The Adoption of Virtual Fitting Rooms in Iranian Sportswear Industries: A Mixed-Methods Study Based on TAM Model

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ABSTRACT

Purpose: Virtual fitting rooms allow online sportswear consumers to try on clothes before shopping. This technology has recently received much attention due to its many benefits to sports consumers and commercial potential. Still, it has not yet entered Iran, and there is no information regarding its adoption by Iranian consumers. This research investigates the adoption of this technology by Iranian online sportswear consumers.

Methodology: This research is applied and developmental in terms of purpose and exploratory in terms of implementation method. In this research, a mixed method (quantitative, qualitative) has been used, in which the Delphi qualitative method precedes the quantitative method. In the qualitative phase, 20 experts in the sportswear industry were selected through snowball sampling. In the quantitative phase, a survey of 394 online shoppers of sportswear products was conducted on social networks. Structural equation modelling was used to test the hypotheses. SMART PLS and SPSS 23 software were used for data analysis.

Findings: The results supported the positive effect of the factors perceived ease of use, perceived usefulness, perceived enjoyment, and fashion leadership, as well as the negative impact of technology anxiety on adopting this technology. The results have practical implications for sports managers, retailers, and sportswear industries regarding adopting the best management and marketing strategies for virtual fitting rooms.

Originality: This study examines the innovation of virtual fitting room technology among Iranian sportswear consumers for the first time. Virtual fitting rooms play a significant role in saving time, energy, and money for sports consumers and protecting their privacy. Also, this technology is a fantastic promotional device for sports industries and retailers if Iranian sportswear consumers accept it.

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1. Introduction

Online sportswear industries have grown significantly compared to other sectors (Beck & Crié, 2018). Online shopping for sportswear has become one of the most essential activities of Internet users. After understanding their needs, consumers of sports products search online websites for information about their products or services. Many online shoppers of sports products feel satisfied with online shopping and find this method very convenient (Herrero-Crespo et al., 2022).

Despite the many advantages offered by online shopping of sports products compared to the traditional channels (such as time, number of choices, and price), it creates many limitations. One of the most important limitations is its inability to pay attention to the physical fitness of the clothes (Beck & Crié, 2018).

Therefore, the lack of fitness and the costs of returning inappropriate goods are among the most critical obstacles to online shopping. If sports consumers are confident that the apparel, they are shopping for fits them perfectly, they will probably purchase it. The retailers are not obliged to make incentives such as free shipping to solve the problem of returning apparel. Research shows that 30% of clothes sold online are returned; this should be taken seriously (Li, 2019).

If online sports retailers can provide sports consumers with trying the sportswear before shopping for them, their motivation to buy online will increase (Alvarez, 2017). The findings of (Walker Sands, 2015) show that if sportswear shoppers can try on products virtually instead of seeing their images, the probability of online shopping will increase by 35%. For this purpose, some companies and industries have offered virtual fitting rooms on their website to create a close relationship between reality and the shopping environment (Alvarez, 2017).

Through virtual fitting rooms, sports consumers can evaluate the clothes on their bodies without putting them on. These systems facilitate the decision-making process for the shoppers and enhance their shopping experience, or at least limit their choices before physical examination (Lee et al., 2021). Today, there is a variety of virtual systems used in sportswear industries. For example, the technology "Webcam Social Shopper" (WSS) is used in online shopping (Bonetti et al., 2018); "Virtual Dressing Rooms" are used in mobile shopping (Adikari et al., 2020), and the technology "Magic Mirror" is applied to in-store shopping (El-Shamandi Ahmed et al., 2023). In general, the performance of virtual dressing rooms is based on augmented reality (AR) technology, in which real data is applied to computer-generated garments (El-Shamandi Ahmed et al., 2023).

Nowadays, sportswear electronic services are expanding greatly in Iran. The rapid growth of the Internet in Iran has made the consumers of sports products gain more confidence in online shopping. In recent years, after the outbreak of Covid 19, Iranians have seen a 60% growth in online shopping (Rezaeinejad, 2021). According to the statistics, about twenty thousand online sports retail stores have been established in Tehran, the capital of Iran, in 2022 alone. The value of the business activities of these retailers reaches 17.4 billion dollars (Sharei & Zare, 2023). However, some problems are specific to this field. For example, the absence of virtual fitting rooms has caused a sharp decline in the potential growth of online sports retail sales in Iran (Keshkar et al., 2021).

In addition, one of the challenges faced by Iranian online retailers is providing sports consumers with appropriate solutions for clothing sizes and fitness (Najafi et al., 2020). Online sports retailers usually rely on sizing supplied by manufacturers and different sizing rules (Saurav, 2016). To buy sportswear, you can never count only on the sizing provided by the manufacturers and the relevant laws, and the consumers must see the appropriate clothing on their body and try its fit. To solve problems related to sizing, sports product retailers must observe two things: providing sizing with maximum accuracy and creating a good experience (Ishfaq et al., 2016). Some experts in this field refer to more flexible policies for returning sold items and refunding the cost in the store, as well as options for exchanging and replacing items as solutions to this problem. At the same time, many experts suggest investing in virtual fitting rooms as a solution (Ishfaq et al., 2016).

This research is trying to investigate the factors affecting the adoption of virtual fitting rooms in Iran when shopping for sportswear online. According to the technology acceptance model, this study examines the influence of the factors below on the adoption of virtual fitting room technology by online sportswear shoppers in Iran: perceived ease of use and perceived usefulness. In addition, this research examines the impact of two personality traits related and compatible with this technology, namely fashion leadership and technology anxiety, and the effect of perceived enjoyment on the acceptance of this technology.

2. Theoretical background

2.1. Virtual Fitting Rooms

Virtual fitting rooms are a modern technology in the sportswear industry that helps consumers improve their accuracy in shopping for sportswear by testing clothes virtually. In virtual appropriate room technology, the avatars are created for the users according to the measurements submitted in the simulation process. This technology was born in 2005. After 2010, many sportswear stores switched to this technology (Lee & Leonas, 2018).

As stated, one of the main factors of the public's reluctance to buy sportswear online is the unfitness of the clothes with the people. In addition, consumers like to personally try their favourite clothes on before shopping, ensure their fitness and check the differences in size (Vaccaro et al., 2018). The primary function of virtual fitting rooms is to ensure online shoppers of sportswear regarding size, fitness, colour, etc. (Zhao et al., 2021). Therefore, they provide conditions where online shoppers can see and choose the clothes they want in their desired design and size (Ishfaq et al., 2016).

According to Beck and Crié (2018), virtual fitting rooms arouse the curiosity of online shoppers about the product and increase the probability of their (online and offline) financial support and purchase intention. Moreover, this technology helps online shoppers save time because they no longer need to go to physical stores (Schnack et al., 2021). Also, research has shown that this technology reduces the probability of product returns because consumers can try the product before shopping online (Schnack et al., 2021).

The first step to using these technologies is for the user to enter his body measurements to produce an avatar (virtual body). The user can input his measurements in different

ways. For example, they can manually enter the size of various body parts, such as height, waist, upper body, lower body, and other measurements, so the system creates an avatar (Adikari et al., 2020). In some applications, it is enough for the user to take a full-length photo of his body and upload it to the application. In this way, consumers can try different products virtually and finally choose their desired product (Beck & Crié, 2018).

The use of advanced technologies in virtual fitting rooms creates concerns and worries for the users, as well as the advantages and benefits it offers. For instance, some kinds of this technology change 2D photos to make 3D avatars, which interfere with the measurements (Adikari et al., 2020). Besides, this technology can cause consumers' privacy concerns because, in some cases, they have to enter their photos or measurements into the system (Zhao et al., 2021). Moreover, some researchers have focused on the fact that entering the measurement in the system is time-consuming and have considered it a defect (Beck & Crié, 2018).

2.2. Technology Acceptance Model (TAM)

The technology acceptance model is taken from Fishbein and Ajzen's logical action theory (Alambeigi & Ahangari, 2016). Davis (1985) proposed this model. This model explains how external factors affect the behavioural decisions of online sports shoppers to use virtual fitting rooms. Perceived usefulness and perceived ease of use are the two key elements of the technology acceptance model influencing online consumers' behavioural decisions in virtual fitting rooms (Mohammadi & Ghysvandi, 2022). In this model, perceived usefulness refers to the subjective approach of online sports consumers to use virtual fitting rooms to improve performance; perceived ease of use points to the ease of using virtual fitting rooms. These factors affect sports consumers' adoption of this technology (Marangunić & Granić, 2015). Accordingly, I propose these two hypotheses:

- **Hypothesis 1:** Perceived usefulness affects the attitude of sportswear consumers towards adopting virtual fitting room technology.
- **Hypothesis 2:** Perceived ease of use affects sportswear consumers' attitudes towards adopting virtual fitting room technology.

According to Davis et al. (2006), perceived enjoyment can also be considered an internal factor affecting the acceptance of technologies. In other words, TAM operates through three factors affecting the attitude of sportswear consumers towards adopting virtual fitting rooms.

Perceived enjoyment is "how enjoyable the mere use of a particular system can be without considering any functional consequences of that system" (Köse et al., 2019). According to previous studies, intrinsic stimulations (such as pleasure and amusement) can influence consumers' attitudes towards technologies (Lee, 2018; Xu et al., 2016). Holdack et al. (2022) in their study about the role of perceived enjoyment in assessing the acceptance of AR wearables, stated that perceived enjoyment was very influential on the assessment of AR wearables by sports consumers. Also, Erra et al. (2018) concluded in their research that virtual fitting rooms cause pleasure and entertainment in consumers. Therefore, the following hypothesis is proposed in this context:

– **Hypothesis 3:** Perceived enjoyment affects the attitude of sportswear consumers towards adopting virtual fitting room technology.

2.3. Personality traits

2.3.1. Fashion leadership

Fashion leadership is concerned with the influence of fashionable topics on people. In other words, fashion affects people in two ways: 1- they are exposed to the fashions introduced in society and follow them, and 2- supporters influence the people and divert their attention towards them. Fashion leadership concerns these two issues (Kim-Vick & Hahn, 2012). The effect of fashion leadership on consumers' decisions about a product has been proved in previous studies (Cho & Workman, 2015; Haluk Koksal, 2014; Quelhas-Brito et al., 2020). Since a virtual fitting room provides virtual experiences related to online apparel shopping, fashion leadership may influence sports consumers' attitudes and decision-making processes. Therefore, the proposed hypotheses are as follows:

– **Hypothesis 4:** Fashion leadership affects (a) perceived ease of use, (b) perceived usefulness, and (c) perceived enjoyment of using virtual fitting rooms by sportswear consumers.
– **Hypothesis 5:** Fashion leadership affects the attitude of sportswear consumers towards adopting virtual fitting room technology.

2.3.2. Technology Anxiety

Technology anxiety is one of the essential factors for consumers turning to new technologies (Junsawang et al., 2020). Technology anxiety refers to "the anxiety and fear created in the people when using new technologies" (Wilson et al., 2023). This factor focuses on the mental characteristics of consumers concerning new technologies (Yang & Forney, 2013). According to previous research, technology anxiety has a negative effect on consumers' behaviour. Tsai et al. (2020) stated that technology anxiety has made users resist the application of wearable devices in their lives. According to Yang and Forney (2013) technology anxiety is a moderating factor concerning purchase intention through mobile phones. Since virtual fitting room technology is considered new and modern, technology anxiety can be regarded as an essential factor concerning sportswear consumers' acceptance of this technology. In other words, consumers with a high level of technology anxiety are not probably inclined to use virtual fitting rooms when shopping for sportswear. Therefore, the following hypotheses are proposed:

– **Hypothesis 6:** Technology anxiety affects (a) perceived ease of use, (b) perceived usefulness, and (c) perceived enjoyment of using virtual fitting rooms by sportswear consumers.
– **Hypothesis 7:** Technology anxiety affects the attitude of sportswear consumers towards adopting virtual fitting room technology.

2.4. Attitude towards the adoption of virtual fitting room technology

Attitude consists of cognitive, emotional, and behavioural components that show the degree of liking or disliking of a person towards a person, place, thing, event or social group and conducts the general evaluation of people about a specific goal. Attitude refers to a behaviour that expresses a positive or negative assessment of a behaviour. Attitude ultimately leads to the intention to accept technology (Svenningsson et al., 2022). Previous studies have investigated consumers' attitudes towards virtual fitting room technology (Lee et al., 2021). In this article, the researcher examines the effect of attitudes towards virtual fitting rooms on Iranian sportswear consumers' acceptance of this technology. Therefore, the following hypothesis is proposed:

- **Hypothesis 8:** Attitude towards the use of virtual fitting room technology affects the acceptance of this technology.

2.5. Theoretical framework

According to the literature and the proposed hypotheses, the theoretical framework of this research shows the relationship between sportswear consumers' intention to accept virtual fitting rooms and the variables mentioned in the introduction.
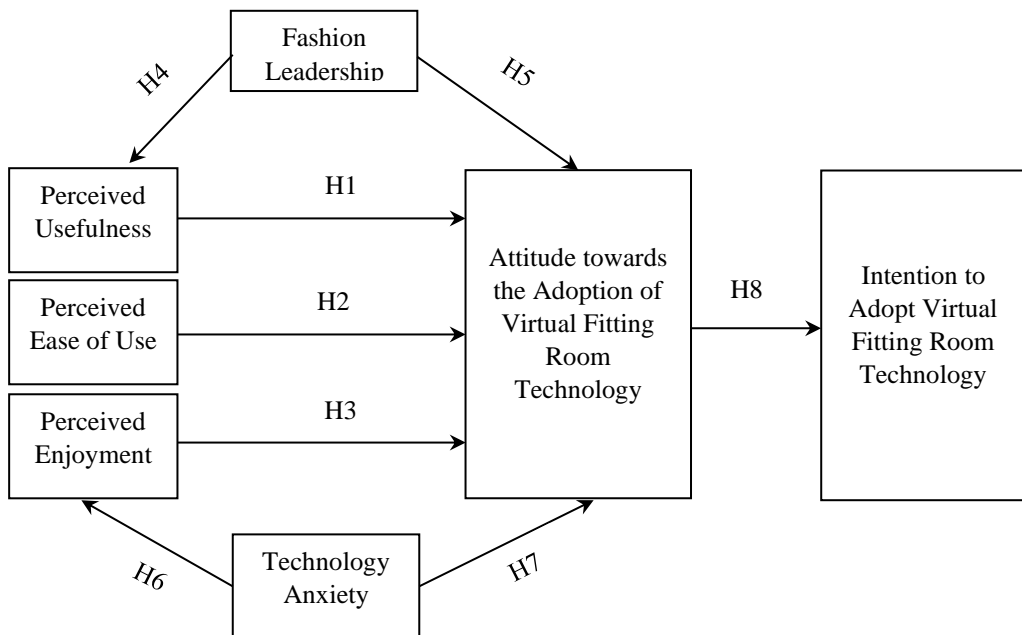

Figure 1. The theoretical framework.

3. Methodology

This is practical and developmental research in terms of purpose. A mixed method is used in this research, in which the Delphi qualitative method precedes the quantitative method.

The methodology approach is exploratory and is based on structural equations where SMART PLS software is used to design the model of factors affecting the adoption of virtual fitting room technology in sportswear stores.

3.1. Delphi method

The Delphi method was used to examine the views of the experts regarding the factors affecting the adoption of virtual fitting room technology in sportswear stores. Twenty experts in the field of sportswear industries were selected as the Delphi panel through snowball sampling. The Delphi panel consisted of all the professors, specialists and sellers with the entry indicators of having at least a master's degree and a minimum of 10 years of experience in the field of sportswear industries.

The questions of the first questionnaire, which we intended to change using the Delphi method, were extracted from library studies and research literature. Thirty-one indicators were removed, as shown in Table 1. The opinions of the experts have been collected with a 9-point Likert scale.

Table 1. Symbolization of open codes in the Delphi technique.

Symbol	Extracted code
Q1	I think virtual fitting rooms help me to be more effective in society.
Q2	I think virtual fitting rooms help me save time.
Q3	Virtual fitting rooms help me achieve my goals faster through fewer steps.
Q4	I think virtual fitting rooms help me be more productive.
Q5	I think virtual fitting rooms make it easier for me to achieve my goals.
Q6	I think virtual fitting rooms can be accessible very easily.
Q7	I think I can quickly learn how to use this technology.
Q8	I think I can easily use this technology.
Q9	I think I can easily remember the process of using this technology.
Q10	I think using this technology gives me a sense of happiness.
Q11	I think using this technology gives me a sense of peace.
Q12	I think using this technology gives me a sense of satisfaction.
Q13	I think using this technology gives me a sense of hope.
Q14	I do not feel tired at all while using this technology.
Q15	I am aware of the new technologies available in the apparel industry, and I want to be one of the first to use these technologies.
Q16	I am one of the pioneers in using new technologies, which is why they call me fashionable.
Q17	I need to be fashionable.
Q18	I am usually one of the first to be aware of the latest developments in the sportswear industry.
Q19	I fear I will lose considerable information by misusing a new technology.
Q20	I hesitate to use new technologies, fearing I might make mistakes I cannot correct.
Q21	Using a new technology worries me.
Q22	The thought of trying to use a new technology makes me nervous.
Q23	I think I like this technology.
Q24	I think I will have a positive reaction to this technology.
Q25	I think I will have a positive feeling about this technology.
Q26	I think This technology will absorb me.
Q27	I think it can be my favourite technology.
Q28	If I can access the Virtual Fitting Room, I will use it.

Symbol	Extracted code
Q29	I will probably use it if I can access the Virtual Fitting Room.
Q30	If I have access to this technology, I will not use it.
Q31	I have a strong desire to use this technology.

3.1.1. The first round of the Delphi technique

The opinions of 20 experts about each indicator are shown in Table 2.

Table 2. The first round of Delphi.

Questions	Responses	Non-responses	Mean	Middle	Mode	S.D	Variation range	Result
Q1	20	0	8.2	8	8	0.615	2	Confirmed
Q2	20	0	8.25	8	8	0.550	2	Confirmed
Q3	20	0	8.1	8	8	0.788	3	Confirmed
Q4	20	0	7	6	7	0.553	3	Confirmed
Q5	20	0	7.45	8	8	0.944	3	Confirmed
Q6	20	0	7.1	7	6	1.02	3	Confirmed
Q7	20	0	7.15	7	7	1.039	4	Confirmed
Q8	20	0	7.7	7	7	0.864	4	Confirmed
Q9	20	0	7.1	7	6	0.744	4	Confirmed
Q10	20	0	8	8	8	0.858	3	Confirmed
Q11	20	0	7.65	8	7	0.670	2	Confirmed
Q12	20	0	7.6	8	8	0.940	4	Confirmed
Q13	20	0	8.25	8	8	0.638	2	Confirmed
Q14	20	0	7.9	8	8	0.788	3	Confirmed
Q15	20	0	7.8	8	8	0.695	3	Confirmed
Q16	20	0	8.15	8	8	0.489	2	Confirmed
Q17	20	0	7.3	7	7	0.801	3	Confirmed
Q18	20	0	7.9	8	8	0.718	3	Confirmed
Q19	20	0	7.35	7	8	1.05	4	Confirmed
Q20	20	0	7.3	7.5	8	0.923	3	Confirmed
Q21	20	0	8.20	8	8	0.695	3	Confirmed
Q22	20	0	7.9	8	8	0.788	2	Confirmed
Q23	20	0	7.35	7	8	1.05	4	Confirmed
Q24	20	0	7.8	8	8	0.695	3	Confirmed
Q25	20	0	7.15	7	7	1.039	4	Confirmed
Q26	20	0	7.3	7.5	8	0.923	3	Confirmed
Q27	20	0	4.7	6	4.5	0.553	3	Rejected
Q28	20	0	8.25	8	8	0.638	2	Confirmed
Q29	20	0	8.2	8	8	0.615	2	Confirmed
Q30	20	0	4.8	7	4	0.744	4	Rejected
Q31	20	0	7	6	7	0.553	3	Confirmed

Any measure whose mean and mode are less than five is removed. In the first round, two values were removed based on the calculated values (27 and 30).

3.1.2. The second round of Delphi

Delphi analysis continued for the factors identified in the second round. The criteria were based on the opinions of 20 experts in the second round of Delphi. The results of Delphi in the second round are reported in Table 3.

Table 3. The second round of Delphi.

Questions	Responses	Non-responses	Mean	Middle	Mode	S.D	Variation range	Result
Q1	20	0	8.7	8	8	0.615	2	Confirmed
Q2	20	0	8.1	8	8	0.550	2	Confirmed
Q3	20	0	8.25	8	8	0.788	3	Confirmed
Q4	20	0	8.05	8	7	0.670	2	Confirmed
Q5	20	0	8.3	8	8	0.944	3	Confirmed
Q6	20	0	8.15	7	6	1.02	3	Confirmed
Q7	20	0	8.35	7	7	1.039	4	Confirmed
Q8	20	0	8.45	7	7	0.864	4	Confirmed
Q9	20	0	8.5	7	8	1.05	4	Confirmed
Q10	20	0	8.30	8	8	0.858	3	Confirmed
Q11	20	0	8.2	8	8	0.940	4	Confirmed
Q12	20	0	8.35	8	8	0.638	2	Confirmed
Q13	20	0	8.45	8	8	0.788	3	Confirmed
Q14	20	0	8.35	8	8	0.695	3	Confirmed
Q15	20	0	8.3	8	8	0.489	2	Confirmed
Q16	20	0	8.3	7	7	0.801	3	Confirmed
Q17	20	0	8.33	8	8	0.718	3	Confirmed
Q18	20	0	8.4	7.5	8	0.923	3	Confirmed
Q19	20	0	8.7	8	8	0.695	3	Confirmed
Q20	20	0	8.1	8	8	0.788	2	Confirmed
Q21	20	0	7.15	7	7	1.039	4	Confirmed
Q22	20	0	7.9	8	8	0.718	3	Confirmed
Q23	20	0	8.1	8	8	0.788	3	Confirmed
Q24	20	0	7.9	8	8	0.788	3	Confirmed
Q25	20	0	7.45	8	8	0.944	3	Confirmed
Q26	20	0	7.1	7	6	1.02	3	Confirmed
Q27	20	0	7.15	7	7	1.039	4	Confirmed
Q28	20	0	7.7	7	7	0.864	4	Confirmed
Q29	20	0	7.35	7	8	1.05	4	Confirmed

3.1.3. The end of the Delphi technique rounds

In the second round, no questions were omitted, which is a sign of the end of the Delphi rounds. In general, an approach to the end of Delphi is to compare the average scores of the last two rounds of questions. The survey process will be stopped if the difference between the two stages of the very low threshold is smaller than 2.

Table 4. The difference between the results of the first and second round.

	The result of the first round	The result of the second round	Difference	Result
Q1	8.2	8.7	0.5	Confirmed
Q2	8.25	8.1	0.15	Confirmed
Q3	8.1	8.25	0.15	Confirmed
Q4	7	8.05	1.05	Confirmed
Q5	7.45	8.3	0.85	Confirmed
Q6	7.1	8.15	1.05	Confirmed
Q7	7.15	8.35	1.25	Confirmed
Q8	7.7	8.45	0.75	Confirmed
Q9	7.1	8.5	1.4	Confirmed
Q10	8	8.30	0.3	Confirmed
Q11	7.65	8.2	0.55	Confirmed
Q12	7.6	8.35	0.75	Confirmed
Q13	8.25	8.45	0.20	Confirmed
Q14	7.9	8.35	0.45	Confirmed
Q15	7.8	8.3	0.50	Confirmed
Q16	8.15	8.3	0.15	Confirmed
Q17	7.3	8.33	1.03	Confirmed
Q18	7.9	8.4	0.5	Confirmed
Q19	7.35	8.7	1.35	Confirmed
Q20	7.3	8.1	1.05	Confirmed
Q21	8.20	7.15	1.05	Confirmed
Q22	7.9	7.9	0	Confirmed
Q23	7.35	8.1	0.75	Confirmed
Q24	7.8	7.9	0.1	Confirmed
Q25	7.15	7.45	0.3	Confirmed
Q26	7.3	7.1	0.2	Confirmed
Q27	8.25	7.15	1.1	Confirmed
Q28	8.2	7.7	0.50	Confirmed
Q29	7	7.35	0.35	Confirmed

Based on the results listed in Table 4, it was determined that the difference is less than 2 in all cases so that the Delphi rounds can be completed. Kendall's consensus coefficient was used to calculate the agreement of the experts.

Table 5. Kendall's coefficient of agreement (research data source).

	Number of indicators	Number of experts	Kendall coefficient	Degree of freedom	Significance value
First round	29	20	0.860	19	0.001
Second round	29	20	0.887	19	0.001

Based on the results of Table 5, the value of Kendall's coefficient in the first round of the Delphi technique is 0.860, which shows that the consensus among the experts is moderate. Also, a significant value of 0.001 has been obtained, which shows that the obtained results can be trusted with 95% confidence. As a result, ignoring the indicators that scored below 0.7, other indicators have been used in the second round. The Kendall coefficient in the second round was 0.887, which shows that the consensus among the

experts is good. Also, a significant value of 0.001 has been obtained, showing that the results can be trusted with 95% confidence. Also, the average scores of all the items are around 0.7, which shows that the views are close to each other. Therefore, the Delphi technique was stopped, and the identified indicators were used for the final analysis.

3.2. Quantitative phase

The current research is based on the online buyers of sportswear in Shiraz. The convenience sampling method was used to collect data from the respondents. After identifying the telegram channels of sportswear stores in Shiraz, the respondents were randomly selected to fill out the questionnaires from each channel. Since the target population in this study were the people who were members of the telegram channels of sportswear stores, the questionnaires were distributed through messages in Telegram channels. Questionnaires were designed online using Google Forms, and a 5-point Likert scale was used to collect data. The participants were assured that all their answers would remain confidential and anonymous. At the end of the data collection period, 420 questionnaires were collected, of which 26 questionnaires were removed due to incompleteness or non-response of users to all questions. This means that 394 complete questionnaires were used for data analysis. The information related to the questionnaires used in this research is given in Table 6. Finally, the Excel file was downloaded and transferred to SPSS software. The opinions of the experts and university professors and convergent validity were used to confirm the validity of the questionnaire. Cronbach's alpha and composite reliability were used to check the reliability of the questionnaire, both of which confirmed the high reliability of the instrument.

Table 6. Convergent validity and reliability of research variables.

Variable	Number of questions	Rho	CR	AVE	Cronbach's alpha
Perceived usefulness	5	0.874	0.919	0.791	0.867
Perceived ease of use	4	0.921	0.938	0.792	0.913
Perceived enjoyment	5	0.913	0.930	0.770	0.897
Fashion leadership	4	0.921	0.934	0.742	0.910
Technology anxiety	4	0.911	0.930	0.770	0.896
Adoption Intention	3	0.955	0.965	0.847	0.955
Attitude towards the virtual fitting room	4	0.900	0.930	0.769	0.900

SMART PLS and SPSS 23 software were used for data analysis. Structural equation modelling was used to test hypotheses and evaluate the overall fit of the research model.

4. Results

The results of the respondents' demographic statistics in terms of gender, age, and education are presented in Table 7.

Table 7. Demographic profile of the sample.

Gender	F.	P.	Age	F.	P.	education	F.	P.
			20<	19	4.8	High school	16	4
Female	158	40.8	20-25	68	17.2	Diploma	70	17.6
Male	236	59.2	25-30	264	66.9	Bachelor	166	42
			>30	43	11.1	Masters	97	24.4
						PhD	45	12

Getting sure about the correctness of the variables measurement model is the first step before testing the hypotheses and the conceptual model of the research. Therefore, confirmatory factor analysis was used to put the measurement models of the variables in order. As one of the oldest statistical methods, confirmatory factor analysis investigates the relationship between latent and observed variables (questions) and represents the measurement model. The factor analysis results (Table 8) indicated that all the measurement models are suitable, and all the numbers and parameters of the model are significant.

Table 8. Results of Factor Loadings.

Latent variable	Questions	Factor Load	P value
	Q1	0.936	0.0001
	Q2	0.933	0.0001
Perceived usefulness	Q3	0.938	0.0001
	Q4	0.893	0.0001
	Q5	0.901	0.0001
	Q6	0.837	0.0001
Perceived ease of use	Q7	0.912	0.0001
	Q8	0.932	0.0001
	Q9	0.916	0.0001
	Q10	0.684	0.0001
	Q11	0.929	0.0001
Perceived enjoyment	Q12	0.937	0.0001
	Q13	0.923	0.0001
	Q14	0.699	0.0001
	Q15	0.898	0.0001
Fashion Leadership	Q16	0.874	0.0001
	Q17	0.896	0.0001
	Q18	0.893	0.0001
	Q19	0.873	0.0001
Technology anxiety	Q20	0.873	0.0001
	Q21	0.891	0.0001
	Q22	0.872	0.0001
	Q23	0.921	0.0001
Adoption Intention	Q24	0.834	0.0001
	Q25	0.911	0.0001
	Q26	0.922	0.0001
Attitude towards the virtual fitting room	Q27	0.934	0.0001
	Q28	0.923	0.0001
	Q29	0.712	0.0001

As shown in Table 8, all the values of the metrics related to the variables are higher than 0.5. Therefore, it can be said that the measurement models of all variables are suitable, and all the numbers and parameters of the model are meaningful.

Table 9. Descriptive analysis of research variables.

Variable	Kurtosis	Skewness	S.D	Mean
Perceived usefulness	0.257	-0.953	0.66	3.76
Perceived ease of use	0.803	-0.013	0.69	3.39
Perceived enjoyment	0.744	-0.120	0.74	4.09
Fashion leadership	0.963	-0.132	0.67	3.98
Technology anxiety	1.062	0.094	0.71	4.14
Adoption intention	0.791	-0.014	0.62	4.17
Attitude towards the virtual fitting room	0.921	-0.084	0.81	3.35

Based on the descriptive statistics of the research variables, the perceived usefulness variable averages 4.46. The variance of this variable is 0.56. Considering that the skewness and Kurtosis of the research variables are between 2 and -2, it can be said that the research variables have a normal distribution.

Table 10. Variance inflation factor (VIF).

Variable	VIF
Perceived usefulness	1.950
Perceived ease of use	1.702
Perceived enjoyment	1.652
Fashion leadership	1.471
Technology anxiety	1.535
Adoption intention	1.867
Attitude towards the virtual fitting room	1.334

According to the results of Table 10, the VIF value of the research components is less than 3. Therefore, the research components are not linear.
The following relations are established:

CR>0.7
CR>AVE
AVE>0.5

To undertake the measurement of discriminant validity, it was suggested to measure two standards: the Fornell–Larker principle and the Heterotrait–Monotrait ratio (HTMT). As shown in Table 11, the Fornell–Larker principle has verified the obligations as all the AVEs and their square roots are more than its correlations with other models.

Table 11. Fornell–Larker Scale.

	Perceived usefulness	Perceived ease of use	Perceived enjoyment	Fashion leadership	Technology anxiety	Adoption Intention	Attitude towards the virtual fitting room
Perceived usefulness	0.890						
Perceived ease of use	0.731	0.890					
Perceived enjoyment	0.793	0.810	0.878				
Fashion leadership	0.681	0.780	0.777	0.861			
Technology anxiety	0.685	0.474	0.580	0.567	0.878		
Adoption intention	0.516	0.700	0.409	0.701	0.762	0.920	
Attitude towards the virtual fitting room	-0.522	-0.468	-0.627	-0.620	-0.629	-0.562	0.877

In Table 12, the HTMT ratio outcomes are shown, illustrating that the threshold value of 0.9 is still above the value of every construct, leading to the establishment of the HTMT ratio. These findings help to know the discriminant validity. The results of the assessment show that there were no problems with the validity and reliability faced during the measurement model's evaluation. Thus, to use the collected data more productively, the structural model can be judged.

Table 12. Heterotrait–Monotrait Ratio (HTMT).

	Perceived usefulness	Perceived ease of use	Perceived enjoyment	Fashion leadership	Technology anxiety	Adoption Intention	Attitude towards the virtual fitting room
Perceived usefulness							
Perceived ease of use	0.722						
Perceived enjoyment	0.645	0.823					
Fashion leadership	0.579	0.725	0.677				
Technology anxiety	0.458	0.558	0.574	0.781			
Adoption intention	0.613	0.771	0.750	0.590	0.671		
Attitude towards the virtual fitting room	0.538	0.740	0.631	0.626	0.351	0.703	

According to Table 12, the value of the obtained numbers is less than 0.9, so discriminant validity is established.

According to the mentioned issues regarding the analysis of the measurement model, all the investigated indicators have the necessary qualifications and therefore, the model proposed in this research has sufficient predictive power. After analysing the measurement model, the research hypotheses will be examined.
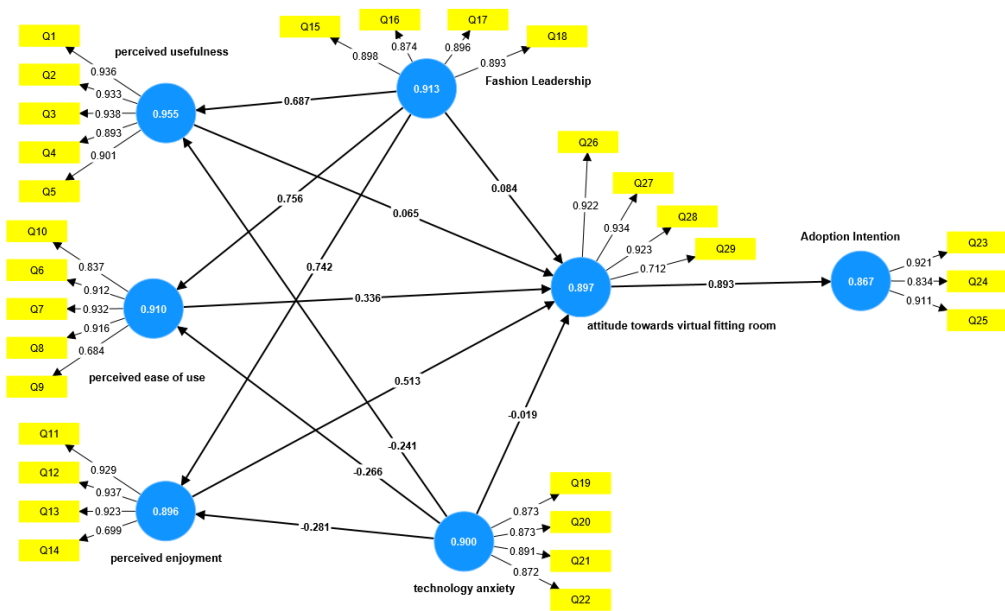
Figure 2. Path coefficients of the General Research Model.
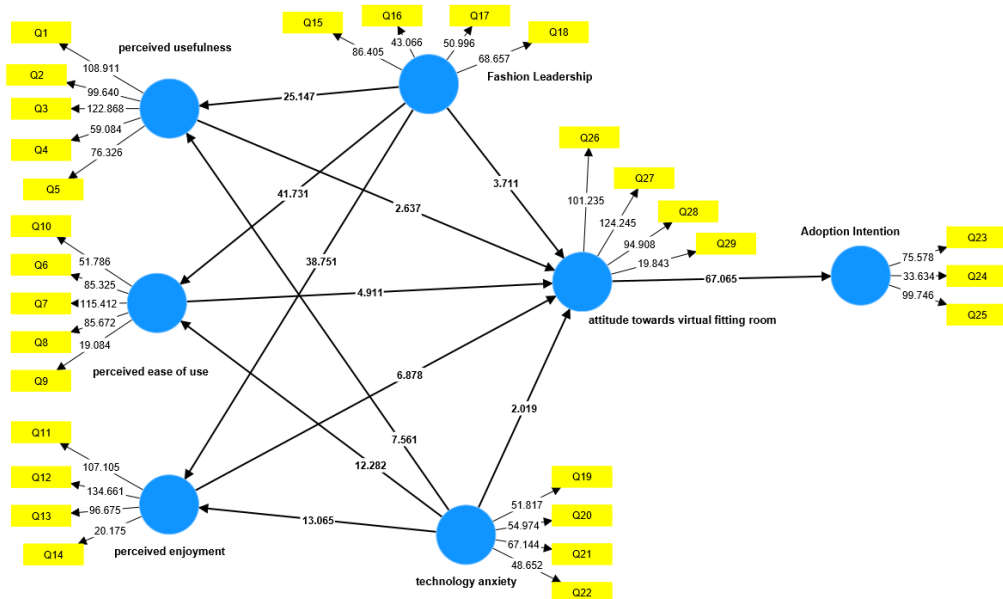

Figure 3. The t-Statistic of the General Research Model.

As can be seen in Figures 2 and 3, considering the path coefficient of 0.065 and the t-statistic of 2.637, it can be said that the t-statistic is more significant than 2.57, at the confidence level of 99%, the positive and significant effect of perceived usefulness on the

attitude towards virtual fitting room technology is supported. According to the path coefficient of 0.336 and the t-statistic of 4.911, it can be said: Considering that the t-statistic is more than 2.57, at the confidence level of 99%, the positive and significant effect of perceived ease of use on the attitude towards this technology is supported. According to the path coefficient of 0.513 and the t-statistic of 6.878, it can be said considering that the t-statistic is more than 2.57, at the confidence level of 99%, the positive and significant effect of perceived enjoyment on the attitude towards virtual fitting room technology is supported.

According to the path coefficients of 0.687, 0.756, 0.742, 0.084 and also the t-statistics of 25.147, 41.731, 38.751 and 3.711, it can be said considering that all the t-statistics are more than 2.57, at the confidence level of 99%, the positive and significant effect of fashion leadership on the three elements of technology acceptance model and also the attitude towards virtual fitting room technology is supported. According to the path coefficients of -0.241, -0.266, -0.281, -0.019 and also the t-statistics of 7.561, 12.282, 13.065 and 2.019, it can be said considering that all the t-statistics are more than 2.57, at the confidence level of 99%, the significant and negative effect of technology anxiety on the three elements of technology acceptance model and also attitude towards virtual fitting room technology is supported. According to the path coefficient of 0.893 and also the t-statistic with a value of 67.065, it can be said: Considering that the t-statistic is more significant than 2.57, at the confidence level of 99%, attitude towards virtual fitting room technology has a positive and significant effect on the acceptance of this technology.

It can be concluded that all the proposed hypotheses are supported. The description of the model based on the hypotheses is shown in Table 13.

Table 13. Path coefficients, t-statistics and coefficient of determination.

Hypothesis	The effect of the variable...	On the variable …	Path Coefficient (β)	T statistics	Result
1	Perceived usefulness	attitude towards the virtual fitting room	0.065	2.637	Supported
2	Perceived ease of use	attitude towards the virtual fitting room	0.336	4.911	Supported
3	Perceived enjoyment	attitude towards the virtual fitting room	0.513	6.878	Supported
4	Fashion leadership	Perceived usefulness	0.687	25.147	Supported
5	Fashion leadership	Perceived ease of use	0.756	41.731	Supported
6	Fashion leadership	Perceived enjoyment	0.742	38.751	Supported
7	Fashion leadership	attitude towards the virtual fitting room	0.084	3.711	Supported
8	Technology anxiety	Perceived usefulness	-0.241	7.561	Supported
9	Technology anxiety	Perceived ease of use	-0.266	12.282	Supported
10	Technology anxiety	Perceived enjoyment	-0.281	13.065	Supported

Hypothesis	The effect of the variable...	On the variable …	Path Coefficient (β)	T statistics	Result
11	Technology anxiety	attitude towards the virtual fitting room	-0.019	2.019	Supported
12	Attitude towards the virtual fitting room	Adoption Intention	0.893	67.065	Supported

5. Managerial implications

Sports managers should take the necessary measures to set up virtual fitting rooms in sportswear stores and deliver the information required to sports online retailers to motivate them to use this technology. Also, sportswear industries can use virtual fitting rooms to advertise and promote sports products. Despite the great benefits of virtual fitting rooms for sports consumers, there is still the possibility of damage to consumers' privacy. Therefore, those in charge should reduce these risks as much as possible and warn about them.

6. Discussion and conclusion

The purpose of this research is to see what factors affected the adoption of virtual fitting room technology by online consumers of sports products and led to the following results:

The results demonstrated that perceived usefulness positively and significantly affected the consumers' attitude towards virtual fitting rooms. It is consistent with the results of (Noordin et al., 2017). Virtual fitting rooms improve consumers' shopping experience in the online environment. It leads to adopting this technology, provided they consider it helpful. Perceived usefulness includes values such as effectuality, fitness, colouring, and composition. The main benefit of this technology is the ability to provide opportunities for consumers to try different combinations of clothing. Sportswear retailers can upload different types and designs of clothing in this system and provide various services to shoppers and provide them with more information regarding the products.

Based on the research findings, the significant effect of perceived ease of use on the attitude of sportswear consumers towards virtual fitting rooms is undeniable. Most of the participants took it as granted that learning the process of using this technology was easy. (Perry et al., 2019) achieved similar results in their research. They considered this factor to be an essential factor for attitudes towards virtual fitting rooms.

The results show that the attitude of sportswear consumers towards virtual fitting rooms was significantly affected by perceived enjoyment. This indicates that if consumers enjoy using virtual fitting rooms, they will have a positive and meaningful attitude towards this technology. It is consistent with (Boardman & McCormick, 2022) who stated that if consumers consider online shopping enjoyable, they will participate in the process to a large extent.

The results show that all three elements of the technology acceptance model in this study, as well as the participants' attitudes towards virtual fitting rooms, were significantly affected by fashion leadership. Fashion leadership plays a moderating role in this respect. It means that if providing virtual fitting rooms is easy, valuable and enjoyable for the

consumers of sports products, fashion leadership will have a more significant impact on them and attract them to this technology. Shephard et al. (2014) stated that perceived enjoyment was more effective on the consumers' attitude with a low level of fashion leadership. In the same way, for consumers not so willing to buy fashion, enjoyment can be considered a determining criterion. On the other hand, in consumers with a high interest in fashion, perceived ease of use was more effective in adopting this technology.

According to the findings, all three elements of the technology acceptance model in this study and the participants' attitudes towards virtual fitting rooms were negatively and significantly affected by technology anxiety. In other words, if technology anxiety increases, the three elements of the technology acceptance model and the attitude toward this technology decrease meaningfully. It is consistent with the findings of (Li & Xu, 2020). They stated in their research that lower levels of technology anxiety caused consumers to enjoy more of the technology and have a better attitude towards it. Also, it positively affects perceived usefulness and ease of use. They stated that sportswear retailers and industries should have a serious strategy to face technology anxiety and pay special attention to this issue. For example, online sportswear retailers can offer instructional videos to consumers to relieve their technology anxiety. Kim et al. (2017) stated that perceived enjoyment had the most significant effect on the attitude of consumers with more technology anxiety, while perceived ease of use was more effective on the attitude of consumers with less technology anxiety.

This research investigated the adoption drivers of virtual fitting room technology in Iranian online sportswear consumers. The findings supported the idea that personality traits play a significant role in the attitude towards this technology and its acceptance. In all, the elements of the technology acceptance model should be taken seriously. Sportswear consumers will probably select this technology if they consider it easy to use, valuable, and enjoyable.

The more the consumers follow the fashions, the better their perception of enjoyment, usefulness, ease of use, and attitude towards this technology. Besides, the more anxious the consumers regarding this technology, the less positive their attitude towards it, and the worse their perception of enjoyment, usefulness, and ease of use.

This research showed the positive attitude of Iranian sports consumers towards adopting virtual fitting room technology. Also, this research presented a theoretical model for Iranian sportswear consumers' adoption of this technology. Future researchers can refer to this study to investigate the decisions of shoppers and sellers regarding the adoption of other technologies.

Generally, according to the findings, Iranian sportswear consumers have positive perceptions and attitudes towards using virtual fitting rooms. Therefore, this technology can be used as a marketing strategy to attract consumers.

Limitations and suggestions for further studies

As a limitation of this study, the Iranian sportswear sellers often do not use virtual fitting rooms or have any information in this field, so their idea about this technology may be somewhat imaginary. Second, Lazar et al. (2020) mentioned external variables as

influencing factors. These variables include system qualities, instructions provided, teaching, the involvement level of the users, and the way this technology is to be implemented (Lazar et al., 2020). Therefore, future research can focus on these factors. Thirdly, examining demographic variables such as gender, age, education, income, etc., can add more comprehensive results to the relevant literature. Fourthly, looking at other psychological variables can provide the possibility of a more complex and detailed examination.

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پذیرش فناوری اتاق پرو مجازی در صنایع پوشاک ورزشی ایران: مطالعه ترکیبی بر اساس مدل TAM

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چکیده

هدف: اتاق‌های پرو مجازی این امکان را برای مصرف‌کنندگان آنلاین پوشاک ورزشی فراهم می‌آورند تا قبل از خرید پوشاک، آن‌را به صورت مجازی پرو کنند. این فناوری اخیراً به دلیل منافع بسیار زیادی که برای مصرف‌کنندگان به ارمغان می‌آورد و همچنین پتانسیل تجاری آن بسیار مورد توجه قرار گرفته است، اما هنوز وارد ایران نشده است و در ارتباط با پذیرش آن توسط مصرف‌کنندگان ایرانی اطلاعاتی در دست نیست. هدف این تحقیق بررسی پذیرش این فناوری توسط مصرف‌کنندگان آنلاین پوشاک ورزشی در ایران می‌باشد.

روش: این تحقیق از نظر هدف کاربردی و توسعه‌ای است و از نظر شیوه اجرا اکتشافی می‌باشد. در این تحقیق از روش ترکیبی (کمی، کیفی) استفاده شده است که در آن روش کیفی دلفی بر روش کمی مقدم است. در مرحله کیفی، ۲۰ نفر از طریق تکنیک گلوله برفی به عنوان افراد خبره در صنعت پوشاک ورزشی انتخاب شدند. در مرحله کمی، نظرسنجی از ۳۹۴ خریدار آنلاین محصولات پوشاک ورزشی در شبکه‌های اجتماعی انجام شد. برای آزمون فرضیه‌ها از مدل‌سازی معادلات ساختاری استفاده گردید. برای تجزیه و تحلیل داده‌ها از نرم‌افزارهای SMART PLS و SPSS 23 استفاده گردید.

یافته‌ها: نتایج حاکی از تأثیر مثبت عوامل آسانی استفاده درک‌شده، مفیدی درک‌شده، لذت درک‌شده و رهبری مد و همچنین تأثیر منفی اضطراب فناوری بر پذیرش این فناوری بود. نتایج، دارای پیامدهای عملی برای مدیران ورزشی و خرده‌فروشان و همچنین صنایع پوشاک ورزشی در خصوص اتخاذ بهترین استراتژی‌های مدیریت و بازاریابی برای استفاده از اتاق‌های پرو مجازی می‌باشد.

اصالت و ابتکار مقاله: این پژوهش برای اولین بار به بررسی نوآوری فناوری اتاق‌های پرو مجازی در میان مصرف‌کنندگان پوشاک ورزشی در ایران می‌پردازد. اتاق‌های پرو مجازی نقش بسزایی در صرفه‌جویی در زمان، انرژی و هزینه مصرف‌کنندگان ورزشی داشته و همچنین از حریم خصوصی آنها محافظت می‌کنند. همچنین این فناوری در صورتی که مورد قبول مصرف‌کنندگان پوشاک ورزشی در ایران واقع شود، یک وسیله تبلیغاتی عالی برای صنایع ورزشی و خرده‌فروشان در این عرصه می‌باشد.

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