

Effects of virtual try-on technology as an innovative e-commerce tool on consumers' online purchase intentions

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Abstract

Purpose – The purpose of this study is to investigate the role of using augmented reality (AR) in the form of virtual try-on technology in consumers' purchase decision-making process.

Design/methodology/approach – The study, executed in a beauty industry context, uses the value-based adoption model (VAM). Data were collected by means of a survey carried out on 238 Tunisian women. Subjects performed an experimental task using the virtual try-on (VTO) application in the L'Oréal website. Web-administered questionnaires were used to collect the data, which was processed using an exploratory factor analysis and partial least squares structural equation modeling.

Findings – The findings shows that perceived value is positively related to purchase intentions and it was affected by both perceived benefits and perceived costs. In particular, perceived benefit (perceived usefulness) was found to have a strong positive effect on perceived value. Moreover, it turns out that perceived enjoyment does not have a significant effect on the perceived value. In terms of perceived costs, perceived intrusiveness was found to limit perceived value. The results also show a significant relationship between AR characteristics and perceived benefits. For personal traits, personal innovativeness is found positively influencing perceived usefulness, but it shows no significant effect on perceived enjoyment.

Practical implications – Companies should highlight the benefits for consumers (interactivity, informativeness and usefulness) and attempt to reduce the costs (intrusiveness) related to the use of VTO AR technology, which can play a substantial role in determining the perceived value and purchase intentions.

Originality/value – The existent literature, which examines the AR in e-tailing, shows weak acknowledgment of theories related to consumer barriers to AR adoption in e-tailing, they overlook the role of consumer psychology and individual differences in AR acceptance. Thus, this study contributes to the literature by enhancing the understanding of the roles that AR based VTO technology plays in determining consumers' online purchase intentions by extending the application of perceived value theory and taking into account its characteristics and personal traits that play a role in weakening or strengthening the customer's benefits and cost perceptions.

Keywords Augmented reality, Virtual try on, Online shopping, Purchase intention, Value-based adoption model (VAM)

Paper type Research paper

1. Introduction

Consumer behavior is changing as a result of immersive technologies such as augmented reality (AR), especially after COVID-19, we have seen really fascinating use-cases. E-commerce is an example of businesses embracing this technology. E-tailers, however, are dealing with challenges, such as high return rates, online shopping cart abandonment, and webrooming, i.e. browsing products online, and then buying them offline (Dacko, 2017; Hilken *et al.*, 2018). These issues may be related in part to the absence of direct product experiences while shopping online, as online product presentations do not provide the same sensory information as those found in physical stores (Hilken *et al.*, 2017; Smink *et al.*, 2019).



As a solution to this problem, the gaps between offline and online shopping can be reduced with the aid of AR technologies (Baek *et al.*, 2018). The combination of interactions between the real world and the virtual world utilized by AR [1] makes users feel the information displayed in real time seems interactive and real and integrates adaptive content (Vieira *et al.*, 2022). Virtual try-on experiences are a great application of AR in retail because they allow customers to virtually try products on their own faces or environment in real time (e.g. make-up, furniture, sunglasses). Numerous large brands and corporations are utilizing AR's various capabilities to provide an enhanced and immersive consumer experience (Scholz and Smith, 2016). Beauty brands and clothing brands, are among the most frequent users of this technology in retail (Zhang *et al.*, 2019). According to Fenanda *et al.* (2024), beauty brands should fully leverage advanced technologies like Virtual Try-On (VTO) to assist consumers in better understanding product details and minimize the risk of buying products that don't meet their needs. For example, L'Oréal, a global leader in beauty (Statista, 2021), acquired Modiface in 2018 to incorporate virtual try-on into its marketing strategy. The group's e-commerce sales increased by 52%. On the other hand, it has partnered with Facebook for a social virtual try-on in 2021 (L'Oréal, 2021). Indeed, the question of the impact of virtual try-on in a marketing context arises. Through this study, we answered the following research question: How do AR features and personal characteristics shape consumer perceptions towards AR virtual try-on technology, which in turn affect purchase intentions in an online shopping context?

Thus, the main purpose of this study is to gain a better understanding of the role of the virtual try-on technology on consumer's decision-making process toward online purchase intention using the Value-based adoption model (VAM) in beauty industry context. In the following: the first section expands on related literature and hypotheses development. In the second section, the methodology is detailed. Then, the paper concludes with a discussion of findings, managerial implications, limitations and future research opportunities.

2. Literature review and hypotheses development

2.1 The augmented reality virtual try-on technology

The literature claims that VTO [2] technology has utilitarian and hedonic values. Utilitarian value involves helping consumers address the suit, fit and match dilemma. For example, McLean and Wilson (2019) and Qin *et al.* (2021) find that AR applications allow consumers to manipulate the technology to their needs by visualizing products, thus increasing its usefulness. Thus, it provides rich product information by letting consumers try virtual products in the real world, thus improving cognitive and affective responses products in the real world, (Kowalczyk *et al.*, 2021). Those arguments were also supported by early studies (Rese *et al.*, 2014, 2017). Even though it's a virtual trial, the customer can see how the product would seem, making it easier for them to picture the outcome of the purchase they are considering (Choi and Choi, 2020, Chidambaram *et al.*, 2024). As a result, augmented reality content assists consumers in their decision-making process (Whang *et al.*, 2021) while also reducing the time spent searching for suitable products (Bonetti *et al.*, 2018) and thus, improving their shopping experience: prompting positive brand attitudes and consequently stimulating purchase intentions (Wedel *et al.*, 2020; Tandon, 2023). Previous research has shown how AR favors this outcome through the perceived value in the context of AR smart glasses (Erdmann *et al.*, 2023).

Additionally, Zhang *et al.*, 2019 found that customers' attitude towards VTO technology can affect their intention to purchase a garment online, which is affected by perceived usefulness, perceived enjoyment and perceived privacy risk. This technology not only assists consumers throughout the entire purchasing process, but it also provides "entertaining and experiential value" (Bonetti *et al.*, 2018). It has the ability to offer a

temporary escape from reality created a fun atmosphere during the online shopping, thereby improving the elaboration and quality of mental imagery and generating positive attitudes (Wang *et al.*, 2022).

According to Nikhashemi *et al.* (2021), this application of AR in e-commerce can create an even better experience and add value to users, which are influenced by several AR characteristics that influence user behavior in using e-commerce (Butt *et al.*, 2021; Nikhashemi *et al.*, 2021; Hsu *et al.*, 2021). Augmented reality can additionally provide users with more information (Kim and Choo, 2021). It engages consumers in an interactive presentation of a product and it has a positive impact on purchasing behavior and positively impacts consumer satisfaction (Bonetti *et al.*, 2018; Porter and Heppelmann, 2017) and increase the level of sales (Flavián *et al.*, 2019; Tan *et al.*, 2022; Tarafdar *et al.*, 2024).

Despite its utilitarian and hedonic values, using VTO technology is not cost free. AR try-on elicits high intrusiveness by demanding personal information, adversely impacting app and brand-related consumer responses (Feng and Xie, 2019; Smink *et al.*, 2019, 2020; Ebrahimabad *et al.*, 2024). AR-based e-tailing platforms that limit consumers' control over their personal information diminish satisfaction with and discourage further use of AR (Poushneh, 2018). High privacy concerns decrease the favorable effects of AR, leading to negative app attitudes (Hilken *et al.*, 2017; Feng and Xie, 2019; Zhang *et al.*, 2019; Ebrahimabad *et al.*, 2024).

Although scholarly publications on AR implementation in online and offline retailing have grown over time (Wedel *et al.*, 2020), the literature remains scattered and indecisive regarding the role of AR in e-tailing. Additionally, Jayaswal and Parida (2023), identify a strong need to explore other theoretical models outside the current scope of TAM [3] to study AR adoption behavior and to understand the perceived values they desire from AR-enabled e-tailing platforms to predict consumers' adoption of this technology.

2.2 The VAM model

As mentioned above, the investigation of augmented reality in online retail has primarily used the technology acceptance model (TAM) (McLean and Wilson, 2019; Plotkina and Saurel, 2019; Rese *et al.*, 2017; Rauschnabel, 2018; Qin *et al.*, 2021) which examined technology acceptance motivations through the lens of users' perceived benefits from technology acceptance (Davis, 1989; Shuhaiber *et al.*, 2019). However, obtaining the benefits of technology adoption requires some sacrifice, and the user evaluates these two conflicting aspects while making an adoption decision. The existing literature shows weak acknowledgment of theories related to consumer resistance and barriers to AR adoption in e-tailing (Jayaswal and Parida, 2023). Thus, it would appear rational for users to evaluate technology adoption in terms of both benefits and costs, which is critical for managerial decision making. Businesses may gain a better understanding of how consumers perceive and respond to AR applications by examining its costs and benefits. This information can be utilized to enhance AR experiences and boost customer satisfaction by identifying potential barriers to AR adoption and develop strategies to overcome them (Hoffmann and Mai, 2022; Erdmann *et al.*, 2023).

Earlier studies have evaluated perceived value in a balanced way; Kim *et al.* (2007) proposed a Value-based Adoption Model (VAM) which distinguishes costs and benefits as predictors of perceived value of new technology (Shah *et al.*, 2021). This model has been successfully used and extended to examine individual behavior in a variety of contexts, including the usability of augmented reality technology based mobile applications (Yoon and Oh, 2022). Erdmann *et al.* (2023) extended it to explore online purchase intention through AR smart glasses. Lau *et al.* (2019) used it to assess the adoption of augmented reality (AR) technology in the hotel and tourism industries. Likewise, the VAM has been utilized to

examine human behavior in the context of wearable devices (Yang *et al.*, 2016), the adoption of virtual reality (Vishwakarma *et al.*, 2020) as well as smart homes (Lucia-Palacios and Pérez-López, 2023), and social commerce (Chen *et al.*, 2018).

According to Kim *et al.* (2007), perceived usefulness and perceived enjoyment are benefiting factors of perceived value, while technicality and perceived cost are cost factors. Perceived usefulness was defined as the extent to which one believes that the use of technology will help in enhancing one's task performance (Davis, 1989). Furthermore, perceived enjoyment was defined in this study as the level of enjoyment experienced while using technology (Yoon and Oh, 2022). Third, technicality was defined as the level of physical and mental effort needed to use technology, which is analogous to the concept of technological complexity. Fourth, perceived cost describes the monetary costs associated with using technology. Perceived value was defined as a consumer's overall evaluation of the utility of a service or product based on their perception of what they receive "get factors" and what they give "input factors" (Zeithaml, 1988).

In line with previous researchers, we propose perceived usefulness and perceived enjoyment as benefits and perceived intrusiveness as costs. Additionally, we extended the model by adding AR characteristics and personal traits variables to investigate their effect on the perceived benefits, the perceived costs, on perceived value and purchase intention.

2.3 Hypotheses development

2.3.1 Perceived value and purchase intention. Bagozzi and Burnkrant (1979) defined the concept of purchase intention as a personal behavioral predisposition to purchase a product and is closely related to the individual's future purchasing behavior. Perceived value is defined as the overall evaluation of a product's utility based on perceptions of what is received and given (Zeithaml, 1988). According to Erdmann *et al.* (2023), perceived value of AR smart glasses for online purchase has a considerable, favorable impact on online purchase intention. Numerous studies have revealed that purchase intention is based on the symbolic and functional aspects of the product, while the utilitarian value resides in the practicality, convenience, and cost-saving experiences by customers during the purchasing process (Batra and Ahtola, 1991; Chen *et al.*, 2015). The perceived function value and perceived hedonic value of the consumption process influence the frequency of online repurchase behavior (Lorenzo-Romero *et al.*, 2016). In the process of online buying, consumers must discover a feeling that makes all types of services and assistance valuable to them, such as cost and experience, which will lead to purchase intention and behavior. According to empirical studies, perceived value serves as an efficient mediator between AI technology experience and consumers' purchase intention on an online shopping platform (Yin and Qiu, 2021). Furthermore, the perceived value of the online store image in an online shopping environment might lead to intentional and impulsive buying behavior (Jiang and Zhao, 2013). Therefore, consumers who perceive the high value of augmented reality technology, are expected to use it for shopping. Based on the above discussions and literature reviewed, we propose the following hypothesis:

- H1.* Perceived value of the innovative technology VTO has a positive effect on purchase intention.

2.3.2 Perceived benefits and perceived value. When using products and services, consumers consider not only practical benefits but also hedonic benefits. Many previous studies that used a value-based adoption model confirmed the effect of perceived usefulness and perceived enjoyment on perceived value in many settings, such as augmented reality based mobile application (Yoon and Oh, 2022), the adoption of augmented reality in tourism (Lau *et al.*, 2019), the adoption of virtual reality (Vishwakarma *et al.*, 2020) and wearable devices (Yang *et al.*, 2016). Based on this, we propose:

H2. Perceived usefulness has a positive effect on perceived value of the innovative technology VTO.

H3. Perceived enjoyment has a positive effect on perceived value of the innovative technology VTO.

2.3.3 Perceived cost and perceived value. Considered as a cost, it has been stated that intrusiveness is disturbing, annoying, and insensitive (Mani and Chouk, 2017). It may arouse unpleasant feelings like annoyance and irritation, which may negatively affect how customers react to it (Li *et al.*, 2002a, b). This is what might happen when AR apps ask for camera access. Perceived intrusiveness influences attitudes toward the brand and app as well as willingness to share personal information (Smink *et al.*, 2019, 2020). Additionally, it has a negative impact on consumer experience value when interacting with smart products (Lucia-Palacios and Pérez-López, 2023). Therefore, we suggest that consumers are more likely to lower the evaluation of perceived value if they perceive using the virtual try-on technology to be intrusive. Based on the above debate, we suggest:

H4. Perceived intrusiveness has a negative effect on perceived value of the innovative technology VTO.

2.3.4 Augmented reality characteristics and perceived benefits. Product informativeness is defined by Rese *et al.* (2014) as the extent to which an innovative system provides useful product information for purchase decisions. Some of the found results suggest that increased levels of informativeness and high-quality information in AR can decrease uncertainty about items, boost perceptions of usefulness, and favorably influence choice confidence (Adam and Pecorelli, 2018). Furthermore, prior AR studies demonstrate that perceived usefulness is increased by perceived informativeness (Rese *et al.*, 2014, 2017; Söderström *et al.*, 2024) and the information presented in a playful manner has a higher hedonic value (Pantano and Di Pietro, 2012). Consequently, we propose the following:

H5a. Product informativeness in the innovative technology VTO has a positive effect on perceived usefulness.

H5b. Product informativeness in the innovative technology VTO has a positive effect on perceived enjoyment.

Additionally, AR was investigated in terms of interactivity in several studies (in 28.9% of the cases). It is defined as the extent to which users can alter virtual objects in the mediated environment in real time (Steuer, 1992) by looking at all of its features and imagining it from different angles, which helps them make a good decision (Jiang and Benbasat, 2004). Therefore, interactivity significantly enhances perceived usefulness and perceived enjoyment (McLean and Wilson, 2019; Yim *et al.*, 2017). Thus, we propose the following hypotheses:

H6a. Interactivity with the innovative technology VTO is positively associated with perceived usefulness.

H6b. Interactivity with the innovative technology VTO is positively associated with perceived enjoyment.

2.3.5 Personal factors, perceived benefits and perceived costs. While existing literature investigates the impact of AR characteristics on experiential value, the impact of consumer personal factors/personality traits is understudied (Watson *et al.*, 2020). This study seeks to fill this gap by examining two key consumer characteristics: personal innovativeness and privacy concerns.

Personal innovativeness is an external variable; it refers to a person’s willingness to experiment with innovation (Agarwal and Prasad, 1998). People who are highly innovative are more likely to accept new technology (Godoe and Johansen, 2012). Perceived usefulness and ease of use are found significantly influenced favorably by personal innovativeness (Kuo and Yen, 2009; Yi et al., 2006). Additionally, if a new system is more innovative and novel, (Venkatesh et al., 2012), also perceive additional hedonic benefits by doing so by raising the level of innovativeness. In line with previous research, we expect that:

- H7a. Personal innovativeness has a positive effect on perceived usefulness.
- H7b. Personal innovativeness has a positive effect on perceived enjoyment.

Privacy concerns reflect fears when information is collected and used by entities for purposes and in ways that the individual did not intend (Bandara et al., 2019). Because of the vast amount and variety of data collection methods, consumers’ privacy concerns have grown. According to Hilken et al. (2017), Customers’ decision comfort is significantly influenced by privacy concerns. We can make the case that customers won’t find a technology that is likely to invade their privacy useful. Additionally, in a virtual try-on app (self-viewing) experiment, it was discovered that people with greater privacy concerns have negative brand attitudes and a high perceived intrusiveness (Feng and Xie, 2019). Consequently, we expect that:

- H8a. Privacy Concerns has a negative effect on Perceived usefulness.
- H8b. Privacy Concerns has a positive effect on Perceived intrusiveness.

The research model is presented in Figure 1.

3. Research methodology

3.1 Data collection

This research’s chosen method of gathering respondents is convenience sampling. We tested the research hypotheses using an online survey. The link to the questionnaire was distributed via Facebook, Instagram, and WhatsApp’s applications. Respondents were asked to complete the survey questions after completing an online virtual try-on simulation

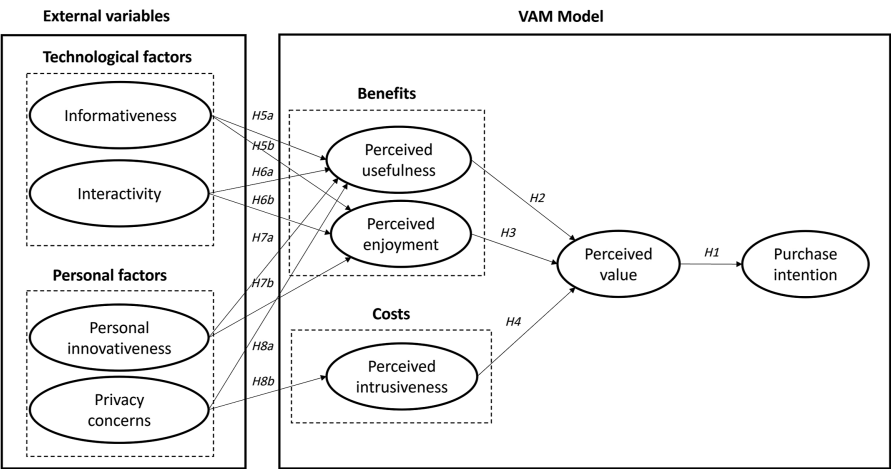


Figure 1. Conceptual model

Source(s): Prepared by the authors

using the L'Oréal website link provided in the questionnaire (Excellence Crème 7 Natural Dark Blonde Permanent Hair Dye | Hair Color | L'Oréal Paris (loreal-paris.co.uk)). They can virtually try on different shades of hair color to choose the one they would hypothetically purchase, in an attempt to see how AR enhances their experience. This is accomplished by selecting the virtual try-on option button for the desired product. Following that, the user's camera is accessed, and video footage of the user's face appears, followed by a swipe through the shades to find the product that best suits her.

3.2 Demographic results

According to Sigma Conseil, 75% used the internet in 2023, up 1.3% from 2021. Women are more active on social networks, with 90.2% participating. Additionally, 32.9% use online shopping services. Women continue to dominate with 38.8%, compared to 27.3% of men (Sigma Conseil, 2023).

Because the online application involved a beauty product (hair color), only women were enabled to participate. The study sample consisted of 238 participants. The majority of the respondents' ages falls between 26 and 35 (41.2%), followed by 32.8% of those between 18 and 25 years old, 24.4% are between 36 and 50 years old and the rest of the sample 1.7% are over 50 years old. For the professional category, the obtained results reveal that 40.8% are "Students", 29.4% are "Employees", 15.5% are "Executive", 8.5% have liberal profession and the rest 5.5% have other professions. The majority of the respondents (89.5%) have a university degree and the rest (10.5%) has a secondary school degree.

All measurement scales were adapted from the previous literature. Items measuring online consumers' purchase intention were developed by (Wang *et al.*, 2007). The scale created by (Joseph *et al.*, 2000) was used to assess perceived value. To measure the perceived usefulness, perceived enjoyment and informativeness constructs, we used scales from Rese *et al.* (2014). Items developed by (Li *et al.*, 2002a) were used to measure consumers' perceived intrusiveness. To measure the interactivity variable, we used a scale adapted from Tsikriktsis (2002) and Van der Heijden (2003). To measure the personal innovativeness and the privacy concerns constructs, we used scales adapted from Compeau *et al.* (1999) and Gu *et al.* (2017) respectively. All constructs were unidimensional and measured on a five-point Likert scale (1 = completely disagree, 5 = completely agree).

3.3 Common method bias

To overcome this problem, both *a priori* and post hoc remedies were employed. Priori remedies included a questionnaire pre-testing to ensure the clarity of terms used and to improve the questionnaire design, additionally, each respondent's anonymity was ensured, to encourage honest responses to the questions. As post hoc remedies, Harman single factor analysis and multicollinearity test were used (Podsakoff *et al.*, 2003). Harman's single-component analysis revealed that the first factor accounted for just 40.328% of the total variance, less than 50% (Akter *et al.*, 2017). The multicollinearity test was also used to validate the Harman single factor analysis findings. The VIF values of all constructs were between 1.000 and 2.681, which are lower than the threshold limit of 5 (Mason and Perreault, 1991; Becker *et al.*, 2015). This means that common method bias is not an issue in our research.

4. Data analysis and results

4.1 Measurement results

SPSS 26.0 was used to carry out the exploratory factor analysis to determine the dimensionality of our constructs and SMARTPLS4 was used to conduct the confirmatory

factor analysis. The results showed that the loadings of all items on their corresponding variables are greater than 0.70 at the 0.001 significance level. All retained measurement scales were reliable with satisfying Cronbach's coefficients ranging between 0.85 and 0.95. Furthermore, all of the AVEs in [Table 1](#) exceeds the recommended 0.50 level ([Hair et al., 2017](#)) which indicates the presence of discriminant validity. [Table 1](#) indicates that the CR for all the constructs exceeding the recommended threshold of 0.70 ([Gefen et al., 2011](#)), demonstrates high construct reliability. As a result, the measurement model has satisfactory convergent validity. [Table 2](#) shows that the HTMT value for each pair of reflective constructs is less than 0.90, indicating that satisfactory discriminant validity has been proven. The variance inflation factor coefficient values are lower than 5 which means that multicollinearity is not an issue in our study.

4.2 Structural results

We employed the Q² value recommended by [Stone \(1974\)](#) and [Geisser \(1974\)](#) to test the predictive relevance. Our models indicate that the primary dependent variable has a positive Q² value, as presented in [Table 3](#). The results suggest that, except for the paths from perceived enjoyment to perceived value, from personal innovativeness to perceived enjoyment and from privacy concerns to perceived usefulness, all paths are significant, as shown in the [Table 4](#). The path analysis of perceived value yields a value of 0.757 for purchase intention. The perceived usefulness and perceived intrusiveness path coefficients towards perceived value are 0.485 and −0.295, respectively. The path analysis values for informativeness are 0.334 towards perceived usefulness, and 0.414 towards perceived enjoyment. The path analysis values for interactivity are 0.395 towards perceived usefulness, and 0.171 towards perceived enjoyment. The path analysis of personal innovativeness yields a value of 0.095 towards perceived usefulness, and finally the path analysis of privacy concerns yields a value of 0.283 towards perceived intrusiveness. All hypotheses, except [H3](#), [H7b](#), and [H8a](#), are supported by the data.

Standardized PLS path coefficients as well as the corresponding *t*-values and R² metrics for each explained variable are shown in [Figure 2](#).

5. Discussion

This study proposes that AR characteristics, consumer traits, and usage experiences with Virtual Try-On (VTO) technology play a significant role in influencing online purchase intentions, as outlined in an extended value-based adoption model (VAM) by [Kim et al. \(2007\)](#). The results from the proposed model indicate that the perceived value of VTO technology significantly affects purchase intentions, consistent with previous studies ([Yin and Qiu, 2021](#); [Erdmann et al., 2023](#); [Jiang and Zhao, 2013](#)). Specifically, perceived value is positively influenced by perceived usefulness and negatively influenced by perceived intrusiveness. These findings align with the works of [Yoon and Oh \(2022\)](#), [Vishwakarma et al. \(2020\)](#), [Chen et al. \(2018\)](#) and [Lucia-Placios and Pérez-López \(2023\)](#), who found similar relationships between these constructs.

Interestingly, our study found that perceived enjoyment does not significantly impact perceived value, which may be explained by the context of the study—virtual try-on of hair coloration products—where women may prioritize utilitarian benefits over hedonic ones. This aligns with [Shafir et al. \(1993\)](#), who argued that utilitarian benefits are easier to rationalize, especially in contexts where practical, functional outcomes are prioritized over experiential enjoyment. [Wang \(2010\)](#) also supports this, noting gender differences in value perceptions, where women may lean more towards utilitarian rather than hedonic value in decision-making processes.

Constructs and items	Std. loadings	Cronbach's α	C.R.	AVE
<i>Purchase intention</i>		0.950	0.968	0.909
If it were possible, I could imagine buying beauty products from this Web site	0.947			
The next time I buy beauty products, I will take this Web site into consideration if it is possible to buy products on it	0.957			
I would be very interested in buying beauty products on this Web site	0.956			
<i>Perceived value</i>		0.926	0.947	0.818
Overall, I believe that the value of using the virtual try-on was good	0.854			
Overall, I believe that I received more than what I gave up when using the virtual try-on	0.870			
Overall, I believe that the virtual try-on satisfied my expectations	0.904			
<i>Perceived usefulness</i>		0.879	0.911	0.673
For me the virtual try-on has great value	0.898			
The virtual try-on provides beautiful ideas for the products	0.825			
The virtual try-on is very inspiring in terms of beauty products	0.906			
The virtual try-on is a perfect aid to come to a decision in the selection of beauty product	0.888			
<i>Perceived enjoyment</i>		0.903	0.932	0.774
Using the virtual try-on is really funny	0.898			
The virtual try-on is good practice	0.877			
It is fun to discover the virtual try-on	0.903			
The virtual try-on invites you to discover L'Oreal online shop	0.874			
<i>Perceived intrusiveness</i>		0.849	0.908	0.768
Trying the product in the virtual try-on was disturbing	0.859			
Trying the product in the virtual try-on was difficult	0.818			
Trying the product in the virtual try-on was intrusive	0.823			
Trying the product in the virtual try-on was unpleasant	0.835			
Trying the product in the virtual try-on was invasive	0.764			
<i>Interactivity</i>		0.895	0.935	0.827
Through the interaction with the virtual product presentation in the AR virtual try-on, I can get a profound picture of the product	0.853			
I am able to interact with the virtual product presentation in the AR virtual try-on in order to get information tailored to my specific needs	0.898			
The degree of interaction with the virtual product presentation in the AR virtual try-on on the website is outstanding	0.896			
<i>Informativeness</i>		0.938	0.953	0.801
The AR virtual try-on shows the information I expected	0.870			
The AR virtual try-on provides detailed information about the products	0.896			
The AR virtual try-on provides complete information about the products	0.901			
The AR virtual try-on provides information that helps me in my decision	0.915			
The AR virtual try-on provides information to compare products	0.893			
<i>Personal innovativeness</i>		0.858	0.913	0.778
If I heard about a new information technology, I would look for ways to experiment with it	0.939			

(continued)

Table 1.
Measurement model:
internal reliability and
convergent validity

EJIM

Constructs and items	Std. loadings	Cronbach's α	C.R	AVE
Among my peers, I am usually the first to try out new information technologies	0.886			
In general, I like to experiment with new information technologies	0.903			
<i>Privacy concerns</i>		0.910	0.937	0.788
I think virtual try-on will over-collect my personal information	0.938			
I will worry that virtual try-on leaks my personal information to irrelevant third parties	0.880			
I am concerned about threats to my privacy	0.885			
I would be concerned that virtual try-on would misuse my personal information	0.913			

Table 1.

Source(s): Prepared by the authors

	INF	IN	PIIT	PC	PU	PE	PIV	PV	PI
INF									
PIIT	0.610								
IN	0.860	0.629							
PE	0.648	0.467	0.613						
PIV	0.681	0.556	0.705	0.552					
PU	0.761	0.588	0.813	0.698	0.647				
PVAL	0.750	0.602	0.869	0.604	0.711	0.794			
PC	0.219	0.260	0.220	0.139	0.308	0.167	0.245		
PI	0.803	0.631	0.775	0.640	0.721	0.822	0.838	0.219	

Table 2.

Heterotrait-monotrait ratios

Note(s): INF: informativeness, PIIT: personal innovativeness, IN: interactivity, PE: perceived enjoyment, PIV: perceived intrusiveness, PU: perceived usefulness, PVAL: perceived value, PC: privacy concerns, PI: purchase intention

Source(s): Prepared by the authors

	Q ² predict
PE	0.361
PIV	0.071
PU	0.580
PVAL	0.472
PI	0.409

Table 3.

Out-of-sample predictive performance of constructs

Note(s): PE: perceived enjoyment, PIV: perceived intrusiveness, PU: perceived usefulness, PVAL: perceived value, PI: purchase intention

Source(s): Prepared by the authors

Moreover, perceived intrusiveness was found to significantly negatively affect perceived value, highlighting the importance of managing the intrusiveness of AR technologies. The study further emphasizes that perceived usefulness, as a utilitarian benefit, has the most substantial impact on purchase intention through its influence on perceived value.

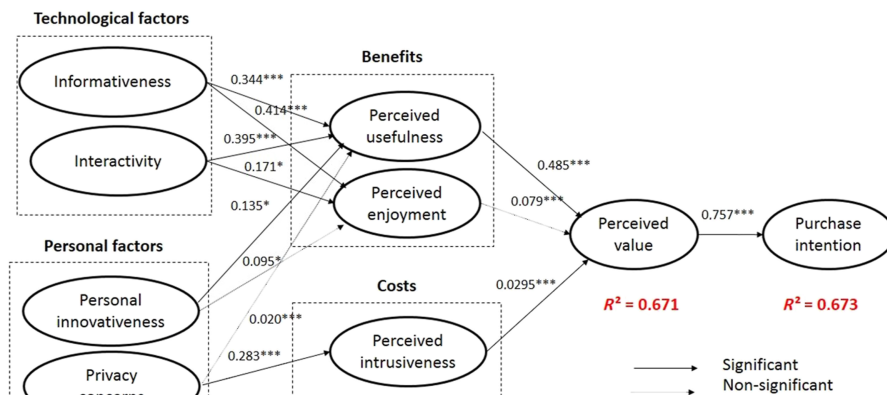
AR characteristics, particularly informativeness and interactivity, positively influence perceived usefulness and perceived enjoyment, consistent with findings from [Adam and](#)

Relationships	Original sample (O)	Sample mean (M)	Standard deviation (STDE)	t statistics (O/ STDEV)	p values
PVAL → PI	0.757	0.755	0.037	20,361	0.000
PU → PVAL	0.485	0.478	0.072	6,768	0.000
PE → PVAL	0.079	0.079	0.055	1,432	0.152
PIV → PVAL	−0.295	−0.299	0.073	4,024	0.000
INF → PU	0.334	0.330	0.069	4,821	0.000
INF → PE	0.414	0.412	0.082	5,054	0.000
IN → PU	0.395	0.395	0.062	6,385	0.000
IN → PE	0.171	0.169	0.086	1,979	0.048
PIIT → PU	0.135	0.137	0.052	2,622	0.009
PIIT → PE	0.095	0.100	0.066	1,452	0.147
PC → PU	0.020	0.017	0.049	0.412	0.680
PC → PIV	0.283	0.287	0.053	5,326	0.000

Note(s): INF: informativeness, PIIT: personal innovativeness, IN: interactivity, PE: perceived enjoyment, purchase intention

Source(s): Prepared by the authors

Table 4.
Results of hypotheses
testing



Note(s): * < 0.05, *** < 0.001

Source(s): Prepared by the authors

Figure 2.
Empirically
validated model

Pecorelli (2018), Pantano and Di Pietro (2012), McLean and Wilson (2019), Yim *et al.* (2017) and recently Söderström *et al.* (2024). Personal innovativeness was found to positively influence perceived usefulness consistent with previous studies (Kuo and Yen, 2009; Yi *et al.*, 2006; Alam *et al.*, 2021), but not perceived enjoyment, suggesting that for innovative users, the utility of the technology outweighs its entertainment value. This finding resonates with Matute-Vallejo and Melero-Polo (2019), who noted that highly innovative users prioritize goal achievement over enjoyment in using VTO technologies. That is implies, by raising the level of innovativeness, women not only are more encouraged to adopt this technology but also perceive additional utilitarian benefits more than the hedonic benefits.

Finally, privacy concerns were significantly linked to perceived intrusiveness, consistent with previous studies (Feng and Xie, 2019), but did not affect perceived usefulness, a finding that can be explained by the privacy paradox, where users prioritize functional and social benefits despite privacy concerns (Church *et al.*, 2017).

5.1 Theoretical and practical implications

This study contributes to the literature by extending the application of perceived value theory to understand the role of AR technology in online shopping, considering both the technology's characteristics and consumer traits that modulate the perceived benefits and costs. The findings demonstrate that while AR technology can enhance the shopping experience, it can also create an intrusive experience that may detract from its overall value. However, the benefits, particularly utilitarian ones like perceived usefulness, seem to outweigh these negative aspects, suggesting that VTO technology in the beauty sector primarily functions as a utilitarian tool.

From a practical standpoint, the study has several implications for managers and marketers. Firstly, AR technology can effectively enhance purchase intentions by providing a "try before you buy" experience, bridging the gap between online and offline shopping. The study shows that AR features, such as informativeness and interactivity, positively affect perceived usefulness and, consequently, perceived value. However, managers should be cautious of the technology's intrusiveness, especially for products closely tied to personal identity. Offering consumers the choice to use AR features or an alternative mode could mitigate the potential negative effects of intrusiveness. Secondly, the utilitarian nature of this technology was evident in beauty retail because the utilitarian benefit appeared to be a better predictor of perceived value as well as purchase intention. While developing a solution, marketers should keep the primary utilitarian aspect of the technology in mind. For example, they could highlight utilitarian features that it is a purchasing tool, such as the high level of interactivity and the quality of the provided information. Additionally, considering the role of personal innovativeness, marketing campaigns should target more innovative consumer segments who are likely to perceive greater value from the utilitarian aspects of the technology. Lastly, privacy concerns should not be overlooked. Given that privacy concerns significantly influence perceived intrusiveness, managers must communicate transparent data security practices to build consumer trust (FTC, 2012). Simplifying privacy policies and clearly informing customers about data usage can help alleviate privacy concerns, particularly in contexts where self-augmentation products like eyewear and makeup are involved.

5.2 Limitations and suggestions for further research

No research is without limitation. First, data was collected based on 238 responses which were included in the analysis and the sampling method used was a convenience sampling. Accordingly, the survey was distributed on social media, restricted to internet users and primarily to female users who were the majority students 40.8 and 65.6% of them were aged between 18 and 35 years old. This limits the generalizability over a more diverse user population, including older people and men, which could have differently affected the results. Regarding age, research has shown that young people are especially tech savvy and tend to have less technology anxiety compared to older people (Rice and Pearce, 2015; Vishwanath and Goldhaber, 2003). As a consequence, older people generally have more difficulties in using and adopting new technologies. Therefore, it is likely that they perceive AR applications as less useful and enjoyable than younger people, and at the same time as more intrusive. Thus, Future research is required to collect and analyze data using a larger sample size and to account for potential gender or age differences. Second, all the participants were from Tunisia and this could affect the results as it is the same culture and might be too homogeneous. Therefore, in the future, we recommend expanding the research to other countries and expand the overall amount of data collected. Third, we also acknowledge the potential limitation of the self-completed survey—the online survey was not conducted in a controlled lab environment. This may affect the results. While this online simulation

provided a more natural setting that enabled participants to try the application in their own time and in their environment, this also enabled participants to choose a different online product virtual try-on than they were assigned to. Future studies could account for this by choosing a more controlled setting. Further, the author did not have any communication with the participants. They did not have the opportunity to ask follow up questions about the survey question to make sure everything was understood correctly. Consequently, there could be some bias with the responses here, with possible confusion or misunderstandings. Thus, we recommend future studies to conduct a face-to-face survey. In addition, this study focuses on customers using the VTO technology of one pioneering brand in the beauty industry; future studies could investigate different online retailers, industries and put the model to test other products categories. Fourth, since the results highlight the non-significance of the relationship between the hedonic factor and perceived value in contradiction with previous studies, further research is needed to examine this effect in this context. Additionally, other number of variables could also be assessed for future research to explore this matter like “playfulness”. Other additional cost constructs can be considered such as “irritation” or “technicality” to understand to which extent the variable influences perceived value. Finally, qualitative research is well-suited to shed light on the mental events and private processes associated with the consumption and usage of AR technologies in retailing.

Notes

1. Augmented reality.
2. Virtual try-on.
3. Technology acceptance model.

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