2021

Examining True Fit® Technology Using Adapted TAM Model.pdf

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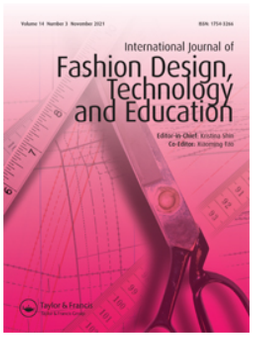

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International Journal of Fashion Design, Technology and Education

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tfdt20

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To cite this article: Sanjukta Pookulangara, Jacqueline Parr, Tammy Kinley & Bharath M. Josiam (2021) Online sizing: examining True Fit® technology using adapted TAM model, International Journal of Fashion Design, Technology and Education, 14:3, 348-357, DOI: 10.1080/17543266.2021.1950847

To link to this article: https://doi.org/10.1080/17543266.2021.1950847

INTERNATIONAL JOURNAL OF FASHION DESIGN, TECHNOLOGY AND EDUCATION
2021, VOL. 14, NO. 3, 348–357
https://doi.org/10.1080/17543266.2021.1950847

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Online sizing: examining True Fit® technology using adapted TAM model

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ABSTRACT

Retail fashion is the fastest growing e-commerce sector; however, the industry is facing a serious issue with returns for purchases made online. Retailers are slowly but surely embracing new online tools to help consumers make smarter fit decisions. The current study investigates the influence that online sizing technology, True Fit®, has on consumer confidence while making sizing decisions online and eventual intention to use True Fit®. The study uses an adapted Technology Acceptance Model and includes the following variables: perceived ease of use of using True Fit®, perceived usefulness of using True Fit®; convenience of using True Fit®, and intention to use True Fit®. Data were collected via an online survey ($n = 577$). Data were analysed using descriptive statistics, factor analysis and Structural Equation Modelling, all the hypotheses were supported. The paper adds insights into the subject of online sizing and provides recommendations for future studies.

ARTICLE HISTORY
Received 29 April 2021
Accepted 19 June 2021

KEYWORDS
Fit-technology; sizing; online purchase; True-Fit®

Introduction

Retail fashion is the fastest growing e-commerce sector with online apparel, footwear and accessories currently valued at $759.5 billion with a 7.18% compounded annual growth rate for the next five years (Orendorff, 2021). However, the retail industry is facing a growing concern with consumer returns. According to National Retail Foundation, consumers returned around $428 billion in merchandise in 2020, representing 10.6% of total retail sales, off which apparel was 12.2%, the second highest category after auto parts (Inman, 2021). Consumers partake in 'bracketing' which is when people buy multiples of the same item with the intent to return some, and in 2020 this practice was reported by 62% of consumers, representing 50% year-over-year increase, with sizing being the number one issue (Petro, 2021; Sizing Issue, 2019). Unfortunately, most retailers are not connecting fit and fit-related issues to their bottom line, especially how it impacts consumer trust and potential future purchases (Luzon, 2019). Additionally, due to COVID-19, consumers are hesitant to venture in physical fitting rooms, and there is a growing demand for online fitting tools (Dopson, 2021). Hence it is critical to examine, how fit technologies are being adopted by consumers, especially since correct fit is critical for both shoppers and retailers.

Sizing Standards were created in the United States before the 1940s and represented about 8% of the total U.S. population at the time (Petro, 2016). Recently, the problem of sizing is exacerbated by (1) changing demographics; (2) brands using data to tailor their fit to who *they* think are their target consumer; and (3) using generic size tables (Kapner, 2019). Two large-scale studies, SizeUSA in 2003 and Human Solutions of North America Inc in 2019 found that consumers have a hard time figuring out their size and this issue is intensified while shopping online. Thus, it can be stated with certainty that by addressing the different size variations among garments, retailers would be able to retain more profit from the consumers purchase by reducing return rates and increasing their confidence in the garment fit itself. Therefore, it is important to investigate how 'apparel sizing and fit technology' (ASFT) is being utilised by retailers and influence of such technology on consumer's purchase intention.

Currently, there is a paucity of empirical research that investigates how ASFT is influencing consumer's intention to use the technology and its eventual impact on purchase intention. Previous studies have conducted a content analysis resulting in formulation of best practice for the utilisation of fit and sizing technology (Miell, Gill, & Vazquez, 2018); whole body scanning as a tool for clothing sizing (Grogan et al., 2020); developing a fuzzy logic approach in children clothing selection (Saaludin, Saad, & Mason, 2020); and identifying common issues among commercial body size charts and propose

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a sizing improvement methodology (Pei, Park, Ashdown, & Vuruskan, 2017). Given the importance of ASFT to consumer's path-to-purchase online, it is critical to examine consumer perceptions with regards to use of such technology; thus, this current study investigates the influence that online sizing technology, True Fit® (TF®), has on consumer confidence in their online sizing selection and its' eventual impact of usage of TF® while shopping online. TF® was chosen as the ASFT in this study as they are the front-runners in fit technology with strategic partnership with Google Cloud, with 250 global retailers using this technology, representing 17,000 brands and 150M registered users (True Fit, 2020). Specifically, this study uses adapted Technology Acceptance Model (TAM) to examine: (1) impact of perceived ease of use (PEOU) and perceived usefulness (PU) of using TF® on confidence of using TF® technology (2) the impact of confidence of using TF® technology on intention to use TF®.

The remaining paper is organised first with the review of literature, which includes information on apparel sizing technology and TAM framework, research model of the study, and hypothesis development. Next, the methods for this research and the findings from testing the conceptual model are outlined. Finally, the paper ends with the conclusions of the study and the contribution to the literature and theory, the applications to academics and industry, and the limitations and future research.

Literature review

Apparel sizing & fit technology

Online sizing interfaces have been developed to address the changing apparel industry. These different types of interfaces allow consumers to engage with fit online (Gill, 2015). These online interfaces come in multiple forms of technology, including virtual fitting rooms, 3D body scanning, and sizing personalisation systems (see Figure 1).

Virtual fitting rooms

Virtual fitting rooms are a simulation of trying on clothing (Kramer, 2011). It allows consumers to try on clothing to see how the garment would fit or whether they would like the size, thus, allowing the consumer to engage with clothing fit online just as they would in a store dressing room.

3D body scanning

3D body scanning is being used in combination with fashion and e-commerce to create a virtual experience for consumers. Hewlett Packard uses an avatar platform called CeBit®, which uses the same technology as the movies to create a 3-D photo booth experience (Padelford, 2017). This image can then be customised by the individual consumer with hair, skin tone, and eye colour and connects with social media and past purchases so that the images can be shared among repeat online shopping trips.

Sizing recommendation services

Recommendation services offer consumers a suggested size based on various factors such as past purchases, measurements, and preferences. This is a good alternative since sizing scales are not consistent among designers. TF® is a size recommendation service and connects manufacturing design data, anonymized consumer order data and personal preference data from registered TF® users to provide personalised recommendations (True Fit, 2020).

Theoretical framework

The conceptual framework of the current study is adapted from the TAM proposed by Davis (1985). This theory examines the impact of current advances in technology and its influence on consumers' behaviours and attitudes (Rauniar, Rawski, Yang, & Johnson, 2014). Specifically, TAM suggests that PU and PEOU are key determinants of a person's attitude towards using a technology, which in turn determines their intention to use it. PU consists of 'the degree to which a person believes that using a particular system would enhance his or her job performance' while PEOU is 'the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989, p. 320). In this current study, TAM will be used to assess the impact of using TF® technology on consumer's confidence and its' eventual influence on online sizing selection. TAM was selected for this study due to its versatile framework for conducting empirical research in a variety of application and facilitating the assessment of diverse technologies (Al-Emran & Granic, 2021).

Previous literature found the TAM model to be a parsimonious by identifying only PEOU and PU as key determinants of the individual toward the use of computer technology (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). In this current study it is proposed that an easy to use and useful technology such as TF® will likely increase consumer's confidence and remove any cognitive impediments while using the technology (Pavlou & Fygenson, 2006), which eventually will impact the intention to use TF®. The conceptual research model is shown in Figure 2.

Technology	Description
Fit Your®	Virtual fitting room with use of a webcam
Fitsme®	Clothes-fitting simulation based on a person's actual body measurements
CeBit® (developed by Hewlett Packard)	3D model, takes 64 images and compiles into 1 3D avatar, simulates virtual clothing onto avatar
Match My Foot®	Creates 3D images of the user's feet based off digital images sent directly to smartphone
Metail's MeModel®	App that compiles user's measurements to produce a 3D model, 96% accurate
Shoefitr®	Footwear shoe recommendation service that uses measurements inside shoes and compares them.
Virtusize ®	Uses past purchases and then compares silhouettes in an overlay form
True Fit®	Size recommendation service that finds similarities in fit between past purchases and recommend sizes for future purchases based on these similarities

Figure 1. Evaluation of different sizing technologies.

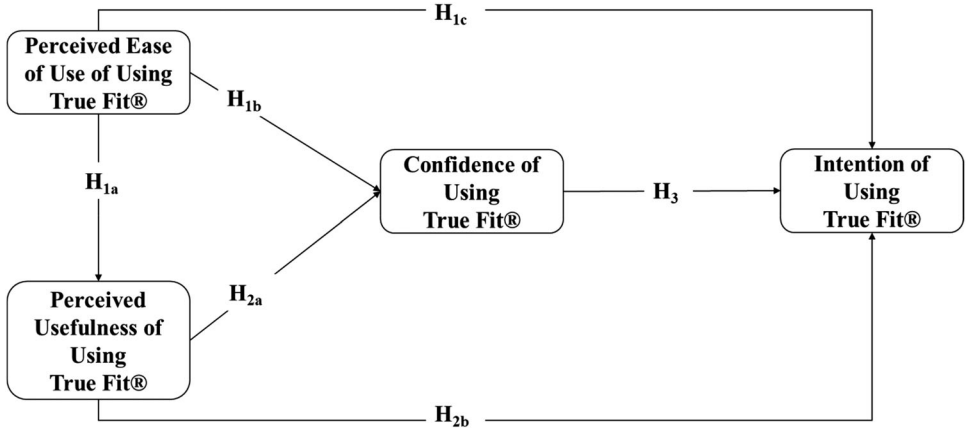

Figure 2. Research model.

Study variables and hypothesis development

PEOU and PU

According to Davis (1989), one's behavioural intentions to use a technological innovation were the result of two beliefs, PEOU and PU. PEOU can be defined as the degree to which the user expects the technology system to be free of effort whereas PU is the user's assumption that the technology will increase their job performance on a task (Davis, 1989). In the current study, PEOU is defined as the ease of use felt by the consumer when utilising TF® technology to make a clothing size decision. Previous studies have indicated that perceived usefulness is a primary motivator of technology acceptance, such as TF® and hence it is reasonable to expect that it may also influence subsequent continuance of the technology (Bhattacherjee, 2001).

In prior studies, PEOU has positively influence PU when it came to adoption on new technology such as online group buying (Wang & Chou, 2014), mobile commerce adoption (Pipitwanichakarn & Wongtada, 2019), and self-service technologies in fashion retail stores (Park, Ha, & Jeong, 2020). Thus, it can be hypothesised that PEOU will positively impact PU with TF® technology.

H_{1a}. PEOU of using TF® will positively influence PU of using TF®.

Variable	Adapted from:
PEOU True Fit®	Rauniar *et al.*, 2014; Chen, Gillenson, & Sherrell, 2002;
PU of using True Fit®	Chen, Gillenson, & Sherrell, 2002
Intent to use True Fit®	Yoon and Kim, 2007
Confidence of Using True Fit®	Flavián, et. al., 2016

Figure 3. Instrument development.

Confident of using TF®

Confidence is defined as the mental state a consumer has where they mentally evaluate their purchase decision they have made (Heitmann, Lehmann, & Herrmann, 2007). It can be inferred that a consumer who perceives a new technology to be useful as well as easy to use will have no difficulty in adapting to its usage since their perception about this technology gives them confidence in using the technology in question (Kim, Mirusmonov, & Lee, 2010). Confidence in selecting a clothing size online refers to the belief that the consumers can trust the size that has been recommended to them by TF®. Thus, based on logical assumption, an easy to use and useful technology such as TF® will likely positively influence consumer's confidence, and thus, it can be hypothesised:

H_{1b}. PEOU of using TF® will positively influence confidence of using of TF®.

H_{2a}. PU of using TF® will positively influence confidence in using TF®.

Intention of using TF®

PEOU and PU have been found to have a direct relationship on intention to use technology (Gefen & Straub, 2003; Venkatesh & Davis, 2000). A consumer is influenced by their previous system knowledge which impacts both their ease of use for a system as well as how useful they perceive the technology as fulfilling a need in their decision-making process. Thus, it is hypothesised that both PEOU and PU will have a direct influence on consumer's intention to use TF® when shopping on an apparel website.

H_{1c}. PEOU of using TF® will positively influence intention of using of TF®.

H_{2b}. PU of using TF® will positively influence intention of using TF®.

Ultimately, the goal of the TAM model is to predict usage of new technology. It is assumed that if one has confidence in TF® to select the correct size, then this will influence their decision to use the technology when making a purchase online. Confidence in selecting clothing size is viewed as an important component of the apparel shopping process and has a positive impact on intention (Flavián, Gurrea, & Orús, 2016). Thus, it can be hypothesised:

H_3. Confidence of using TF® will positively influence intention to use TF®.

Methodology

Participants and data collection

Sample and data collection

An online consumer survey was created in Qualtrics to be distributed to participants. The survey was reviewed for content validity and clarity by three experts in content area related to consumer behaviour and fit. After receiving feedback, changes were made, and approval received from the Institutional Review Board. The survey was piloted by 24 students in two graduate classes to assess readability and content reliability, changes were made as needed, and the survey was deployed. The participants in the survey included students at a Southwestern university in the United States using a snowball sampling technique resulting in a sample size of 577. Prior research indicated that students are considered a valid sample for exploratory study and when items in the questionnaires are pertinent to the respondents involved (Singhapakdi, Vitell, Rallapalli, & Kraft, 1996). Furthermore, as theoretical application of TAM was the goal of this study, students were considered an acceptable sample (Calder, Phillips, & Tybout, 1981). Additionally, Millennials and Gen Z have also indicated that they would like to have their online journey become even more convenient, with better ASFT (Alonso, 2020).

Instrument

A self-administered questionnaire was developed based on existing literature. The various constructs were

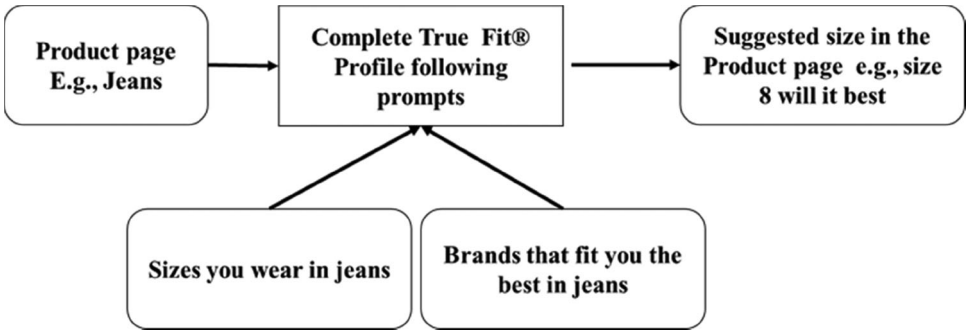

Figure 4. Setting up True Fit® profile.

measured using a seven-point Likert scale (1 = 'Strongly Disagree' and 5= 'Strongly Agree') (see Figure 3). Demographic values include gender, age, race, household income, education, and employment status.

Data collection procedure

The participants were required to follow instructions provided to create their TF® profile. The instructions were provided both in written as well as graphical format (please see Figure 4). The participants were required to visit Macys website, and given 6 choices of jeans to explore, 3 women's and 3 men's style. The jean selections for the study were chosen based on best sellers on macys.com, and their brand partnership with TF®. Macys was selected based on their target demographics and focused approach towards Millennials and Gen Z (Moin, 2020). The participants were required to set up their TF® profile and then were asked a series of questions based on their experience using TF® technology to make a sizing decision.

Data analysis

Data were analysed using Statistical Package for the Social Sciences (SPSS) and AMOS. For a preliminary analysis, construct validity was assessed using exploratory factor analysis (EFA) (Cronbach & Meehl, 1955). To assess the internal reliability of each construct, Cronbach's standardised α was reported (Cronbach, 1951). To assess reliability and validity of the measures, confirmatory factor analysis (CFA) was utilised. A structural equation model (SEM) was used to test hypotheses and explore the causal relationships.

Demographic profile

A total of 577 usable questionnaires were included in data analysis. Most of the participants were female (82.5%); 62.22% between the ages of 18–21 and 49.9% were Caucasians. Most of the respondents either did not respond to the total household income (27.4%) or they earned under $25,000 (27.6%) (see Table 1).

Preliminary analysis

The first step was conducted using SPSS for EFA using principal component with varimax rotation to identify the latent variables in the model. A minimum eigenvalue of one was used as the criterion to control the number of factors extracted resulting in four factors including PEOU of using TF®, PU of using TF®, confidence of using TF®, and intention of using TF®, with 80.44% of the variance explained. Reported alpha coefficients ranged from .87 to .93, supporting reliability of the measures (see Table 2).

Common method bias (CMB) was also taken into consideration at this preliminary analysis stage. According to Podsakoff and Organ (1986), CMB occurs when the estimates of the relationships between two or more constructs are biased because they are measured with the same method. To test for CMB, common latent factor was utilised, in which a new latent variable was created, and it was related all items (measuring latent variables). In this current study, the total variance for the single factor was 37%, less than cut-off of 50% (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), suggesting CMB does not affect the data.

Measurement model

This was tested through SEM using a maximum-likelihood estimation procedure with a covariance matrix as input to test the measures using AMOS. CFA in SEM permitted crosschecking of construct dimensionality and the measurement model's fit of latent variables. The model indicated good fit ($\chi^2 = 329.998$; df = 98; $p = 0.000$; CFI = 0.97; RMSEA = 0.64; NFI = 0.96) meeting the recommended cut-offs as suggested by Kline (2015). Each of the latent variables satisfied the suggested criteria for composite reliability (CR) and average variance extracted (AVE) (Nunnally & Bernstein, 1994). Discriminant validity was assessed by maximum shared

squared variance (MSV) and when AVE is greater than MSV, discriminant validity has been met (Hair, Black, Babin, & Anderson, 2010) (see Table 3).

Structural model

The hypothesised relationships and the model revealed adequate fit ($\chi^2 = 260.730$, df = 96, $p = 0.000$; RMSEA = 0.05; CFI = 0.98; RMSEA = 0.055; NFI = 0.97). Based on parameter estimate t-values cut-offs of 2.00 (Byrne, 1998), all hypotheses were accepted. Figure 5 displays the results of the causal model analysis showing the statistically significant paths. The effect sizes have been placed right below the path coefficients.

Results

Discussion of the findings

Apparel sizing is an issue for consumers when shopping online. According to Zadeh (2018), 67% of consumers believe retailers should provide more support online to help find them their fit. TF® is a sizing recommendation technology used by retailers to provide highly accurate size recommendations for consumers while shopping online (O'Shea, 2017). Thus, the purpose of this study was to understand consumers' confidence and intention of using TF® technology using an adapted TAM framework. The results of the study supported all the stated hypotheses and are consistent with findings from previous studies which had used TAM to evaluate consumer perceptions and intent to use technology (Cho & Fiorito, 2009; Ha & Stoel, 2009; Lee, Fiore, & Kim, 2006).

PEOU positively influenced PU supporting previous research that has examined the intention to use technology such as AI-powered automated retail stores (Pillai, Sivathanu, & Dwivedi, 2020) and adoption of mobile commerce (Chi, 2018). The findings suggest that consumers perception of TF® as a useful technology will be influenced by their ease of use of the system itself.

PEOU and PU positively influenced confidence in using TF® technology, with PU having a higher beta value (i.e. β(PEOU) = 0.33; β(PU) = 0.64). According to Keil, Beranek, and Konsynski (1995), PU can be defined as a function of task/tool fit, while PEOU is viewed as a task-independent construct reflecting intrinsic properties of the user interface. Thus, the findings indicate that usefulness of TF® has a higher impact on confidence rather than how easy it is to use this system. This can be explained based on the demographics of the respondent who were primarily millennials and gen Z, both have a high affinity for technology. Additionally, most of the respondents (76.1%) noted that the time taken to setup TF® was reasonable and that the system

Table 1. Demographic characteristics.

Variables	Frequency ($N = 577$)	Percent
Gender		
Male	101	17.50%
Female	476	82.50%
Age		
18–21	359	62.22%
22–25	137	23.74%
26–30	55	9.53%
31–34	26	4.51%
Ethnicity		
Asian American	51	8.80%
African American	88	15.30%
Bi/Multi Racial American	15	2.60%
Hispanic American	113	19.60%
Native American	3	0.52%
White/Caucasian American	288	49.90%
Other	19	3.30%
Household Income		
under $25,000	159	27.60%
$25,001–$35,000	40	6.90%
$35,001–$45,000	26	4.50%
$45,001–$55,000	21	3.60%
$55,001–$65,000	25	4.30%
$65,001–$75,000	18	3.10%
$75,001–$85,000	17	2.90%
$85,001–$95,000	16	2.80%
$95,001–$105,000	18	3.10%
$105,001–$115,000	28	4.90%
Over $115,001	51	8.80%
I don't know	158	27.40%

Table 2. Factor analysis.

Factor items	Factor loading	α
Perceived Ease of Using TF®		0.92
Interaction with TF® is clear and understandable.	.813	
I find TF® easy to use.	.776	
It would be easy for me to become skilful at using TF®.	.771	
I find TF® flexible to interact with.	.767	
I can quickly find the clothing size I need on TF®.	.710	
Perceived Usefulness of Using TF®		0.87
TF® is useful for choosing clothing size online.	.709	
TF® provides good information about sizing.	.708	
Using TF® makes it easier for me to shop or find information about fit.	.687	
Confidence of Using TF®		0.95
I am certain about my size choice after using TF®.	.835	
I am confident in my size choice after using TF®.	.803	
I believe that I have made the right size choice after using TF®.	.783	
I was convinced that I was able to find a size that best fulfils my needs using TF®.	.771	
Intention of Using TF®		0.92
I plan to buy clothing using TF®.	.806	
I intend to use TF® whenever suitable to do my shopping.	.802	
I will enjoy using TF®.	.785	
I will recommend others to use TF®.	.754	

Table 3. Convergent and discriminant validity.

	Composite Reliability	AVE	MSV
PU	0.909	0.769	0.576
PEOU	0.916	0.685	0.569
Confidence of using TF®	0.946	0.813	0.578
Intention of using TF®	0.922	0.748	0.578

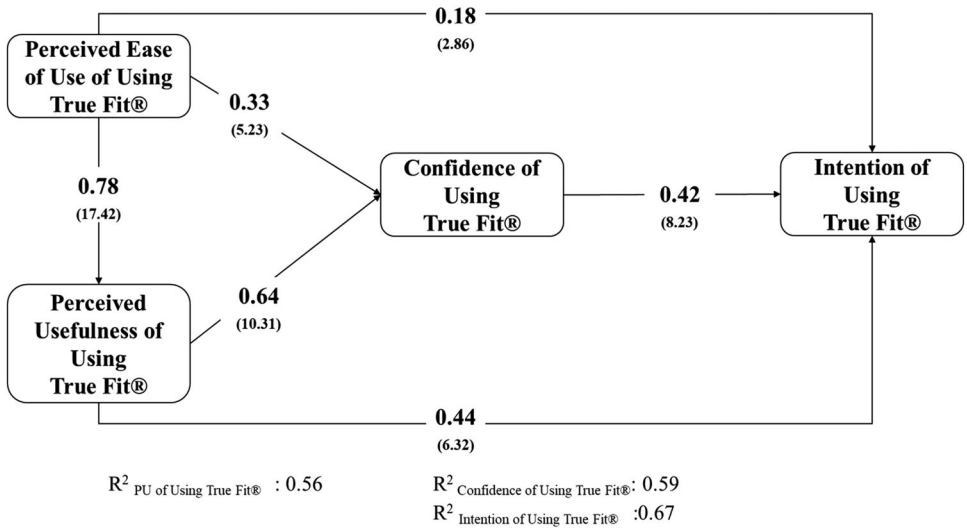

Figure 5. Research model with hypothesised paths.

was intuitive, hence the impact of PEOU on confidence was to a lesser extent than PU. Finally, achieving confidence in one's apparel sizing represents a goal that is related to positive outcomes, such as the correct size selected upon purchase (Flavián et al., 2016). Hence, it can be inferred if consumers find the technology easy to use as well as useful, then, the likelihood of them adopting this new ASFT will be higher.

The current study found that PEOU & PU positively influences intention to use TF®. This finding provided support to the notion that consumers base their decision to adopt a new technology such as TF® on the perceptions of its ease of use and usefulness (Davis et al., 1989), The results support previous studies that have examined technology adoption and reported a positive influence of PU and PEOU on the intention to adopt technology such as virtual try-on (Zhang, Wang, Cao, & Wang, 2019) and chatbot-based consumer service (Ashfaq, Yun, Yu, & Loureiro, 2020).

Finally, the confidence of using TF® technology positively influenced intention to use this technology supporting previous research (Teng & Laroche, 2007). Confidence reflects the subjective self-assessment of an individual's ability to create positive experiences as a consumer (Adelmann, 1987) and in this study it reflects consumer's confidence in using TF®. Thus, it can be inferred that this supports a consumer's perceptions of their ability to make effective decisions related to use of new technology and future usage.

Implications and recommendations

Sizing for consumers has been an issue due to the vast degree of fits, rises, varying lengths and different styles available in apparel (Schwaab, 2017). This concern has quadrupled its' effect due to sudden increase in online shopping during the pandemic, combined with generally liberal return policies resulting in huge amount of apparel returns (O'Brien, 2020). Smart retailers should focus on fit because when a consumer has a successful experience related to fit, they are 81% more likely to purchase from that brand/retailer again (Kong, 2020). Thus, given the dynamic nature of the retail industry as well as importance of online sizing, the current study is a step towards providing an insight to the use and acceptance of sizing technology. The results of this study suggest, that after using TF® technology to aid in size selection, consumers felt more confidence in using this technology and intend to use it in the future for finding sizes online. Overall, this study has succeeded in predicting the causal relationships among the variable with implications for academia as well as the retail industry.

Retailer implications

From a managerial standpoint, TF® can be used by retailers to better fit the sizing needs of their consumers. As stated earlier, returns due to sizing are on the increase and are directly impacting retailer profit margins. Thus, it is critical that retailers not only implement technologies such as TF®, but also understand consumer's perceptions towards using technology to help find the right clothing size when shopping online. Finally, and most importantly, the implementation of TF® could potentially lead to reduced return rates for the retailers. Currently, 40% of all apparel purchased online is returned and TF® works to reduce these return rates by up to 35% (Room for growth, n.d.). It is also

suggested that retailers analyse their current size scale system and explore implementing ASFT as it can help their consumers feel more confident and satisfied in their online sizing decision.

Academic implications

This current study aimed to fill the gap in online sizing research by utilising an adapted TAM model to analyse consumer adoption of sizing technology. To the best of the authors' knowledge, this study is one of the earliest attempts to examine ASFT such as TF®, thus adding to the new body of research that examines ASFT. It is important to note that previous studies that have examined ASFT such as 'augmented reality' has indicated the limitation of gathering data as laboratory setting might not reflect the true quality of the technical access available to consumers (Pantano, Rese, & Baier, 2017) or the application itself is not developed enough to provide participants all the functionalities to truly engage with the technology (Plotkina & Saurel, 2019). TF® is a user friendly ASFT and allows researchers to examine the impact of its' usage without any technological restrictions. A strong, positive relationship was found between PEOU, PU and confidence as well as intent to use. Thus, it can be argued that researchers need to examine confidence of using a technology in addition to well-established variables such as PEOU and PU while examining the intent to use new technology. Furthermore, due to the continued advancement of technologies and increasing online shopping, it is recommended that researchers examine other variables that may impact an individual's confidence such as attitude toward the technology, enjoyment, and entertainment.

Limitations and Further research

Despite, the potential contributions of this study, it should be noted that the information in the current study is limited to the one geographic area and focused on college students; therefore, the information cannot be generalisable to the entire population. Additionally, it is suggested that mixed methods could be used for future research including focus group in addition to the survey. With the focus group, additional variables could be identified based on what the consumers are looking for when using technology and shopping online. Furthermore, other reasons for clothing returns can be explored, such as consumer no longer wanting the product due to reasons such as late delivery, did not like the style, etc. Similarly, given that fit and fit-related issues are of concern to retailers and manufacturers, it is suggested a study can be designed to understand this issue from the industry perspective. Finally, the scales used in the study were adapted from previous studies that examined adoption of new technology. One cannot be fully sure that the scales used measured exactly what was being examined. Thus, it is suggested that future studies could create original scales to measure the different variables of fit-technology study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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