Young women's perceptions towards the Hijab Try-on app

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Abstract –

Conventional hijab shopping requires the shoppers to go to the physical store to select and try the hijab themselves. This form of shopping needs the shoppers to allocate their time and effort. Meanwhile, online shopping has made it easier to shop where shoppers can get the goods they need without having to go to the store and this saves them a lot of time and effort. However, when it comes to online shopping for hijab, shoppers can only base their hijab purchase on the sizing chart and 2D photos. They are not accurate and interactive enough to allow shoppers to make the right choice. As such, for this kind of situation, a new approach to shopping and at the same time be able to try on the favourite hijabs is required. In this paper, we introduce the Hijab Try-On app, a mobile augmented reality application which allows women shoppers to freely browse, select and try-on their favourite hijab at their own convenience using their own smartphone. The users can try-on the hijabs on their own or with the help of their friends or husband anytime and anywhere. The aim of this app is to enable the app's users to try-on the hijabs provided by the app without having to try them in the fitting room. This feature can further enhance the existing capabilities which are lacking in online shopping. The purpose of this study is to investigate the potential of using the Hijab Try-On app among a sample of 120 female young adults between the ages of 18 to 35 years old. The study specifically focusing on enjoyment, perceived augmentation, perceived usefulness, perceived ease of use, attitude toward use and intention to use. The findings of the study showed that the participants strongly agreed on all the attributes namely; perceived ease of use, perceived usefulness, attitude towards use, intention to use, enjoyment, and perceived augmentation. The mean value for intention to use is 4.46 which is the highest while the mean value for perceived usefulness is 4.14 which is the lowest. As a recommendation, owners of online hijab stores should be aware of the technological advances associated with virtual try-on. They need to incorporate and utilise the technology to provide convenience and comfort to their customers.

Keywords – *Mobile augmented reality, Hijab, Virtual Try-On, Women.*

I. INTRODUCTION

Online shopping is one of the most important Internet applications for business and customer convenience. As the number of online shoppers has grown exponentially over the years, clothing purchases are one of the fastest growing segments worldwide. Several initiatives have been introduced to further enhance online shopping facilities such as introducing new technologies which include; whole body 3D scanning and virtual-try-on. However, in online shopping, product returns is the main issue (Walsh et al. 2017; Zhou & Hinz 2016; Rao et al. 2014). Out of all online sales, product returns were still around 50% since online platforms lack tactility in the selection of clothing (Mintel, 2017). Product returns are still high and most consumers are still hesitant to purchase clothing online or dissatisfied with their online shopping experience (Kim & Forsythe, 2008). Online shoppers made their purchase and size selection decision based on 2D photos of the clothings and sizing charts. These methods are not accurate and interactive in providing the right sizes and choices to the shoppers (Cordier, Lee, Seo, & Magnenat-Thalmann, 2001). According to Pachoulakis & Kapetanakis (2012), dressing and fitting are two main concerns of online shopping for clothes. Meanwhile, Chen & Wang (2010) stressed that online shoppers also faced difficulty in matching clothes.

Today, women's clothing and accessories such as clothes, bags, shoes and jewelries grow rapidly and that also include hijab. The hijab or veil is the cover for women's head which include their face, hair and

neck (Kulenović, 2006). Hijab is the simplest form of adornment through the use of a single or multiple pieces of cloth. Hijab is one of the clothing accessories that has been used for centuries by cultures and purposes. Most Muslim women wear hijabs not just for modesty but also they are required by their religion. Nowadays fashionable hijabs are becoming so popular among the women. Currently, businesses involving fashionable hijabs are mushrooming everywhere and the response from the women customers is astounding. Due to the immense response from the fans of fashionable hijabs, various brands have emerged including; Fareeda, Naelofar, dUCkscarf, Padusi, Sugar, Ariani, Bokitta, Exclusive Bawal, J Hijab, Pearl Haya, and Owl. The sales of Naelofar hijabs have reached RM50 million in 2015 where the company sells its products at its flagship store and through a network of 700 distributors nationwide. They also sell online and have distributors in Singapore, Brunei, London, Australia, Netherlands and US (Mayberry, 2015).

Currently, shopping for fashionable hijabs require the shoppers to go to the shop to choose and try the hijab themselves. Retail store shopping requires shoppers to allocate the time and effort (Seiders et al., 2007; Beauchamp & Ponder, 2010). However, for those with lot of commitments, the opportunity to try and eventually buy their favourite hijab is slim. For this situation, a new approach to shopping and at the same time be able to try on the favourite hijab is required. At the same time, when too many shoppers want to try out the same hijabs, they can easily become worn-out and could not be sold anymore to the customers. In this case the business owner has to bear the cost for that particular hijabs.

The online market for women's clothing and accessories is growing fast. Some people get tiresome to fit the clothes in stores and having time constraints with the packed schedule. It is much easier if the clothes can be tried easily without having to face the time constraints by having them with proper size and beauty without having to wait in a long queue outside the conventional fitting room. But then, it is impossible for them to be satisfied with the clothes from online without trying them. The best approach is to see the clothes fit on their own body. In order to save time, clothes fitting can be done virtually where the users can try them on their body, but actually, it is not, and also can reduce time constraints (Liaw & Chen, 2013). The experience of real time virtual try-on gives them the satisfaction of wearing the clothes.

This paper introduces the Hijab Try-On (HTO) app, an application which allows women shoppers to freely browse, select and try-on their favourite hijab at their own convenience. In addition, the interactivity and customer involvement created by the HTO app can enhance the entertainment value of the online shopping experience (Kim & Forsythe, 2008).

II. LITERATURE REVIEW

In this section, some topics related to this study from previous literatures will be discussed which include; vanity sizing, apparel fitting, augmented reality and virtual try-on.

A. Vanity Sizing

Based on the literature review, vanity sizing is among the phenomena that is experiencing steady growing interest. Several studies by Ketron and Naletelich (2017); Aydinoğlu and Krishna (2012); Hoegg et al. (2014); Kinley (2003); Ketron (2016); and Ketron and Spears (2017) have reported the presence of varying responses from users pertaining to vanity sizing and smaller label sizes. However, these studies have not been able to examine the importance of consumer's size of clothing as part of self-concept. Additionally, due to gender differences in the domain of vanity sizing (Franz, 2017), gender may further alters this response.

Nowadays, digital fit and sizing technology has begun to grow and has been applied in the retailers' websites and mobile apps. This technology helps and guides online users in selecting products that are based on fit, size, or style. Through this technology, consumers can lower return rates, reduce uncertainty, and improve online retail efficiency by providing digital fitting of the clothes onto the body prior before purchasing.

B. Apparel Fitting

Basically apparel fitting can be grouped into two namely; physical fitting and virtual try-on. According to the online Cambridge dictionary, a fitting room is a room or area in a shop where one can put on clothes to check that they fit before one buy them. Meanwhile, a fitting room is a place where shoppers can inspect whether clothes fit them and match their taste before deciding to buy them (Yun, Jung, & Choo, 2015). When customers visit a store, the retailer wanted to ensure that every detail of the space represents the quality of the brand. Choosing to install beautifully crafted retail fitting rooms can help in elevating the consumer experience and drive more customers to purchase. In retail shopping, physically trying on clothes is time consuming (Shaikh et al., 2016). It requires several try-on of clothes before the shoppers can decide on the colour, size, and design that satisfy them (Yuan, Khan, Farbiz, Yao, Niswar, & Foo, 2013).

C. Augmented Reality

Augmented Reality is the superimposition of 3D computer-generated images onto a live real-world view (Vidal Jr, et al., 2018). It allows digital objects to be integrated into the real world by inserting them into an image or video as part of the scene (Van Krevelen & Poelman, 2010). This technology can produce a variety of applications that can be used in areas such as design, maintenance, education, and online shopping as well as enhancing people's perception of reality (Zhang, Guo, Laffont, Martin, & Gross, 2017). The advancements in this technology have led to the increasing use of AR in plethora of applications that include apps for heritage (Baker et al., 2019; Boboc, et al., 2019; Huang, Xiang, & Li, 2019), advertising (Idris, Zulkifli, & Yusoff, 2019; Ahmad, et al., 2019; Yi, et al., 2018), and education (Rusli, Zulkifli, Saad, & Yussop, 2019; Zulkifli, Batiha, & Qasim, 2018; Quintero, Salinas, González-Mendívil, & Ramírez, 2015). Meanwhile virtual try-on is one example of application that is based on augmented reality technology. Furthermore, through augmented reality, additional information can be channelled to users in helping them to make decisions through visual information (Olsson et al., 2013; Papagiannidis et al., 2017).

D. Virtual Try-on

Virtual try-on gives the users the opportunity to try different goods on different objects in which the object might be the user's own image to the house that he/she wanted to decorate (Hossen et al., 2015). Virtual try-on allows customers to evaluate garments through physical simulation of these garments on an animated virtual avatar sized to their measurements (Kevelham & Magnenat-Thalmann, 2012). Virtual try-on allows users to virtually dress garments onto digital 3D body (Zhang, Zheng, & Magnenat-Thalmann, 2014). Virtual try-on applications have increasingly popular in recent years as they allow users to view themselves in different clothes without having to physically changing them. This assists users to guickly determine whether they like the clothes or not, which consequently enables retail shops to sell more in less time (Hauswiesner, Straka, & Reitmayr, 2013). Through virtual try-on technology, product information obtained is almost similar to direct product inspection (Kim & Forsythe, 2008). Furthermore, virtual try-on initiates customers involvement and interactivity and these increase the value of entertainment in online shopping (Kim & Forsythe, 2008). This technology enables shoppers to zoom in and view the virtual products from different angles and in a variety of colours (Kim & Forsythe, 2008).

The utilization of AR for virtual try-on applications enable previsualization of products and users can try-on the products and experience them from the comfort of their own homes. Researchers such as Meng, Mok and Jin (2010); Magnenat-Thalmann et al.(2011); Han et al. (2018) have proposed virtual try-on systems for clothing, Zhang et al. (2017); Yuan et al. (2017); Cuaresma and MacKenzie (2017) for eyeglasses, Mottura et al. (2007); Eisert et al. (2008) for shoes and Oztel and Kazan (2015); Rahman et al. (2010) for makeup. In term of clothes purchasing, this technology can also speed-up the process since the purchasers can try-on without physically wearing them (Yuan et al., 2013; Lin & Wang, 2014). It enhances the shoppers' experience by allowing them to view the clothes from various angles and make side-by-side comparison with other clothes (Shaikh et al., 2016). This technology can also be utilised as

digital signage for advertisement and crowds' attraction (Giovanni et al., 2012; Yuan et al., 2013; Pachoulakis & Kapetanakis, 2012).

E. Virtual Try-on for Hijab

Based on the literature review, so far not much research has been focused on the virtual try-on for hijab. Even though there are several virtual hijab try-on apps available from Google play, however, in terms of research, not much research has been conducted in the design and development of the app. To date, very limited empirical study has been conducted in examining the perceptions of users toward the use of the hijab try-on app. Toseeb et al. (2014) proposed a hijab application based on the user's face image. The application utilises the AdaBoost algorithm and elliptic skin model. Based on the frontal and profile cascade classifiers, the AdaBoost is able to detect more faces in the image, thus resulting in better classifiers for face detection. Nugraha and Nasrudin (2015) proposed a technique to display hijab virtually using Augmented Reality technology. They developed an algorithm that automatically adjusts the hijab onto the user's face image using the ellipse mask technique focussing on the jaw area of the face image. They also conducted a quantitative assessment among 30 participants to get feedbacks pertaining to the appropriateness and efficiency of the technique. The result shows that 93.3 % of the participants were strongly agreed or agreed on the use of the technique for virtual hijab fitting. Oktavianti, Sugeng, & Agusta (2016) developed an android app for hijab fitting. The input to this application is the user's face image which in turn displays the face detection process result. Khaliluzzaman et al. (2017) proposed a hijab detection framework from an image based on neck detection by estimating chin and neck point from skin colour image and also hair detection and their system was able to attain 95% detection rate. Based on the four previous studies related to the virtual hijab try-on, only the study by Nugraha and Nasrudin (2015) examined the perceptions of users toward the use of the hijab try-on app. However, their study was only limited to the suitability and effectiveness of the ellipse mask for virtual hijab fitting.

III. THE HIJAB TRY-ON APP

The hijab try-on (HTO) app was developed for Android mobile platform utilizing Unity3D and Vuforia. The app has been developed especially for women in order to help them to be able to browse, select and virtually try-on their desired hijab based on the design and colour so as to match their existing dresses, make-up, and skin colour. The app provides a natural interaction user interface employing floating buttons to allow users to browse the hijab collection and virtually try-on the hijab of their choice. The women can try on the hijabs on their own or with the help of their friends or husband anytime and anywhere. They can try-on the hijabs provided by the HTO app to suit their choice of colours, designs, patents and so on without having to try them in the fitting room. Once they are satisfied with the try-on of their favourite hijab, they can snap the image and share through the social media channels.

When starting the HTO app, the first screen that appears for a few seconds is the flash screen as shown in Fig. 1. Next the app will display the main interface as shown in Fig. 2. It consists of two selection buttons namely; Hijab Collection and Help. The Hijab Collection button will direct the user to the collection of hijabs available in the app as shown in Fig. 3. At the time of development, altogether 20 hijabs of various colours and designs were included into the app. The hijab collection can be changed and added according to the customers' requirements. Users can browse all the hijabs in the collection and there is no limit to the number of hijabs that she can try. Meanwhile the Help button guides the user on the use of the app.

In order to try-on a hijab, firstly the user has to choose the hijab from the collection and the try-on screen as shown in Fig. 4 will appear. The user can select the information button at the bottom of the screen for more information. User is given two options for try-on, with snapshot or saved image. With snapshot option, the user can try-on the hijab in real time. However, this option requires somebody else to adjust the distance of the mobile device so that the face fits the hijab nicely. The next option requires the user's face image so that the hijab can be virtually fitted onto the face. Fig. 5 shows from the original

image of the user, the HTO app superimpose the selected hijab onto the user's image. For both options, once the hijab try-on has been accomplished, the user can snap the scene and share the photo through the social media channels such as Whatsapp, Facebook, Messenger, email and etc.



Fig. 1: HTO app's flash screen





Fig. 3: Samples of hijab available in the HTO app



Fig. 2: HTO app's main interface







Fig. 4: The try-on screen



Fig. 5: From original user's image to user's image fitted with virtual hijab

IV. METHOD

The aim of the HTO app is to help women to be able to browse, select and virtually try-on their desired hijab based on the design and colour so as to match their existing dresses, make-up, and skin colour. Therefore, it is important to determine the women's perceptions after using the HTO app in the aspect of enjoyment, perceived augmentation, perceived usefulness, perceived ease of use, attitude towards use and intention to use.

A. Sample

The samples for this evaluation were young women where their ages ranged from 18 to 35 years old (Petry, 2002). Altogether 120 young women took part in the evaluation and the number exceeds the minimum number specified by Coakes and Steed (2003). Convenience sampling was utilized in selection of samples. It is a technique of selecting samples due to easy selection and availability among the population (Groebner et al., 2013).

B. Instrument

For the evaluation, the instrument used was a set of questionnaires. It consists of measurements that include; enjoyment, perceived augmentation, perceived usefulness, perceived ease of use, attitude toward use and intention to use. All the measurements were adapted from various previous studies.

Enjoyment is the degree to which performing an activity is perceived as providing pleasure and joy in its right, aside from performance consequences (Venkatesh, 2000). Perceived enjoyment is defined as the excitement and happiness derived from use of a system in its own right (Van der Heijden, 2004). The extent of using a technology is considered fun in itself as opposed to any possible performance outcome (Davis et al., 1992).

Perceived enjoyment also means the use of virtual worlds is considered fun disregarding of achievement (Venkatesh, 2000; Lu et al., 2009). Perceived enjoyment is crucial, when users enjoy using a technology, they have positive attitude and focus on it, thus promoting its acceptance (Li and Huang, 2009).

The concept of enjoyment signifies the feeling that benefits to the message of the application. It includes users who experience fun and excitement interacting with MAR applications (Enrique, 2012; Bressler & Bodzin, 2013; MäNtymäKi & Salo, 2011; Nysveen et al., 2005). This study follows the definition of MäNtymäKi & Salo (2011) and Nysveen et al. (2005) which states that enjoyment is when the user experiencing fun, joy and entertainment with the usage of the application.

Perceived augmentation is a psychological connection of the ability of AR to virtually transform the experience of users pertaining to the physical environment (Javornik, 2016). It relates to how AR applications are viewed by the users in changing the real environment. Perceived ease of use is the degree a user accepts that using a technology would be free of effort (Davis, 1989). Perceived usefulness is the degree to which the users believe that their performance will be enhanced by using the technology (Davis, 1989). Intention to use is the likelihood a user plans to use an application in the future (Venkatesh et al., 2003). Attitude towards use is the user's positive or negative evaluation towards the use of an application (Davis, 1989).

The questionnaire used in the evaluation was divided into two sections which include; demographic profile of participants and perceptions of the participants after using the hijab try-on app. The questionnaire used a five point Likert scale ranges from 1(Strongly Disagree) to 5 (Strongly Agree).

C. Procedure

A briefing was given to the participants on the aim of the evaluation. They were also briefed on the interfaces as well as the functions of the HTO app. Next, the HTO app was installed to the participants' mobile devices in order to enable them to get used to the app. The participants were given roughly 30 minutes to use the app. Then they were given about 20 minutes to answer the questionnaire.

V. RESULTS

A. Demographic Characteristic

120 female young adults between the ages of 18 to 35 years old were selected as the participants. They were selected on the basis of their willingness to participate in the evaluation and complete the questionnaire.

B. Reliability

Reliability analysis was performed to assess the stability or internal consistency of the items within the instrument (Sekaran & Bougie, 2016). The Cronbach alpha (α) value must be greater than 0.7 in order to indicate that the internal consistency of the attribute is good (Hair et al., 1998). SPSS version 22.0 was used to compute all the the attributes α values and Table 1 shows the results. The Cronbach alpha for perceived ease of use is 0.728, perceived usefulness is 0.814, attitude towards use is 0.775, intention to use is 0.827, enjoyment is 0.862, and perceived augmentation is 0.771. According to Nunnally (1978), if $\alpha > 0.7$ for all the attributes, then they are considered reliable.

Table 1: α for all attributes		
Attribute	No. of items	<u>Cronbach alpha (α)</u>
PEOU	4	.728
PU	3	.814
AT	3	.775
ITU	3	.827
ENJ	4	.862
PA	4	.771

C. Descriptive Statistics

The aim of conducting the descriptive statistics analysis is to determine the participants' perceptions after using the HTO app. This analysis determined the mean and standard deviation of each item and the results are shown in Table 2.

Table 2:	Results	of Descr	iptive	Statistics	Analysis
					2

Attributes and Items	S Mean	SD

Perceived ease of use	4.29	
The HTO app was easy to use.	4.24	.565
Learning to use the HTO app was easy for me.	4.33	.570
My interaction with the HTO app was clear and understandable.	4.27	.546
It was easy for me to try the Hijab with the HTO app.	4.32	.467
Perceived usefulness	4.14	
The HTO app was useful to me.	4.09	.367
The HTO app enabled me to try the hijab faster.	4.23	.480
The HTO app saved me time in trying the hijab.	4.11	.384
Attitude towards use	4.44	
I like the idea of using the HTO app.	4.39	.523
I am more likely to use the HTO app.	4.32	.502
It was easier and better for me to use the HTO app instead of using a fitting room.	4.62	.505
Intention to use	4.46	
I will always use the HTO app.	4.39	.507
I will continue to use the HTO app in the future.	4.47	.564
I will introduce the HTO app to my friends.	4.51	.518
Enjoyment	4.30	
I enjoyed using the HTO app.	4.29	.509
The HTO app provided me an entertaining experience.	4.13	.607
It was fun using the HTO app.	4.27	.579
I did not feel that time has passed when using the HTO app.	4.52	.518
Perceived augmentation	4.29	
The HTO app added virtual hijab to my face	4.35	.560
The way the hijab was applied to my face looked real	4.25	.554
The Hijab became part of my face.		.525
The Hijab appeared in real time.	4.25	.489

The survey instrument used a five point Likert scale in determining the mean values for all the attributes. The Likert scale is an ordinal scale (Jordan, Croft, & Ong, 1998) which is used to rate the degree to which the participants agree or disagree with a statement (Sekaran & Bougie, 2016). The responses in Likert scale can only be rated or ranked. However, the distance between the responses is not measurable. Numerical scale measures the distance between positions and they are grouped into strongly disagree, disagree, agree and strongly agree with no neutral position. As such, Qasim et al. (2018) suggest the use of numerical scale in determining the degree to which the participants agree or disagree with a statement. In order to convert from Likert scale to numerical scale, the following equation was used to determine the distance between numbers of Likert scale.

Whereby;

RS = (m - n) / b

- RS score range
- m highest score on scale
- n lowest score on scale
- b number of group

Thus, based on the equation, the score range is 1. Table 3 shows the numerical scale and category.

Table 3 Numerical	scale and category
Numerical scale	Category
1 - 1.99	Strongly disagree
2 - 2.99	Disagree

3 - 3.99	Agree
4 - 5	Strongly agree

Based on the descriptive statistics analysis results as shown in Table 2, the mean for perceived ease of use is 4.29, perceived usefulness is 4.14, attitude towards use is 4.44, intention to use is 4.46, enjoyment is 4.30 and finally, perceived augmentation is 4.29. Referring to Table 3, since all the attributes have mean scores of between 4 to 5, they are categorized as strongly agree. These proved that the participants strongly agreed on all the attributes in this study. Intention to use with mean of 4.46 has the highest while perceived usefulness with mean value of 4.14 has the lowest.

VI. CONCLUSION

The main aim of this paper is to introduce the Hijab Try-On app which is based on the android mobile augmented reality technology to help women to be able to browse, select and virtually try-on their desired hijab based on the design and colour so as to match their existing dresses, make-up, and the skin colour. Although there are many shops that sell hijabs online, shoppers can only base their hijab purchase on the sizing chart and 2D photos. These methods are not accurate and interactive enough to allow shoppers to make the right choice. With the HTO app, the users are able to browse the hijab collection and virtually try-on the hijab to suit their choice of colours, designs, patents and so on without having to try them in the fitting room. This study was carried out in determining the young women's perceptions after using the HTO app. The perceptions were measured in terms of perceived augmentation. The results of the evaluation indicated that the participants have reacted positively on the use of the HTO app by strongly agreed on all the attributes. Whilst this study shows the positive receptions of young women after using the HTO app, future research can investigate how the use of the app contributes to the sale of Hijab online as well as the value the app is able to create if it is applied in other domains.

VII. ACKNOWLEDGMENT

Our deepest gratitude goes to the Universiti Utara Malaysia for supporting us by funding this research and also for other supports and facilities provided that has facilitated the research process along this year.

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