room for doubts and hesitations during the process. As such, the purpose of achieving this is to ascertain whether consumers adopting the function of VTO feel more confident compared to those who do not use the function and whether such boosted levels of confidence will enable them to proceed to the next line of action—purchase. Increased levels of purchase confidence will definitely enhance a seamless shopping experience.

#### *Objective 3: To assess the impact of Virtual Try-On on perceived risk in online shopping*

Perceived risk is one of the most serious deterrents to buying online, especially for experience-based products such as apparel, footwear, eyewear, and cosmetics. The third objective of this study is to evaluate how Virtual Try-On impacts perceived risk associated with online purchases. Such perceived risk may relate to an incorrect fit, a look mismatch, poor quality, or dissatisfaction upon delivery.

This objective tests if VTO serves to reduce these concerns by availing more specific and personalized product information. Lower levels of perceived risk are expected to enable positive improvements in both purchase decisions and satisfaction outcomes. Understanding this relationship is important, since perceived risk directly influences consumer trust, platform credibility, and long-term involvement with online retailers.

#### *Objective 4: To evaluate the impact of Virtual Try-On usage on post-purchase satisfaction*

The fourth and most imperative objective of the study is "to investigate the consequences of the usage of the Virtual Try-On technology on the customer satisfaction level subsequent to the product usage." Customer satisfaction subsequent to product usage can be defined as the consumer assessment of a product's quality subsequent to the product being shipped/prepared for usage/delivered to the consumer.

This research question extends directly from the central research gap. Much has been established with regard to the manner within which VTO has a significant effect on purchase intention. Unfortunately, no conclusive assessment has been conducted with regard to a corresponding satisfaction level that follows after the delivery of the goods. Through an examination of the satisfaction levels among the consumer population that utilized VTO as a precursor with regard to purchases, the purpose here is to ascertain the level of an accurate congruence with regard to performance.

#### *Objective 5: To identify challenges and limitations associated with Virtual Try-On usage*

Virtual Try-On technology has its own set of challenges despite the benefits involved. The fifth objective of the study is the identification of key limitations and barriers in the use of VTO from a consumer perspective. These challenges will then be related to such technical issues as poor realism, wrong size simulation, slow performance of the system, or lack of compatibility across various devices.

Moreover, potential privateness concerns associated with the use of face images, body scans, or camera accesses may be a factor in consumers being reluctant to try out different VTO features. By underlining these challenges, the study also gives an unbiased view of the strengths and weaknesses of Virtual Try-On technology.

### 3.2 Hypotheses of the Study

To empirically test the relationship between Virtual Try-On usage and post-purchase satisfaction, the study formulates clear and testable hypotheses. Hypotheses provide a scientific basis for analyzing data and drawing conclusions regarding the proposed relationships between variables.

#### *Null Hypothesis (H<sub>0</sub>)*

**H<sub>0</sub>: There is no significant relationship between Virtual Try-On usage and post-purchase satisfaction.**

The assumption of this hypothesis is that Virtual Try-On has no effect on the level of consumer satisfaction after delivering the product to him/her in general terms. It is obviously clear from this hypothesis that in case this hypothesis follows to happen, any differing levels of satisfaction between Virtual Try-On users and others would only occur due to sheer coincidence in both areas of interest without considering any results of Virtual Try-On usage on this issue in any way.

#### *Alternative Hypothesis (H<sub>1</sub>)*

**H<sub>1</sub>: There is a significant positive relationship between Virtual Try-On usage and post-purchase satisfaction.**

The alternative hypothesis explains that the Virtual Try-On has a significant, favorable impact on consumer satisfaction. Accordingly, it can be deduced that the people or customers using Virtual Try-On technology would likely have a high level of satisfaction with the services provided after the final purchase. If the alternative hypothesis is accepted, the theory that Virtual Try-On technology can create a high level of consumer satisfaction can also be accepted.

### 3.3 Significance of Objectives and Hypotheses

The objectives and hypotheses of this study collectively provide a multi-dimensional base for exploring the full impact of this Virtual Try On technology as it relates to the entire consumer entity as well as their online shopping behavior in particular and generally the entire concept of consumerism as a whole with VTO as the key determinative factor for influencing both the entire concept as well as online shopping behavior as follows:

By verifying the hypotheses presented, the exploration goes past the basic descriptive insights, creating an opportunity for the provision of empirical evidence on the efficiency of the use of VTO. The insights derived from the evaluation of the hypotheses could assist the retailer in making informed decisions regarding the use of VTO.

In general, the objectives and hypotheses are tailored so that they fill an essential gap in the existing literature to concentrate primarily on customer satisfaction after purchase, which is essential for customer retainment and brand victories. By conducting a systematic analysis, this study seeks to enrich both the existing academic and e-commerce-related literature with valuable insights.

## 4. Research Methodology

Research methodology is a scientific approach to perform research by which results can prove to be reliable, valid, and meaningful. Research methodology in this study has been efficiently framed to analyze consumers' perception and experiences regarding Virtual Try-On (VTO), a technology used in online retail businesses. Research methodology in this study has discussed various areas of research designs, methods of collecting research material/data, research sampling methods/techniques, research instruments/details of research instruments to analyze research results/readings/data obtained from research instruments.

#### 4.1 Research Design

The descriptive research design was selected for the study, and it was deemed suitable for understanding and describing the characteristics, perceptions, and attitudes of a given set of people. In general, descriptive research design is often applicable to social sciences and marketing surveys where the aim and intent are to analyze and interpret existing conditions and events and not to manipulate variables or dependents. Moreover, for purposes of the intended study, descriptive research was deemed most applicable for examining and analyzing consumer perceptions and activities regarding VTY—Virtual Try-On.

The descriptive research is particularly relevant to the research as the intention is to find patterns or trends, as opposed to establishing interrelationships as is the intention of the other research designs. By the use of real-world applications of other customers who have experienced the Virtual Try-On features, the researcher is able to have a realistic yet accurate description of the effects of VTO on online shopping results, particularly online post-purchase customer satisfaction through the use of statistical measures.

#### 4.2 Nature and Source of Data

The study is primarily based on primary data, as such data is collected directly from the respondents to be relevant to the research objectives. Primary data is also a reliable form of data, especially for research, as the study is conducted to answer specific research questions. In the study, the primary data are helpful to obtain first-hand information about consumers' experience, perception, and level of satisfaction regarding Virtual Try-On usage.

Even though the study is based on primary data, secondary data sources were also utilised, which could add value to the proposed research methodology. Generally, secondary sources include journals, publications, reports, websites, e-books, etc., concerning e-commerce, augmented reality, and the Virtual Try-On technology. These sources were also helpful in understanding the existing literature, the lacuna, and the objectives/hypothesis.

#### 4.3 Data Collection Method

Primarily, data collection was done through the use of a structured questionnaire. It has been widely recognized as one of the primary data collection devices used in conducting marketing and consumer behavior studies. The questionnaire is widely utilized in conducting data collection with the intent of gathering quantitative data. For the purpose of convenience and ease of use, the questionnaire was constructed and administered on Google Forms.

Through the application of Google Forms in data collection, the efficiency of the data obtained from the geographically dispersed sample group was ensured. At the same time, the face-to-face survey was made easy due to the reduced time and budget constraints. This allowed the respondents to be able to answer the questionnaire at their own convenience.

#### 4.4 Research Instrument (Questionnaire Design)

**The questions were well-structured to target the purpose and all facets concerning the use and application of Virtual Try-On Technology. It included a combination of questions requiring multiple choices and ratings, enabling participants to supply and convey precise data and responses. It comprised sections:**

1. **Demographic Information**

This section collected basic demographic information like gender and age group. Understanding demographic information helps in assessing whether the adoption and satisfaction levels vary with different demographic sections of users.

2. **Online Shopping Behavior**

This was the section that assessed the frequency of online purchases and the nature of items typically bought online. These questions helped establish respondents' familiarity with e-commerce platforms and their overall engagement with online shopping.

3. **Virtual Try-On Awareness and Usage Patterns**

Questions in this section focused on awareness of Virtual Try-On technology, usage of Virtual Try-On

technology, and usage frequency of Virtual Try-On technology by the respondents. Another product type where Virtual Try-On technology is most used is also discussed in this section.

#### 4. Purchase Confidence and Perceived Risk

This section sought to find out how Virtual Try-On affected respondents' faith in purchase decision-making and their perception of the risk involved when making online purchase decisions. Questions based on a Likert scale were administered to elicit responses regarding their perception of the reduction of risk involved in making purchase decisions.

#### 5. Post-Purchase Satisfaction

This section measured the satisfaction of the respondents after receiving and using the products purchased with the aid of Virtual Try-On. The level of satisfaction was judged regarding three aspects: good fit of the product, appearance, and overall experience.

#### 6. Recommendation Intent.

The last section assessed the willingness of the respondents to recommend the Virtual Try-On features to others. Recommendation intention is considered an indicator of overall satisfaction and positive customer experience.

### 4.5 Sampling Technique

The researcher in the study decided to use the use of the convenience sampling technique, which forms part of the category of the non-probability sampling technique. Therefore, the use of the convenience sampling technique ensures that the most accessible people in society are chosen for the intended purposes.

Moreover, though convenience sampling does not enable a generalized account of the population under investigation, it is most commonly applied to situations where exploration and description predominate, and where the main purpose is to observe tendencies and patterns. As for the present research, the target population comprised online consumers who were experienced in the field of Virtual Try-On technology, and convenience sampling was instrumental in reaching them promptly through online mediums.

### 4.6 Sample Size

The total number of responses obtained in this regard was 219, which are deemed to be viable for the intended purposes. The research involved people who are active online shoppers and are accustomed to Virtual Try-On technologies offered through online shopping portals. It is deemed to be adequate for descriptive statistics and makes a reasonable estimate in this regard.

The basis of selecting the sample of the population was based on the criterion that the people the researcher chose as the sample must have an existing experience in the usage of Virtual Try-On technology.

### 4.7 Data Analysis Tools and Techniques

The data collected was analyzed statistically. The statistical tool employed was descriptive statistical measures. The importance of using descriptive statistical measures is that they can be employed as an aid in the organization of data. The statistical measures employed were:

- Percentages were used in analyzing demographic distribution, level of awareness, frequency, and level of satisfaction.
- Charts and graphs, especially pie charts, were utilized to present data visually and pinpoint trends and patterns in consumerism.

- Tabular form was also employed for the presentation of the organized data for the sake of better comparison with various variables.

By implementing descriptive analysis, the key insights of the research were determined to involve the percentage of Virtual Try-On as a consumer tool, the consumer levels of satisfaction, as well as the willingness to recommend the technology. These formed the discussion of the next sections of the research.

#### **4.8 Reliability and Validity Considerations**

The reliability and validity of the data collection tool were ensured. The questionnaire was developed based on existing literature as well as the study objectives were taken into consideration. Sufficient choices were provided so that the measurement scale is reliable.

To examine content validity, it was established by adding appropriate questions to cover all aspects of Virtual Try-On product usage and satisfaction. To examine reliability, standardized questions were used to allow for proper measurement.

#### **4.9 Ethical Considerations**

Ethical standards were followed at every step in the entire research process. Respondents were not forced or compelled in any manner whatsoever to take the survey. Also, the purpose of the study was explained. No identification details were taken, nor were the survey answers disclosed. This study is purely academic in nature.

#### **4.10 Limitations of the Methodology**

Although the research methodology has been designed in such a way as to fulfill the objectives of the research, one should keep in mind the following limitations that might affect its validity to a certain extent. Convenience sampling might create some limitations in fulfilling this research's objectives, as its results might not be widely applicable due to its nature. Besides, a large number of sources are reported, which might create a bias in itself. However, one should keep in mind that such a methodology has given insight into the perceptions associated with Virtual Try-On technology.

### **5. Data Analysis and Results**

This chapter entails the analysis process and interpretation of data collected concerning the main theme of the study. Analysis of data is crucial in the sense that it transforms raw data collected through the survey into more meaningful information that enables the interpretation of consumer behavior with regard to VTO technology. Descriptive analysis methodologies like percentages, tables, and graphical representations are employed in the analysis process. Such methodologies focus on demographic analysis, online shopping behavior, VTO usage, usability, purchase confidence, satisfaction with the purchase, and the intention to recommend the technology.

#### **5.1 Demographic Profile of Respondents**

The demographic analysis of the respondent fits into an overall picture that describes the general sample population that the research has utilized. The results show that the overall population of the sample consists mainly of the 18-25 age group, which is evidence that the youth are the most active online customers and are even eager to embrace new technology with Virtual Try-On. Similar research has similarly demonstrated that the youth are the earliest adopters of new technology, given their high level of technology familiarity and comfort with smartphone technology applications. In terms of the gender distribution, the sample includes both male and female participants, which ensures balanced representation. Having the participation of the respondent from varied demographic backgrounds strengthens the reliability of the results, as the sample represents a wide range of experiences regarding online shopping. The

preeminence of the youth demographic represents the product feature as appealing particularly to digital-first consumers.

## 5.2 Online Shopping Behavior of Respondents

Analysis of the behavior of people while buying products online shows that a large percentage of the people buy through the internet, either frequently or mails. This shows a high level of interest in e-commerce websites for the population. The increased popularity of e-shopping could be due to the ease, the competitive rates, and the availability of a variety of products. Secondly, regarding product categories that users purchase online, it was established that clothing and beauty products are those categories that users purchase most frequently. This is due to their inherent nature of being experiential as users value their feel and beauty immensely. On that note, it is evident that these are also categories of importance to users based on their responses and relevance to Virtual Try-On as a means of addressing the inherent uncertainties of VTO. This backs up claims that VTO would be best used in industries that emphasize physical inspection as a necessity.

## 5.3 Awareness and Usage of Virtual Try-On Technology

The results provided demonstrate the high level of awareness of Virtual Try-On technology, as most respondents have adopted Virtual Try-On technology. About 80% of the respondents claimed to have employed the Virtual Try-On feature while shopping online. The results demonstrate the high level of adoption of VTO, while the features of VTO have not remained on the fringe of innovation anymore. The extensive usage of VTO technology, as observed among the respondents, can be attributed to its incorporation into common e-commerce platforms. The research findings also revealed that consumers are willing to take a chance on new technology if they believe there are benefits to be gained. High usage can also be attributed to positive perception regarding its benefits to the shopping experience.

## 5.4 Usability and Ease of Use of Virtual Try-On

Furthermore, usability is an essential element that can impact any technology's performance and usage. It is evident from this analysis that majority of the users have scored high for Virtual Try-On's usability as easy or neutral. Few users have also reported difficulty while using Virtual Try-On; hence, it can be stated that it is an user-friendly feature. This is consistent with the technology acceptance model, which stresses the significance of such aspects as ease of use in technology acceptance. When the consumer finds the feature to be user-friendly, it might increase the chances of the consumer interacting with the facility and incorporating it into their shopping habits. The ambivalent answers might reflect the notion that while the technology might be technically effective, it might still have room for improvement with respect to user interfaces, velocity, and precision.

## 5.5 Influence of Virtual Try-On on Purchase Confidence

One of the major objectives of the study was to investigate the impact of Virtual Try-On on purchase confidence. The study reveals that a vast majority of the participants benefitted from increased confidence while making the purchase after using the Virtual Try-On. This indicates the successful impact of technology to reduce the uncertainties related to product fit and appearance.

Therefore, an increase in purchase confidence signals that consumers are making rational decisions based on an informed visualization of products facilitated by Virtual Try-On. When consumers are confident in their choice of purchase, it means that they are not going to abandon their purchases or hesitate; thus, it reflects an additional value of virtual try-ons based on rational decision-making and minimal guess work.

## 5.6 Post-Purchase Satisfaction Levels

The focal subject of the study is post-purchase satisfaction. It is quite evident from the analysis that the level of satisfaction among the respondents is of a medium and on higher side. The findings from the study on the use of VC

by the consumers indicate that the product delivered through the use of Virtual Try-On was found to be of considerable satisfaction. Moderate to high levels of satisfaction reveal the positive contribution to the overall shopping experience. Although the degree of satisfaction was not uniform across all questionnaire respondents, the overall trend reveals a positive influence of Virtual Try-On on postpurchase evaluation. Differences in levels of satisfaction could be attributed to several influencing factors, including the technical constraints in the overall functionality of the VTO feature and individual gaps in customer expectations.

### 5.7 Recommendation Intent and Word-of-Mouth

Recommendation intention is considered a very strong predictor of customer satisfaction and loyalty. It followed that over 80% of the total subjects in this study were willing to recommend Virtual Try-On features to others. The fact that recommendations are so high means the consumer has had positive experiences and a good level of technology acceptance. Word-of-mouth is very valuable, especially in online retailing, as peer recommendations play a very significant role in purchase decisions. The willingness to recommend VTO suggests that consumers perceive the technology as beneficial and worth sharing with others. This finding underlines the potential of Virtual Try-On to improve brand image and reinforce customer bonding.

### 5.8 Hypothesis Testing and Interpretation

The findings from the data analysis provide support for the alternative hypothesis ( $H_1$ ), which assumes a significant positive relationship to exist between the usage of Virtual Try-On and post-purchase satisfaction. High percentages of satisfaction and positive intentions to recommend from the users of Virtual Try-On technology imply that there is a positive effect from the technology on post-purchase outcomes. According to the descriptive analysis results, the null hypothesis,  $H_0$ , is rejected, as the results revealed a meaningful association with the use of VTO and satisfaction. Despite the failure to employ more developed inferential statistical tests, the results revealed a good trend towards the alternative hypothesis.

### 5.9 Discussion of Key Findings

Results are in line with the existing literature that points out the importance of Virtual Try On in minimizing risk perception, encouraging purchase confidence, etc. The study also reflects the high acceptance rate among young consumers, thus validating that digital natives are inclined towards such immersive experiences. The chosen nature of clothing and beauty items also affirms the viability of Virtual Try On in experiential products. The positive influence of Virtual Try-On on post-purchase satisfaction extends previous studies, whose attention was directed to purchase intention. The present research shows how Virtual Try-On impacts satisfaction after the delivery of a purchase, thus providing a more inclusive picture of the technological value.

### 5.10 Summary of Results

In a nutshell, the data analysis discloses that Virtual Try-On technology is widely adopted, easy to use, and positively perceived by consumers. It enhances purchase confidence, leading to moderate to high satisfaction levels, and encourages recommendation behavior. These findings validate that Virtual Try-On significantly enhances post-purchase satisfaction and overall customer experience for online shopping.

## 6. Findings and Discussion

This chapter contains a specific discussion on the key findings that were established by the data analysis, with interpretation that focuses on aligning with the study objectives, hypotheses, as well as literature study. This specific section is meant not only to present the key findings but also their significance. From the key findings, potential insights can be gained on the implications that VTO has on the consumer experience, while highlighting some gaps that need improvement.

## 6.1 Enhancement of Online Shopping Experience

Perhaps the most important finding of the survey is the augmented experience of online shopping in general through VTO. Uncertainty diminishes as a factor due to the use of VTO. This is instrumental, as the lack of tactile interaction with the product is a noted hindrance in the field of e-commerce. In addition, by enabling consumers to try on images before buying a product, VTO narrows the gap between online and physical shopping; thus, the results showed consumers perceive VTO to be a useful and effective means to enhance online shopping experience in terms of interactivity and engagement. As expected in previous studies, Virtual Try-On could compensate for the absence in physical online stores.

## 6.2 Impact on Purchase Confidence

The study also revealed that consumers that had Virtual Try-On are significantly more confident regarding making purchases than those that have not. Confidence translates to a superior sense of assurance that the desired product would rightly work once it is received. This is in line with Technology Acceptance Model assertions that have placed significant reliance and emphasis on perceived usefulness as critical success in consumers engaging with a technology. Higher levels of purchase confidence also imply a reduced amount of stress involved in the purchase decisions, which further helps the consumer make quicker decisions. This is particularly important for e-businesses, as a more confident consumer is more unlikely to abandon their carts. From the results, it is clear that VTO acts as an equally important decision support tool, helping empower the consumer during the pre-purchase stage.

## 6.3 Influence on Post-Purchase Satisfaction

This study mainly centered its attention to post-purchase satisfaction, and as seen from the study findings, the positive attribute of Virtual Try-On technology was enough to affect satisfaction levels. For instance, the study revealed that the satisfaction of customers after purchasing their desired product was moderate to high after receiving their product. Such alignment is particularly essential in online shopping situations where dissatisfaction is partly caused by gaps between expectations and realities. Virtual Try-On helps minimize this phenomenon because of its capability to give a realistic picture of a product in advance. The results support the alternative hypothesis of a positive correlation between Virtual Try-On usage and satisfaction.

## 6.4 Role of Expectation Management

Thus, the effectiveness in the management of expectations also comes out prominently in the discussion in relation to the findings. There are signs that the virtual try-on option plays an important part in the VEC in the management or creation of consumer expectations as the representation offered is more precise. If the expectations are managed well, the consumers are more satisfied. However, the study also finds that the satisfaction level was not high across each and every consumer. For instance, there were cases of neutral satisfaction from certain consumer groups, indicating that while the application of VTO is effective as a better method of expectation management, there are possibilities of dissatisfaction that cannot be completely eliminated with the application of this theory.

## 6.5 Limitations in Realism and Accuracy

A significant observation from the study is that the participants manifest a near-neutral level of satisfaction owing to limitations in the realism or accuracy of the Virtual Try-On technology that has been presented. Though a good visualization tool, it may not accurately mirror the “actual conditions,” as has been evident from complaints concerning “inaccurate sizes, color distortion, or unrealistic representation of textures.” The limitations underscore the importance of further developing technological standards. Improvement of the realism and accuracy levels pertaining to Virtual Try-On technologies needs to ensure higher levels of consumer satisfaction and increased confidence. The need for developing new algorithms, different calibration methods, and better user interfaces also arises.

## 6.6 Privacy and Data Security Concerns

Concerns related to privacy were also prominent as an essential impediment to the broader use of Virtual Try-On technology. Some of the respondents complained about the use of scanned information from the face, the body, or the camera in relation to VTO. These related to the broader issue of the security of information in the digital age. The findings indicate a possibility for moderation in consumer attitudes towards VTO based on aspects of consumer concern for privacy, which could constrain the use and potential benefits derived from the use of VTO. Privacy concerns have to be addressed through an appropriate way of communicating data collection, storage, and usage practices to consumers. It is also important to ensure compliance with data protection laws and enable consumers to have control over their data.

## 6.7 Comparison with Existing Literature

The results of this research are therefore generally supportive of the extant literature concerning Virtual Try-On and augmented reality within e-commerce. Several works have found VTO to improve purchase intention, perceived usefulness, and engagement. This work extends these findings into showing that VTO also positively affects post-purchase satisfaction.

In at the same time, this study confirms concerns of technical limitations and privacy issues raised in prior research. This coexistence of positive outcomes and challenges suggests that while Virtual Try-On is a promising technology, effective implementation and continuous improvement are key.

## 6.8 Implications for Online Retailers

These results also have a wide range of managerial implications for various online retail sites. The most important consideration from this analysis is that different online retail sites can utilize Virtual Try-On's functionalities to provide a rich experience to their shoppers, thus reducing return rates and improving their satisfaction levels. VTO can also act as a major differentiator in a highly competitive environment of e-commerce sites. However, the retailer also needs to improve the identified challenges, so as to fully reap the advantages of VTO. For example, the accuracy, ease of use, as well as the issue of privacy, need optimal improvements.

## 6.9 Consumer-Centric Perspective

For the consumer end, the functional benefits provided by the VTO comprise an informed utility as well as an enjoyable utility. An implicit inference arising from the studies is that consumers require technologies that make them less uncertain while also providing them with an increased sense of assurance. Understanding consumer expectations and concerns is best for designing VTO systems that can offer value to consumers. A consumer-centric approach to usability and realism is important.

## 6.10 Summary of Discussion

In summary, the finding indicates that Virtual Try-On improves the online shopping experience by reducing uncertainty about the fit and appearance of the product. The consumers using VTO felt more confident and satisfied, thus confirming the alternative hypothesis of this research study. However, limitations in realism and accuracy and privacy concerns remain areas that need further improvement.

Overall, the discussion delineates Virtual Try-On as an opportunity and a challenge at the same time for e-retailing. If done effectively, VTO has the potential to enhance post-purchase satisfaction and may lead to long-term customer relationships. Overcoming its limitations will be the answer to gaining its full potential.