ISSN: 2836-8495

Review Article

Journal of Current Trends in Computer Science Research

An Android App Using Virtual Trial Room to Minimize Clothing Perceived Risks of Buyers

Haider Mustafa

Profession Services, Software Technical Consultant II, Pakistan.

***Corresponding Author**
Haider Mustafa, Profession Services, Software Technical Consultant II, Pakistan.

Submitted: 2023, May 11 ; **Accepted:** 2023, June 20 ; **Published:** 2023, July 07

Citation: Mustafa, H. (2023). An Android App Using Virtual Trial Room to Minimize Clothing Perceived Risks of Buyers. *J Curr Trends Comp Sci Res, 2*(2), 168-173.

Abstract

The world is moving on the clothing mobile application shopping applications, especially during the pandemic COVID 19 days there seems to be an excessive demand for online shopping. Online shopping applications that provide an approach to buying a product of your choice with the least effort also involve some of the risk factors, especially in the psychological environment of the developing county like Pakistan, where people have a minor trust factor and prefer to touch, use and see the personalized appearance before buying the item. This behavior seems to be more regressive when it comes to shopping in terms of clothing. People prefer to wear the items, match the colors, and check if it suits their personality. Online shopping seems to lack this customer approach, especially in developing countries like Pakistan. There has always been fear and, at the same time, a trust factor. A virtual trial room is an alternative approach where a user can virtually try the clothes on the body after providing the complete image to the system and then try different color combinations, different fabrics, and matching the contrast. Using an Image processing machine learning approach, a methodology is proposed to judge this behavior of the customer after trying the clothes on personal appearance virtually and evaluate the results after comparing them with buying behavior of the user in a simple online application and the online mobile application containing the virtual trial room model. Furthermore, studies have the Virtual trial room model as a productive model in the online shopping experience. Following the described methodology in mobile clothing mobile application, it is expected to gain the utmost trust after eliminating buying risks associated with online shopping.

1. Introduction

The development of the Internet has lessened physical borders and made the world a little place where people can communicate with each other, at any time from any location. E-commerce is a major shift in the field of business. more and more people are getting linked with the Internet every day, and the value of online shopping rises. Thousands of people browse thousands of online sellers every day for the reason to purchase products and services. E-commerce is a subclass of e-business to buy, sell, and exchange products and services through computer networks, and transactions are executed electronically. The overall behavior of people in the world experiencing online shopping using ABMA applications is higher than before. However, a customer in today's world finds it more accessible to shop online just because of economic ease, the leisure of staying at home and deciding instead of going into the heavy traffic and find something to wear, and also because of the discounts and promotions the online retailers are providing in today's era and that trying garments in garments shops is generally a time-consuming pastime. Moreover, it would not be viable to undertake clothes within the shop, like ordering garments online. Therefore, the world's business is currently moving towards clothing mobile application technology as the business community targets the web and mobile apps-based buying and selling platform at a large scale. Therefore, the business has changed on the internet even competition has increased due to clothing mobile applications. Similarly, computer communication networks have changed many marketplaces on the web for consumers [1]. According to the survey paper, 41% of the customer's review experience is extremely dissatisfied, and 25% of the customer's review experience is extremely satisfied [1].

Moreover, modern-day marketing techniques bring customers to online shopping by providing Application interactivity, which offers assisted communications, modification of given information, entertainment, and image manipulation, where image manipulation brings customers ease of enlarging images providing some rotational effects to visualize the image properly [2]. Trust is a valuable factor in the field of e-commerce. Much research is based on customer trust and explains external and internal factors that influence trust. Internal factors consist of customer traits, website traits, and firm traits. External factors mean technology and procedure. According to the author, the trust process is recurring [2]. Moreover, a part of the trust and perceived risks factors, it is getting to be difficult for a private to ascertain how a given article would look if worn by that person-owing to the rich variation in body size and shape, hair, and complexion, etc., during a person's population. As per the research, the lack of information about the product's experience and physical interaction is one of the main obstacles to online

fashion shopping [2]. Since clothing requires multisensory information, it has been shown that a lack of direct experience can reduce consumer fun during the shopping process and increase the perception of risk. However, due to digital technology innovation, this multi-sensory input can now be converted to an online environment in several ways. Enriched information about a product on the application can be collected through visual cues. IIT (Interactive Information Technology) enables different operations for its users to get information about an effect on the application and the mobile application. It allows them to change a product's background, context, design, and view by distance or angles [2]. A combination of image interactivity with a personalized view of the customer can minimize the associated risks towards online purchasing, specifically in the Pakistani shopping experience environment, where people are more focused on touching a product and experimenting with it on their personality by matching the color combination which suits them perfectly. People are attracted by sensory attributes of the products for home shopping like color, garment fitness, quality, and fabric [3]. It is observed that website designs are essential for making e-shopping attractive. People like to shop from applications that use less cognitive effort, using brief presentations, tidy screens, and easy search ways. In the paper, character effects on deal results among business-to-business sellers and buyers are discussed [3]. Some of the personality traits which are required to boost sales are endurance, extroversion, and dominance. A better shopping experience that reduces shopping time is pleasurable and practical. Hence the consumer will be more interested in purchasing online for the next time. He further added that Web-interactivity enhances repetitive visits to the application, and online marketers use tactics like community building and virtual 3D experiences to attract and satisfy customers. In this way, it increases online purchases.

From image blending and zooming technologies to more advanced image interaction technologies such as virtual fitting/trial rooms. Many online applications use different sorts of software technologies to provide the maximum comfort for the buyer to make the decision, sometimes using image interactivity technology, the ability to enlarge the product, mix, and match technologies that enable the users to analyze the dynamic behavior of the available images by rotating them and maximizing them at different angles. Also, sometimes by providing 3D and 2D models of images, the online applications try their best to achieve the maximum level of customer satisfaction that can improve the consumer's buying behavior and help them make purchase decisions. The author has proposed a Stimulus-Organism-Response (S-O-R) model, combining image interactivity, cognitive experience, and appearance, which is another way of examining the behavior of the person toward buying an item [4]. Unlike other methodologies (discussed above), Virtual Trial Room is an ability of a software system using which a person can try the available clothing products online on personal appearance. Therefore, this technology keeping the overall risk factor in mind can be more suitable and productive in increasing online shopping buying behavior, as the person can try the products on their personal appearance, and can analyze how it looks on their body, which can lead to an ease in making the decision and can somehow minimize the difference between online shopping and the physical shopping [4].

The advantages of using a virtual dressing room from your home/office are several [5]:

a. Reducing the percentage.
b. Competitive advantages as the customer can try the clothes by using the application before buying, ultimately reducing risk in the buying process and decision.
c. An Increase in opportunities for customization
d. The customers can create customized clothes.
e. Before making the final decision, people can easily upload a video of themselves trying the clothes virtually to social media and share it with the family circle.

Methods:
An Android-based mobile app (ABMA) was developed using the following tools and Technologies:

- Android minSdkVersion 16
- Android targetSdkVersion 30
- Android buildToolsVersion 30.0.3
- Java version VERSION_1_8
- Tool: Android Studio

The purpose of this mobile application is to provide a virtual trial room within a mobile application to collect data based on some questions using a Google response form in which a user, after using an android-based virtual trial room mobile application, is presented to the user to get their response.

The user in the mobile application, in the first step, will upload their full-body image. In the second step, the user will be asked to select the gender. Thirdly the user will be presented with the screen to choose the shirt that they like to try on their appearance. Once the user selects the shirt, the user in the fourth step will be asked to select their body type. In the fifth step, an AI-based API will be called, which takes a user's image (taken in the first step) and a selected dummy(taken in the fourth step) as an argument. The AI-based API will then perform face-swapping by picking the face of the user's image and replacing it with the selected dummy's face so that the person can see the selected shirt on his/her appearance. In the sixth and last step, the user will be given a Google response form link opening in which a user will be presented with a questionnaire in a form after asking his/her name, age, and gender.

AI-based API face swapping is a graphics-based method to swap the faces of a source image to a target image, while Deep fakes are a deep learning-based method of face swapping. Several manipulation methods are proposed to generate compelling fake images. This method performs face-swapping by fitting the model to landmarks in the source face and aligning it to the target face. The rendering and color correction are then applied to improve the visualization/smoothness of swapped images.

The recent common underlying mechanism for deep fake creation is deep learning models such as autoencoders and generative adversarial networks, which have been applied widely in the computer vision domain. These models are used to examine the facial expressions and movements of a person and synthesize facial images of another person making analogous expressions and movements [10]. Deepfakes trains two autoencoders with

a shared encoder for two specific individuals to reconstruct the source and target faces. The face swap image is produced from the source face by the trained encoder and target decoder. The cropped face is then blended with the target image. However, this technique is needed to train a model on several human faces. Face segmentation is used to adjust for both pose and expression variations. Moreover, a face blending network is proposed to preserve the target skin color and lighting conditions.

We first utilize a morphable model to extract facial shape and appearance inconsistency in face-swap images to extract facial shape features to swap images with target images. Then, we calculate the Mahalanobis Distance between the shape features of the source images and the corresponding images, and the distance is further utilized to validate the source images by comparing them with the fixed threshold. Specifically, we utilize the inconsistency between facial appearance and facial shape in face-swap deep fakes for detection. For a specific individual, his/her facial shape should change significantly in diverse images. In face-swap deep fakes, we only replace the target faces with the source faces but retain the facial shapes of the target images. Hence, the flaw of the cross-modal inconsistency provides us with the idea that the face swapped with the target image is smooth or not so that it will be possible to align source facial features with a targeted image.

The morphable model is widely applied to face analysis and synthesis [11]. The geometry of a face is represented with a shape vector S, which contains the X, Y coordinates of its n vertices. The texture of a face is represented with a texture vector T, which contains the R, G, and B color values of the n corresponding vertices. A morphable face model is then constructed using a set of example faces, each represented by its shape vector Si and texture vector Ti. A new shape S mod and new texture T mod can be expressed in barycentric coordinates as a linear combination of the shapes and textures of the example faces [12].

$$S_{\text{mod}} = \sum_{i=1}^{m} a_i S_i, \quad T_{\text{mod}} = \sum_{i=1}^{m} b_i T_i, \quad \sum_{i=1}^{m} a_i = \sum_{i=1}^{m} b_i = 1 \qquad \text{(i)}$$

we only require the shape of the source face to match that of the target face. Given a source shape S (x, y) source, the reconstructed shape is closest to the target shape in terms of Mahalanobis distance.

Using the Mahalanobis distance compared with a given threshold for detecting facial landmarks. Due to the inaccuracy of estimation, the template is enrolled with a set of facial shape features, and a particular distribution is modeled for the features. Therefore, for the comprehensive utilization of the image information, we use Mahalanobis Distance for measurement. Compared to other common measurements, Mahalanobis Distance is scale-invariant and uses the relations of various features. Moreover, it can compute the distance between a point and a distribution. Consequently, in our approach, we utilize Mahalanobis Distance to calculate the distance between facial shape features in a manipulated image and the distribution modeled by the corresponding image. The formula of Mahalanobis Distance is described as follows:

$$D(\vec{x}) = \sqrt{(\vec{x} - \vec{\mu})^T \Sigma^{-1} (\vec{x} - \vec{\mu})} \qquad \text{(ii)}$$

where ~x denotes the facial shape feature vector of the manipulated image, and ~μ and Σ are the mean vector and the covariance matrix of the corresponding template, respectively. The formula shows that Mahalanobis Distance utilizes the covariance matrix to integrate a template's various features and distribution information. It is noticed that regarding the inverse covariance matrix, the number of images in the template must not be less than the feature dimensions. After measuring the distance, a threshold must be determined in the training phase to detect deep fakes. The facial shape features of a genuine image should be close to the corresponding template. Thus, an image is classified as swapped if the computed distance between it and its template is below the given threshold. We tune and fix our threshold with the criterion of approximate accuracy between genuine and swapped images.

To implement this methodology, we are using python as a programming language. To achieve the desired results, we are using OpenCV and dlib packages that provide methods to check Face alignment, detect face landmarks and crop the face respectively to feed it to our deep learning algorithm.

2. Results

Figure 4.1 indicates the curiosity of users about the product used in the virtual trial room. 56.76 percent of people are strongly curious about the actual product in the market. Moreover, 4.05 percent population neither agreed nor disagreed and chose to be neutral about the curiosity of the product after using it in the virtual trial room. However, 2.70 percent population lack curiosity about the product that means they denied checking the product.

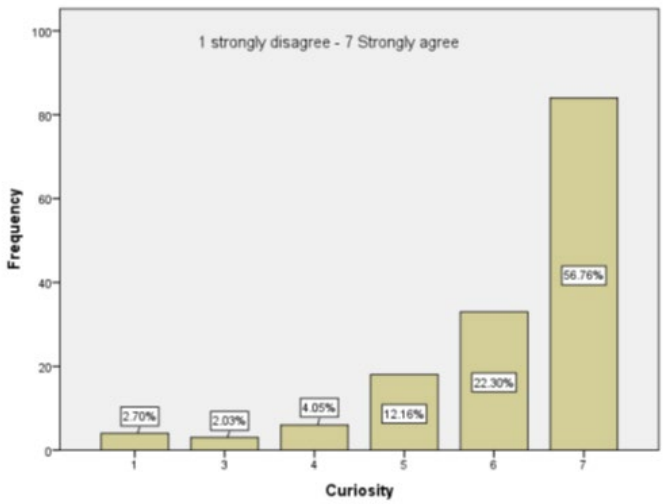

Figure 4. 1: Curiosity of users about the product

Figure 4.2 indicates the interest of users in the product tried in the virtual trial room. 59.46 percent of people are strongly interested in using the real product they tried in the virtual trial room. Moreover, 3.38 percent population chose to be neutral about showing interest in the product after using it in the virtual trial room. However, 0.68 percent population lacks complete interest in the product. Nobody answered '2' which somewhat

disagrees with showing interest in the product.

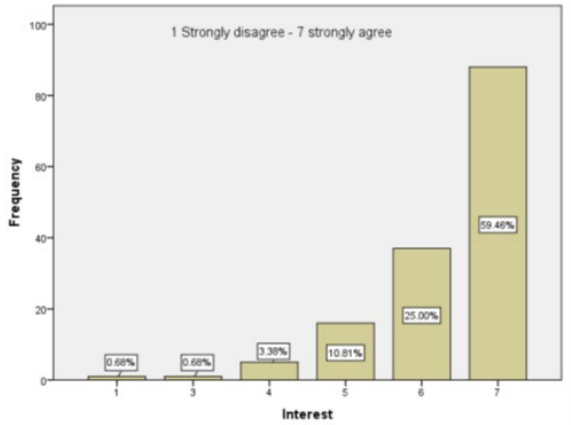

Figure 4.2: Interest of users in the product

Figure 4.3 indicates the likelihood of purchasing the product participants after trying it in the virtual trial room. 60.14 percent of people answered full interest in purchasing the product they strongly agreed. Moreover, 33.10 percent of participants somewhat agreed to agree about purchasing the product in the market. 4.05 percent population chose to be neutral about showing the likelihood of purchasing a product using a virtual trial room. However, 2.03 percent of people somewhat disagreed with purchasing the product they tried.

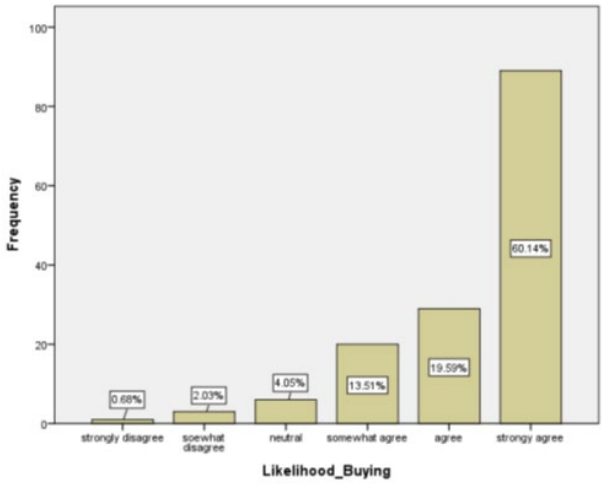

Figure 4.3: Likelihood of purchasing the product

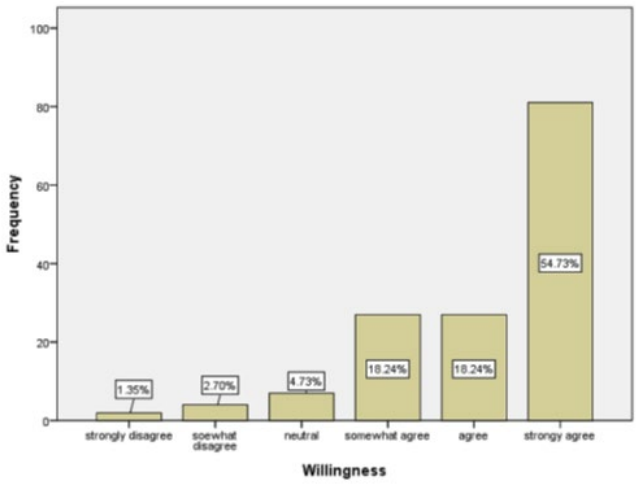

Figure 4.4: Probability of buying the product

Figure 4.4 indicates participants' probability of buying the product after using it in the virtual trial room. Seventy-nine participants (53.38%) strongly agreed and showed a complete probability of buying the product they tried. Moreover, 55 participants (i.e. 37.16%) agreed to buy the product they used in the virtual trial room. However, 8 participants did not show any absolute chance of buying or not buying the product. Moreover, 6 participants' probability of buying the product is less than 4 percent.

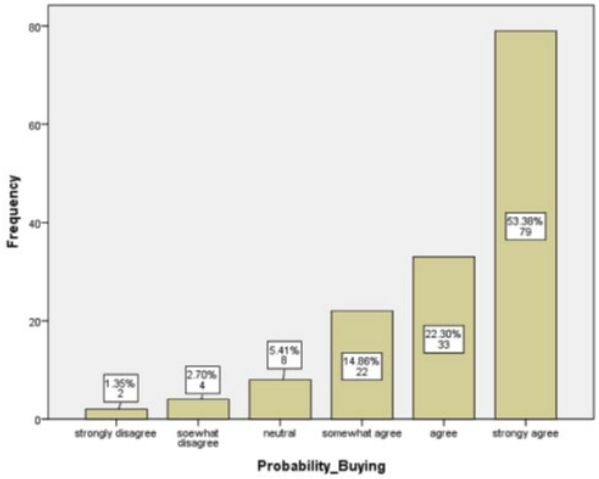

Figure 4.5: Willingness of participants to buy the product

Figure 4.5 indicates the willingness of participants to buy products tried in the virtual trial room. 54.73 percent of people showed a complete willingness to buy the real product they tried in the virtual trial room. Moreover, 4.73 percent of the population chose to be neutral about showing their willingness to use it in the virtual trial room. However, 4.05 percent of the population disagreed with showing any willingness to buy the product completely.

3. Discussion

The findings explained in the prior chapter provide a summary of the research work. After these results, it is confirmed to the customer that there is no risk in purchasing the item which suits him/her well. The customer's trust is gained to purchase the item confidently as trust is a significant factor in online shopping. Attractive applications, reputation, and dealing with customers on time are the major factors that strongly impact willingness to trust online shopping. All these factors help to attain the credibility of online shopping.

Presently, online clothing shopping is a rapidly developing craze worldwide and, in my country, [13]. Society is becoming efficient and doing online shopping. Online shopping applications are extremely less investigated from a non-functional requirements viewpoint [14]. The single examined and explored the subject in it is the client contentment and layout of the application. It is discussed in the methodology part that it is a mobile application using Android versions, developed on Android Studio. The form is also available to the user forgetting their response. The user needed to upload his/her picture and then select gender. After that, the user will select the clothing they want to buy; AI-based API makes the user able to see himself/herself in the selected shirt.

Due to the popularity of online shopping, there is less influence of social risk, as no one considers buying anything online unusual [4]. Furthermore, when customers provide others with positive feedback after shopping, others' viewpoints about online shopping are no longer a concern. The application, considered in this research, enhances customer satisfaction to get the customer's willingness. The trust level is also significant in online shopping [7]. The technology used in this application will be used to get customers' trust and satisfaction. The shopper showed active participation by posting their feedback, implying that the bought items met their expectations, thus mitigating product discrepancy.

A trial room application has been successfully developed. It is created to gain interest from consumers and must expand sales performance and encourage online shopping. As a result of the increasing demand for an improved shopping experience via integrating Virtual Trial Rooms into the fashion-selling atmosphere, this research categorizes Virtual Trial Rooms by highlighting the functional and empirical attributes. This research recommends the latest pathway for understanding the capabilities of Virtual Trial Rooms ahead of a performance-centered viewpoint by integrating practical and functional attributes of virtual trial rooms as the main considerations that impact customer involvement.

Furthermore, by categorizing virtual trial rooms from the customer experience viewpoint, this research provides methods to describe the differences in customer experiences in virtual trial rooms recommended in the previous studies by understanding the differences among various virtual trial rooms. Intellectually, recognizing how several virtual trial rooms contribute to similarities and variations is essential for implementing a more precise and advanced study [3]. Through virtual trial rooms from the customer experience viewpoint, this research explains the variations in customer experiences in virtual trial rooms recommended in previous research. Precisely, the recommended virtual trial room has various abilities to improve customer's practical and hedonic experiences with varying degrees of correctness, appeal, and interactivity, and y could be used to fill a gap in the literature concerning customers' different intellectual and affecting responses to the virtual trial room.

Organizationally, this research explains fashion businesses' identification and adoption of improved virtual trial room solutions for providing increased value to end fashion customers. That is the method for studying the most psychologically alluring and functionally valuable to their objective customers and understanding the technique to take advantage of them to enhance a brand's performance [15].

Out of identified virtual trial room types, all give tools to improve the interactivity between customers and the system, i.e., image enlargement, mix-and-match, and recommendation system. Also, a social sharing system. Though, in terms of precision and desirability, research demonstrated a broad variety of differences because of the variations in body measurements, capturing method, visualization technology, and the subject used on the virtual model.

This application is implemented to indicate the look and feels accurately. With the help of the customer, the application would carry out the process of trying the apparel easily and fast. From a managerial viewpoint, two kinds of implications could be considered. First, the results seen by this research provide a good understanding of the influence of virtual trial rooms on customer behavior. Second, there are some influences on the brand which grow in a context where big data is ever more significant [5]. Managers could use all the information produced by the virtual trial room. The information could relate to first the product, i.e., the most sold product which provides the best conversion rate and other linked information.

Furthermore, the collected information could also be buyer-oriented, i.e., a virtual trial room provides access to the buyer's social network profiles. Thus, brands could depend on the collected information to improve their prompt or retargeting tactics [16]. This application, with the help of the client, would perform the procedure of evaluating the apparel effortlessly and quickly and then selecting the finest option, which will, as a result, facilitate us to get the benefit of the large capability given by the science of interaction between computer and man [9]. This, consequently, would indicate optimistically on the seller, in terms of trading the items easily and innovatively, consequential in improved sales and on the customer in terms of ease and speed in visualizing through all the items, access to reach the best choice in selecting apparels.

4. Conclusion

According to the latest online shopping research and the marketing domain's trust theories, this research provides a conceptual model to attain the customer's trust, advantages, and disadvantages in online shopping. Also, it is likely that the higher the person's Internet experience, the more chances are to trust the technology, so it might help in improving their trust in online shopping. Consequently, the more users use the Internet, the more will be their concern of privacy and security, and so it might lessen levels of trust. Online shopping might be affected much by motivations, i.e., fun, curiosity, and convenience.

Recently, the Internet is being broadly used as a significant path for conducting online business, as it eliminates space and time obstacles by enabling 24-hour shopping for consumers. A constant increase in online shopping and the number of online customers is seen. Improvements in the online ordering system have driven those changes. However, customer intentions of risks associated with buying online remain a big obstacle in the constant growth of online shopping. In this context, this research focused on investigating the techniques to attain the trust level of the customers and mitigate the risk of loss or not getting the product they were expecting. The application presented in this research, starting with uploading the picture, apparel selection, and virtual trial room environment, and fabric size suggestion system is also provided. Different algorithms are used for this perspective. Algorithms made in Python language are also used. The application is developed on Android. Tests were also executed to check the appearance and interaction by using a virtual trial room. Overall, the application presented in this research seems to be a good solution for a fast and accurate try-on of clothing.

References

1. Cheung, C. M., & Lee, M. K. (2001). Trust in internet shopping: instrument development and validation through classical and modern approaches. Journal of Global Information Management (JGIM), 9(3), 23-35.
2. Corbitt, B. J., Thanasankit, T., & Yi, H. (2003). Trust and e-commerce: a study of consumer perceptions. Electronic commerce research and applications, 2(3), 203-215.
3. Dion, P., Easterling, D., & Miller, S. J. (1995). What is really necessary in successful buyer/seller relationships?. Industrial marketing management, 24(1), 1-9.
4. Kurniawati, A., Kusumaningsih, A., & Aliffio, Y. (2020). Clothing size recommender on real-time fitting simulation using skeleton tracking and rigging. Jurnal Teknologi dan Sistem Komputer, 8(2), 127-132.
5. al-Qerem, A. (2016). Virtual dressing room implementation using body image–clothe mapping. Int J Eng Comput Sci, 5(2), 15859-15862.
6. Blázquez, M. (2014). Fashion shopping in multichannel retail: The role of technology in enhancing the customer experience. International Journal of Electronic Commerce, 18(4), 97-116.
7. Ha, Y., & Stoel, L. (2004). Internet apparel shopping behaviors: the influence of general innovativeness. International Journal of Retail & Distribution Management, 32(8), 377-385.
8. Bhatnagar, A., Misra, S., & Rao, H. R. (2000). On risk, convenience, and Internet shopping behavior. Communications of the ACM, 43(11), 98-105.
9. McCorkle, D. E. (1990). The role of perceived risk in mail order catalog shopping. Journal of Direct Marketing, 4(4), 26-35.
10. Nguyen, T. T., Nguyen, C. M., Nguyen, D. T., Nguyen, D. T., & Nahavandi, S. (2019). Deep learning for deepfakes creation and detection. arXiv preprint arXiv:1909.11573, 1(2), 2.
11. Park, J., Lennon, S. J., & Stoel, L. (2005). On-line product presentation: Effects on mood, perceived risk, and purchase intention. Psychology & Marketing, 22(9), 695-719.
12. Min, F., Sang, N., & Wang, Z. (2010, August). Automatic face replacement in video based on 2d morphable model. In 2010 20th International Conference on Pattern Recognition (pp. 2250-2253). IEEE.
13. Leeraphong, A., & Mardjo, A. (2013). Trust and Risk in Purchase Intention through Online Social Network: A Focus Group Research of Facebook in Thailand. Journal of Economics, Business and Management, 1(4), 314-318.
14. Zhao, W. X., Li, S., He, Y., Chang, E. Y., Wen, J. R., & Li, X. (2015). Connecting social media to e-commerce: Cold-start product recommendation using microblogging information. IEEE Transactions on Knowledge and Data Engineering, 28(5), 1147-1159.
15. Bailey, A. A. (2005). Consumer awareness and use of product review websites. Journal of Interactive Advertising, 6(1), 68-81.
16. Liaw, C., & Chen, C. (2013). The impact of virtual fitting room technology on consumers' online purchase intention. Management and Administrative Sciences Review, 2(1), 23-35.