# FACTORS INFLUENCING ACCEPTANCE OF MOBILE AUGMENTED REALITY APPLICATION BASED ON TECHNOLOGY ACCEPTANCE MODEL (TAM)

**NUR SYUHADA' BINTI MOHD POZI**



**MASTER OF SCIENCE (MULTIMEDIA)**
**UNIVERSITI UTARA MALAYSIA**
**2023**

Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

## PERAKUAN KERJA TESIS / DISERTASI
*(Certification of thesis / dissertation)*

Kami, yang bertandatangan, memperakukan bahawa
*(We, the undersigned, certify that)*

NUR SYUHADA' MOHD POZI

calon untuk Ijazah
*(candidate for the degree of)* MASTER OF SCIENCE (MULTIMEDIA STUDIES)

telah mengemukakan tesis / disertasi yang bertajuk:
*(has presented his/her thesis / dissertation of the following title):*

"FACTORS INFLUENCING ACCEPTANCE OF MOBILE AUGMENTED REALITY APPLICATION BASED ON TECHNOLOGY ACCEPTANCE MODEL (TAM)"

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
*(as it appears on the title page and front cover of the thesis / dissertation).*

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada : ***26 September 2022.***
*That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:*
***26 September 2022.***

| | | |
|---|---|---|
| Pengerusi Viva:<br>*(Chairman for VIVA)* | **Assoc. Prof. Dr. Siti Mahfuzah Sarif** | Tandatangan<br>*(Signature)* |
| Pemeriksa Luar:<br>*(External Examiner)* | **Dr. Farah Nadia Azman** | Tandatangan<br>*(Signature)* |
| Pemeriksa Dalam:<br>*(Internal Examiner)* | **Assoc. Prof. Gs. Dr. Ruzinoor Che Mat** | Tandatangan<br>*(Signature)* |
| Nama Penyelia/Penyelia-penyelia:<br>*(Name of Supervisor/Supervisors)* | **Dr. Hammuzamer Irwan Hamzah** | Tandatangan<br>*(Signature)* |
| Nama Penyelia/Penyelia-penyelia:<br>*(Name of Supervisor/Supervisors)* | **Dr. Nadia Diyana Mohd Muhaiyuddin** | Tandatangan<br>*(Signature)* |

Tarikh:
*(Date)* ***26 September 2022***

## Permission to Use

In presenting this thesis in fulfilment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the Universiti Library may make it freely available for inspection. I further agree that permission for the copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part should be addressed to:

Dean of Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok

# Abstrak

Kajian ini memperkenalkan aplikasi realiti luasan mudah alih (MAR) yang membolehkan wanita meneroka, memilih dan mencuba hijab pada masa lapang mereka. Selain itu, kajian persepsi dan penerimaan turut dijalankan dalam kalangan responden yang menggunakan aplikasi tersebut. Pembelian hijab dalam erti kata tradisional memerlukan pengguna datang ke pusat jualan untuk memilih dan mencuba hijab. Pembelian jenis ini mengambil masa dan usaha pembeli. Sementara itu, para pelanggan yang melakukan pembelian hijab secara dalam talian hanya boleh bergantung pada carta saiz dan gambar untuk membuat keputusan. Kaedah ini kurang tepat atau interaktif untuk membantu pembeli membuat keputusan yang terbaik. Akibatnya, pendekatan baharu untuk mencuba hijab di mana-mana dan pada bila-bila masa diperlukan. Kajian ini mencadangkan aplikasi Virtual Hijab Try-on (VHT), yang menggunakan MAR sebagai teknologi utama dan Multimedia sebagai teknologi sokongan untuk mengkaji persepsi dan penerimaan pengguna berdasarkan dirasakan luasan (AR), keseronokan, dirasakan berguna, dirasakan mudah digunakan, sikap terhadap penggunaan, dan niat untuk menggunakan. Matlamat artikel ini adalah untuk menilai sama ada AR menarik kepada pengguna melalui bidang mana ia boleh mencipta nilai tertinggi. Oleh itu, kami telah berusaha untuk mengenal pasti bidang aplikasi AR yang paling berguna, serta faktor yang mempengaruhi daya tarikan AR. Metodologi kajian untuk penyelidikan ini diadaptasi daripada Vaishnavi dan Kuechler yang merangkumi lima fasa. Model Penerimaan Teknologi diaplikasikan sebagai teori asas untuk kajian ini. Kajian ini menggabungkan aplikasi (VHT) dan teori konstruktivis untuk mengukur penerimaan pengguna dan mengesahkan model baru MAR. Keputusan menunjukkan bahawa semua ukuran telah dipersetujui oleh pengguna dan ini mencerminkan tahap penerimaan pengguna yang tinggi terhadap penggunaan aplikasi VHT. Fasa bermula dengan proses perancangan yang melibatkan definisi skop penyelidikan dan pengenalpastian pengguna sasaran. Ia diteruskan dengan penubuhan kekangan penyelidikan di mana ia merupakan pendekatan yang sistematik untuk mengatasi sebarang batasan yang berkaitan dengan penyelidikan. Dapatan kajian menunjukkan bahawa pengguna sangat bersetuju dengan persepsi luasan, keseronokan, persepsi kegunaan, persepsi kemudahan penggunaan, sikap terhadap penggunaan, dan niat untuk menggunakan. Model Penerimaan Teknologi (TAM) didapati sebagai alat teori yang baik untuk memahami penerimaan pengguna terhadap aplikasi. Keseronokan dan peningkatan yang dirasakan secara positif mempengaruhi penerimaan pengguna terhadap aplikasi tersebut. Tambahan pula, kami mendapati jurang antara bekalan dan keperluan pelanggan dari segi jenis aplikasi AR yang ditawarkan di pasaran. Kami mengenal pasti kelebihan dan kekurangan aplikasi AR dan membandingkannya secara tradisional kepada mereka yang mempunyai kesan terhadap penggunaannya. Keseronokan dan peningkatan yang dirasakan secara positif mempengaruhi penerimaan pengguna terhadap aplikasi tersebut. Sumbangan utama kajian ini ialah model kajian yang membuktikan pembinaan mantap TAM. Hasil menunjukkan bahawa TAM ialah model yang berdaya maju untuk memahami penerimaan pengguna terhadap teknologi seperti aplikasi VHT. Selain itu, keseronokan dan persepsi luasan mempunyai pengaruh positif terhadap penerimaan pengguna terhadap aplikasi VHT. Oleh itu, apabila mereka-bentuk dan membangunkan aplikasi percubaan, faktor yang merangkumi keseronokan dan persepsi luasan perlu dimasukkan ke dalam aplikasi untuk meningkatkan penerimaan alat.

**Kata Kunci:** Hijab, Mencuba, Realiti Tambahan, Penerimaan, Pemodelan Persamaan Struktur

# Abstract

This study introduces a Mobile Augmented Reality (MAR) app that allows women to explore, choose, and try on hijabs at their leisure. In addition, a study of perception and acceptance was also conducted among a sample of respondents who have used the app. Hijab shopping in the traditional sense requires users to come a retail shop to choose and try on the hijab. This type of shopping necessitates the shoppers' time and effort. Meanwhile, while purchasing for a hijab online, customers may only rely on the sizing chart and photographs to make their decision. These methods are not really precise or interactive enough to help buyers make the best decision. As a result, a new approach to trying on hijabs anywhere and anytime is required. This study proposes the Virtual Hijab Try-on (VHT) app, which employs MAR as the primary technology and Multimedia as the supporting technology to examine users' perceptions and acceptance based on perceived augmentation, enjoyment, perceived usefulness, perceived ease of use, attitude towards use, and intention to use. The aim of this article is to assess if Augmented Reality (AR) is attractive to consumers and in which areas it can create the most value. Hence, we have sought to identify the most useful areas of AR applications, as well as factors influencing augmented reality's attractiveness. This study has adapted a research methodology consisting of five phases from Vaishnavi and Kuechler. The Technology Acceptance Model (TAM) was applied as the underpinning theory for this study. The study incorporates the VHT app and constructivist theory to measure user acceptance and validate the new MAR acceptance model. The results showed that all of the measurements were strongly agreed upon by the users and these reflect the high level of users' acceptance towards the use of the VHT app. The phase starts with the planning process involving the definition of the scope of the research and the identification of the target users. It continues with the establishment of the research constraints whereby it is a systematic approach to overcome any limitations pertaining to the research. The findings revealed that users rated perceived augmentation, enjoyment, perceived usefulness, perceived ease of use, attitude to use, and intention to use in the category of strongly agreed. The TAM was found to be a good theoretical tool for understanding users' acceptance of the app, based on the results of structural equation modelling. Enjoyment and perceived augmentation positively influence users' acceptance of the app. Furthermore, we found a gap between the supply and needs of customers in terms of types of AR application offered on the market. We identified advantages and disadvantages of AR applications over their traditional counterparts impacting its adoption besides Enjoyment and perceived augmentation positively influence users' acceptance of the app. The study's key contribution is the research model which proves the vigorous establishment of the TAM. The results indicate that the TAM is a viable model for understanding users' acceptance of a technology like the VHT app. Besides that, enjoyment and perceived augmentation have positive influence on users' acceptance of the VHT app. Thus, when designing and developing try-on app, factors that include enjoyment and perceived augmentation have to be incorporated into the app which are crucial to improve the acceptance of the tool.



**Keywords**: Hijab, Try-On, Augmented Reality, Acceptance, Structural Equation Modeling.

## Acknowledgement

First and foremost, I would like to thank to God for giving me chances and direction for me to be strength, patience and wisdom throughout conducting this research. This thesis would not have been possible without the guidance and assistance of several great souls that contributed their valuable support for this success. Then, I would like to express my utmost gratitude to my supervisor Associate Prof Abdul Nasir Bin Zulkifli for his excellent guidance, support, kindness, patience, motivation and his expertise in the field of study. I am truly blessed for having such a passionate and dedicated supervisor to guide my entire journey of this research. It is a pleasure for me to acknowledge the experts who have been involved in this study since it is started. Additionally, my sincere thanks to the Ministry of Education for supporting this research by funding the Fundamental Research Grant Scheme (FRGS); and my utmost gratitude also goes to Universiti Utara Malaysia for other supports and facilities provided that have facilitated the research process.

Last but not least, I also would like to say my deepest thanks to my family members especially my parents Mohd Pozi Bin Mohd Zaki (father) and Rozita Binti Abdul Aziz (mother) also my husband and daughter Muhammad Dzkri Bin Mohd Fauzi and Maryam Annisa Binti Muhammad Dzkri for their great moral, loves, patience and financial support. Not forget my siblings Dr. Muhammad Syafiq, Nur Syarafana and Muhammad Nur Syahid. My mother and father in laws and not to forget also my siblings in laws and my research colleagues Nur Farhatun Najwa Binti Rusli and Nurul Liyana Binti Che Ismail and others for the supports and encouragement in achieving this Master (by Research) degree.

# Table of Contents

# List of Tables

# List of Figures

## List Of Abbreviation

| | |
|---|---|
| VHT | Virtual Hijab Try-On |
| VTO | Virtual Try-On |
| TAM | Technology Acceptance Model |
| MAR | Mobile Augmented Reality |
| ATU | Attitude Towards Use |
| ITU | Intention to Use |
| E | Enjoyment |
| PA | Perceived Augmentation |
| PEOU | Perceived Ease of Use |
| PU | Perceived Usefulness |
| AR | Augmented Reality |
| GPS | Global Policy and Strategy |
| ATT | Perceived Attention |
| VR | Virtual Reality |
| IIT | Image Interaction Technology |
| VITON | Virtual Try-On Network |
| PE | Perceived Enjoyment |
| SEM | Structural Equation Modeling |
| PLS | Partial Least Squares |
| UTAUT | Unified Theory of Acceptance And Use Of Technology |
| RS | Score Range |
| AVE | Average Variance Extracted |
| CR | Composite Reliability |
| HTMT | Heterotrait-Monotrait Ratio |

# List of Appendices

# CHAPTER ONE

# INTRODUCTION

## 1.1 Introduction

Nowadays, business is becoming an important activity in our daily life. We as consumers would definitely purchase lots of goods as part of our obligations to ourselves as well as our families. Examples of items that we purchase include; groceries, furniture, and clothing. Clothing such as shirts, dresses, pants, socks and hijab are basic necessities for everyone. Now, there are many shopping centres that sell clothing around the world. Normally, shopping or window shopping are favourites activities of every individual, especially for women.

## 1.2 Research Background

Shopping is an activity of purchasing goods or services provided by the seller in accordance with the desired option. According to Arnold, Reynolds, Ponder and Leug (2005), shopping experience can vary from fun to horrible because of various factors including facilities, types of goods purchased, how customers are treated and mood. According to the Global Islamic Economy Report 2015-2016, Muslim consumers spend an estimated US$230 billion for clothing, and it is expected to increase to US$327billion in 2019 (Reuters & Standard, 2015). Malaysia's lifestyle goods exports totaled RM31.36 billion in 2015, up 12 percent from RM28 billion the previous year, with exports mostly to the Japan, United States, Singapore, China, Thailand, India, Turkey, and Indonesia. Women's apparel, such as blouses, bags, and shoes, proliferate quickly nowadays, and hijab is no exception. A single or numerous pieces of cloth are used to make the hijab, which is the most basic form of adornment. Hijab has been one

of the most flexible clothing adornments for millennia, serving a multitude of purposes throughout cultures. Hijabs are worn by Muslim women for modesty and good manners, and they are becoming increasingly fashionable among Malaysian women.

Currently, businesses selling attractive hijabs are springing up all over, and the response from female clients has been phenomenal. Various companies have evolved as a result of the overwhelming response from fans of fashionable hijabs, and numerous prominent Malaysian designers, such as Fareeda, Naelofar, and dUCkscarf, have promoted this style abroad in the last couple of decades. Naelofar's sales in 2015 totaled RM50 million, with the company's products supplied through major retailers and a chain of 700 dealers around the country. They sell online as well as through retailers in London, Brunei, Netherlands, Singapore, Australia, and the United States (Mayberry, 2015).



As a result, purchasing for trendy hijabs necessitates going to the store and trying on the hijabs themselves. This will necessitate them devoting the necessary time and effort. However, for those who are involved with various commitments, the chances of trying and eventually purchasing their favourite hijabs are slim. As a result, for this type of situation, a different strategy to purchasing is required, as well as the ability to try on favourite hijabs. When a hijab is tried on by too many customers, it can quickly wear out, and could not be sold anymore. As a result, the store owner must cover the cost of the hijab.

The rapid growth of the Internet and the computational power has emerged as compelling channels for sale of products. This has given rise to a new revolution in the sale and purchase of products known as e-commerce or electronic commerce. E-commerce is the process of purchasing and selling products and services through the

use of the Internet (Chaffey 2010). Considering the bigger picture, e-commerce entails exchanging business data, maintaining business connections, and carrying out commercial transactions via telecommunications networks. (Zwass, 1996). The growth of e-commerce has fundamentally altered how people shop and behave around the world. Farber (2016) reported that in 2016, US shoppers made 51% of purchases via e-commerce. Figure 1.1 below shows the total sales revenue of Amazon vs major retail stores.

According to Pajovi (2018), Amazon, an American-based e-commerce business, is currently the biggest in the world. The black bars represent the conventional (offline) stores revenues while the blue bars represent the Amazon e-commerce stores revenues. The Amazon e-commerce stores revenues are increasing rapidly year by year compared to the conventional stores. This proves that the consumers nowadays are more willing to purchase products online compared to the conventional approach.



The Internet could be used for e-commerce, but other types of technology would also be needed, especially for letting consumers make informed decisions before purchasing. Apparently, 30% of garments purchased online are returned by consumers, according to a survey conducted by Lectra (www.lectra.com). The majority of online purchase decisions are made based on 2D images of the garments, as well as sizing charts provided by retailers. There is no precision or interaction with these techniques in providing the actual size as well as the right decision to the buyer (Cordier et al., 2001).

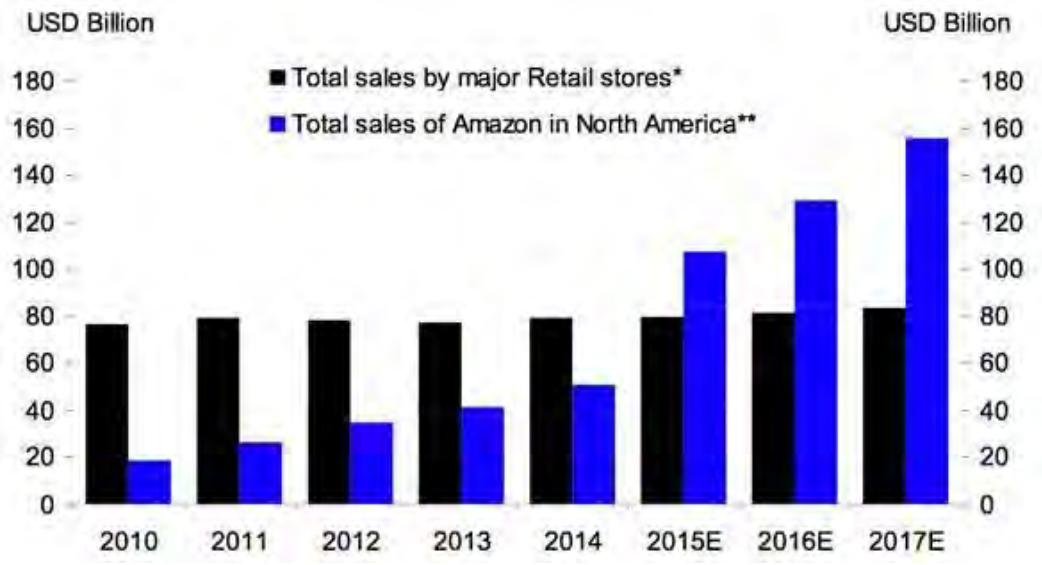


*Figure 1.1*. Total sales revenue of Amazon vs major retail stores (Source: http://www.businessinsider.com/amazon-compared-to-traditional-retail-in-one-chart-2015-11/?IR=T)

Meanwhile, as the biggest Muslim fashion market in the world, Malaysia has increased its trends in recent years and Muslim clothing is being worn in daily activities as well as during religious times. Housewives, entrepreneurs, artists, and even children wear it. Muslim clothing is used by housewives, entrepreneurs, artists, and even children.



The Virtual Hijab Try-On (VHT) app is described in this study as an app that enables women to explore, choose, and at their leisure to try on hijab. According to Kim and Forsythe (2008), utilizing the Virtual Try-On to improve the online buying experience can increase user engagement and participation.

### 1.3 Problem Statement

Lack of the digital technology in the modern era has negatively affected the marketing procedures and decreased the profit margin. The use of digital technology is a marketing strategy that marketer uses to influence customer behavior (Sugiat, Primiana, Kaltum, & Herwany, 2020). (Pappas et al., 2016) made a case for using interactive technologies

to change individuals' behavior and to persuade them to buy products. People anticipate high levels of internet service quality because it is much easier to compare pricing online. As a result, people heavily consider the quality of internet services while making purchases (Santos, 2003). In-depth knowledge of the elements influencing consumers' decision to purchase online or the quality of online services should be prioritized in order to make online retailers more competitive.

Furthermore, the minimal number of user acceptance for MAR application decreases the sales revenue. The Internet's explosive expansion and computing capacity have become powerful conduits for product sales. Beside the Internet as a medium for e-commerce, other form of technology is required specially to allow the shoppers to make vice decision prior to the purchase. According to a survey by Lectra (http://www.lectra.com), 30% of online garment purchases were returned by the consumers. The average return rate in the United States was 33% in 2012, and it is anticipated to rise even more in the future (Banjo, 2013). Shah (2014) reports that the typical return rate for online purchases of clothes in the US is 30%. Online purchases worth $20 billion were reportedly returned in the 2015 pre-Christmas months of November and December. (Maple, 2015). A return rate of 20% or more was observed in 2014 by 36.1% of German online shops selling clothing and accessories (Institut für Demoskopie Köln, 2015).

Most shoppers nowadays make their purchasing decisions based solely on images of the clothing and sizing guides when purchasing and selecting the size of their choice. Both of these approaches are less precise and interactive in presenting the proper size and option to the shopper (Cordier et al., 2001). Dressing and fitting are two primary issues facing online shoppers (Pachoulakis & Kapetanakis, 2012). Chen and Wang

(2010), on the other hand, stated that online shoppers had trouble matching garments.

Meanwhile, inadequacy of online clothing market is hugely affected the acceptance of MAR application in order to sell specific products through the TAM model. The online clothing market is rapidly expanding. Some people find it exhausting to try on clothes in stores and deal with time limits due to their busy schedules. It will be much more convenient if trying on clothes can be speeded up and simplified with the correct size, pattern, and colour without having to deal with time limits or long lines in a traditional fitting room. According to Liaw and Chen (2013), clothes can be fitted virtually on the users' body by allowing them to try on, even though in reality they are not actually trying them, and this approach can reduce the time constraints.

They have the joy of donning the clothes because of the real-time virtual try-on experience. Currently, customers have to go to the retail store to look around, choose, and try on the hijabs which necessitate them devoting the necessary time and effort. However, for those who are involved with various commitments, the chances of trying and eventually purchasing their favorite hijabs are slim. As a result, for this type of situation, a different strategy to purchasing is required, as well as the ability to try on favourite hijabs. When the same hijab is being tried by too many customers, it may wear out quickly and can no longer be sold. In this case, the hijab had to be covered for by the store owner.

There has been a noticeable trend in the retail sector toward the employment of digital technology as a marketing tactic to change consumer behavior. (Sugiat, Primiana, Kaltum, & Herwany, 2020). One such technology that has emerged as a compelling channel for product sales is the Virtual Try-On (VTO) app, which enables customers to try on clothes

virtually and make informed purchasing decisions (Liaw & Chen, 2013).

In the context of hijab sales, the use of VTO apps has the potential to address some of the challenges faced by online shoppers. Online shopping for clothing can be difficult because customers typically have to make purchasing decisions based on images and sizing guides (Cordier, Taylor, & Babb, 2001), which can be less precise and interactive in presenting the proper size and options to the shopper. Additionally, the issues of dressing and fitting are particularly challenging for online shoppers, with some experiencing difficulties in matching garments (Chen & Wang, 2010; Pachoulakis & Kapetanakis, 2012).

The VTO app can help overcome some of these challenges by enabling customers to try on clothes virtually, even though they are not physically trying them on. Customers may have less time limitations as a result, and they will be able to make better educated purchasing judgments. (Liaw & Chen, 2013). In the case of hijab sales, the VTO app can help customers to try on hijabs virtually and make purchasing decisions without having to physically visit the store. This is particularly beneficial for customers who are busy and cannot devote the necessary time and effort to visit a store (Sugiat et al., 2020).

Despite the fact that various Virtual Try-On applications have been developed around the world and some are commercially available, The Virtual Try-On program has received scant empirical investigation to date, particularly for hijab. As a result, determining the perception and acceptance of the Virtual Hijab Try-On app among the users becomes the key motivator for the study.

A frequently used framework for describing the adoption and use of technologies (Davis, 1989). The theory suggests that Perceived Usefulness and Perceived Ease Of Use have an

impact on how well technology is accepted (Davis, 1989). In relation to VTO apps, Perceived usefulness describes how much the app is thought to be helpful in guiding users toward wise purchasing selections, while perceived ease of use refers to the degree to which the app is perceived to be easy to use (Liaw & Chen, 2013). It is important to clarify the viability of the TAM framework and the limitations of VTO apps in the hijab market to determine the perception and acceptance of the VTO app among users.

Perceived Usefulness describes how much the app is thought to be helpful in guiding users toward wise purchasing selections, with a focus on the TAM framework. Specifically, The purpose of the study is to ascertain how the VTO app's perceived value and usability relate to users' intentions to utilize the app. The study also intends to investigate the moderating effect of gender on the relationship between perceived usefulness and intention to utilize the app.

In conclusion, A developing trend in the retail sector is the use of digital technology as a marketing approach to influence consumer behavior. The VTO app has emerged as a compelling channel for product sales, particularly in the context of hijab sales. However, Empirical studies on the application and efficiency of VTO apps are lacking, especially in the hijab market. By investigating the elements that affect the VTO app's acceptance and use in the hijab market with an emphasis on the TAM framework, this study seeks to close this gap.

## 1.4 Research Questions

The following are the questions that will be investigated in this study based on the problems mentioned above:

i. What are the factors that influence MAR Application acceptance
ii. How to measure user acceptance of MAR Application through a prototype
iii. How to validate the new MAR acceptance model

## 1.5 Research Objectives

The following objectives are introduced as guidance for this research in order to fulfill the objective.

i. To determine the factors that influence MAR Application acceptance
ii. To measure user acceptance of MAR Application through a prototype
iii. To validate the new MAR acceptance model



## 1.6 Research Hypothesis

There are seven hypotheses that have been formulated in this study, and Chapter Five goes into further depth about them.

$H_1$: Attitude towards use (ATU) has a positive relationship with Intention to use (ITU).

$H_2$: Enjoyment (E) has a positive relationship with Perceived usefulness (PU).

$H_3$: Perceived augmentation (PA) has a positive relationship with Perceived ease of use (PEOU).

$H_4$: Perceived augmentation (PA) has a positive relationship with Perceived usefulness (PU).

$H_5$: Perceived ease of use (PEOU) has a positive relationship with Attitude towards use (ATU).

$H_6$: Perceived ease of use (PEOU) has a positive relationship with Perceived usefulness (PU).

$H_7$: Perceived usefulness (PU) has a positive relationship with Attitude towards use (ATU).

## 1.7 Research Scope

This research focused mainly on domains namely the target users. The study's target users were female youngsters between the ages of 15 and 39. Erikson's stages of psychosocial development which are related to psychological development and interaction with social environments, including the learning or educational environment were used to group the users. In addition, Vuforia and Unity were used to develop the VHT app for Android in order to impact user acceptance. A floating button-based user interface that allows users to view a collection of hijabs and try on any of the preferred hijabs visually. Adobe Photoshop will be used for image editing. The VHT app will be developed to allow users to try-on their favourite hijabs on their own or with the help of their friend, husband or somebody else. They can take a picture of themselves wearing their favourite hijab and publish it on multiple platforms such as WhatsApp, Facebook, and Instagram after they are satisfied with the fit. For analyses, the perception of the users was determined using descriptive statistics in SPSS. In determining the users' acceptance, The model was tested using structural equation modeling and path partial least squares.

## 1.8 Research Significance

This research will increase the amount of understanding in the field of online shopping in hijab industry that looks into prototype design for customer and retailer to upscale the purchase intention. From the retailer side, VHT app have clear benefits. Obviously, their ease of use will attract more people in stores. Besides that, the application provides an easier

and faster virtual fitting room for hijab users via online tool for performing VHT app which integrates MM and AR technologies. It also provides an interactive mobile-based 2D real-time visualization learning tool which is readily accessible anytime and anywhere and attractive to the "mobile savvy" youngster and elder generations. The findings from this study as simulation technologies transform the apparel shopping experience.

The VHT app's practical use necessitates the addition of several virtual objects. Finally, the VHT app has to be developed for mobile phone users. VHT app, as previously said, is a substitute to a fully virtual try on. Customers who prefer e-commerce from home can benefit from VHT app if they are unable to visit a real store. This chapter provides a summary of what the researcher wants to accomplish with this investigation. An overview of the subject matter of this study is given by the research background, problem statement, research question, and research purpose discussed above.



## 1.9 Summary of All Chapters

**Chapter One: Introduction**

The overall introduction to the thesis is presented in this chapter. The sub-sections start with the research background, proceed to the problem statement next. Next are the research questions and objectives. It continues with the research hypothesis, research scope, significance of research, and lastly conclusion.

**Chapter Two: Literature Review**

This chapter contains previous relevant research was evaluated with an emphasis on the attributes, theories, and models employed in the study. AR and MM technologies are also discussed, as well as related theories that are applied in this study.

**Chapter Three: Theoretical Framework**

The theoretical framework used in this study, which includes the Technology Acceptance Model, research model, and all its hypotheses is elaborated on in this chapter.

**Chapter Four: Research Methodology**

This chapter discusses the research approach and methods employed in this study. It was adapted from Vaishnavi and Kuchler (2011) and consists of five primary phases. In addition, the chapters also explain how the methodology was carried out.

**Chapter Five: Data Analysis and Results**

The evaluations that were carried out are discussed in this chapter which includes expert and user evaluations. One expert evaluated the content of the VHT app while the functionality and interface of the VHT app was evaluated by two experts. Meanwhile, the user evaluation comprises of perception and acceptance of users towards the use of the VHT app. SPSS was utilised for the perception study and SmartPLS was applied for the acceptance study. For the purpose of pre-testing the research instrument, a pilot study was also conducted.

**Chapter Six: Conclusion**

The overall findings in this chapter offer a synopsis of the study. It includes every goal of the research that was completed, as well as the contribution to the research topic, limitations encountered, and future research recommendations.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Background

To pay attention to the chosen study subjects, a review of previous literature relevant to this subject is essential. Merchants and retailers employ a variety of strategies to make it easier for their customers to try on apparel. The background study on the concepts of Virtual Try-On and Mobile Augmented Reality (MAR) is reviewed in this chapter. Additionally, it talks about some of the earlier investigations into the two research fields.

## 2.2 The Apparel Industry

In the United States, the main contributor to the overall economy is the apparel industry whereby in 2017, this industry contributed about US$328.07 billion in apparel sales and the market size projection for 2025 is US$390 billion (Statista, 2019). Meanwhile for Malaysia, Statista reported that for 2018, it was expected that the revenue from the fashion segment to be around US$155 million. The annual growth rate for the years 2018-2022 to be projected at 10% and the market volume to be expected around US$227 million by 2022. Clothing is the largest segment with market volume expected to be US$110 million in 2018. This implies that the retail industry and consumer expenditure on apparel are both quite important. Therefore, research related to the various influences in the context of clothing can lead to a view that can be beneficial if understood and adhered accordingly.

Vanity size is one of the concerns that is gaining a lot of attention, according to the literature review. Ketron and Naletelich (2017); Ketron and Spears (2017); Kinley (2003); Hoegg et al. (2014); Aydinoğlu and Krishna (2012); Ketron (2016) have

documented the importance of vanity size and various feedbacks from users to smaller label sizes than usual, including pros and cons results. However, these researches were unable to investigate the significance of a consumer's clothing size as part of their self-concept. Then, because of the gender disparities in vanity size, these reactions will shift even more (Franz, 2017).

Digital fit and sizing technology is becoming more popular, and it is now available as a feature on merchant both mobile apps and webpages. This innovation is designed to help or advise online shoppers who are looking for items chosen for fit, size, or style. By presenting digital photographs of the body's clothing before to purchase, buyers can eliminate ambiguity, lower return rates, and increase online shopping's effectiveness. Product returns, on the other hand, continue to account for about half of all online purchases, since online platforms must overcome intrinsic obstacles such as a lack of tactility in clothing choosing (Mintel, 2017).



Among the world's most important industries is the fashion industry. According to Amed, Berg, Brantberg, & Hedrich (2016), it is valued at US$2.4 trillion and is growing at a 5.5% yearly pace. The fashion industry is characterized by the temporary features that make up the boom. Fashion is a social and temporal structure that allows people to be incorporated into a specific period and place (Kaiser, 2012). People all around the world, for example, often get rid of clothes that are physically wearable but not in line with the latest fashion trends after fashion events like Paris Fashion Week, the Met Gala, and New York Fashion Week. Clothing allows individuals to express themselves. Consumer preferences change rapidly as trends around the world change. This means that driving the growth of the fashion industry is just a short-term waste resulting from the short-lived nature of fashion. As a result, the researcher integrates MAR and MM

to influence user acceptance, as well as providing background information of the study relating to the concepts of MAR and MM.

The dynamic transformation in the apparel sector is being fueled by the shifting perspective of customers' buying habits (Nayak and Padhye, 2015). Changing demographics and consumer preferences are two major obstacles facing the garment sector. However, they show that only 20% of clothing is collected for recycling and reuse, with the majority of the remaining items usually ending up in landfills (Boston Consulting Group, Global Fashion Agenda, 2017). The demand from consumers for clothing products that are created, made, and distributed sustainably is rising in order to reduce the impact on the environment and society (Nayak and Padhye, 2015). The second-most polluting industry in the world is the clothing sector (Henninger et al., 2016).



**2.3 Mobile Augmented Reality**

MAR On a mobile device's screen, which is a combination display with the AR service that is designed for portable devices, users may interact with virtual objects. New opportunities for MAR in the next 5G networks are expected. (J. G. Andrews et al., 2014). Both academia and industry are increasingly interested in MAR. For MAR applications, there are two main platforms: Hardware-based MAR and App-based MAR. In a Web-based approach, A benefit of the development of 5G communication networks is MAR dense computing. Considering MAR's potential, it is expected to become a powerful new tool for improving how we interact with the physical and cyber environments surrounding us (Qiao, 2019).

Based on Azuma, 1997 definition, AR involves integrating virtual objects with three-dimensional environments in real-time and supporting interaction. MAR content is referred to the experiences that are displayed. MAR is also defines based on the user experience is

investigated empirically as well as their perception and, the informativeness and ease of use (Qin, Peak, & Prybutok, 2021).

Apps that integrate MAR have a favorable effect on PEOU, E and user satisfaction. The interactive nature of Mobile AR apps is not unique to them, it is the most main features, enables users to navigate apps and allow them find what they're looking for (Do, Shih, & Ha, 2020). The two categories of MAR applications already available are image recognition-based AR applications and AR browsers (Olsson & Salo, 2011). Many open source and commercial AR browsers have emerged in response to the fast expansion of technologies linked to MAR, including Wikitude, Layar, Junaio, Sekai Camera, and ARViewer (Grubert, Langlotz, & Grasset, 2011).

David Prochazka, Michael Stencl, Ondrej Popelka & Jiri Stastny (2011) in their study entitled MAR applications propose MAR a cloud-based MAR programme that enables the use of more advanced computational techniques like neural networks. AR Depending on the sort of device being used, apps can be split into two primary categories which is applications for transparent gadgets and tools for equipment that records the scene as video. In order for the programme to function at its best, the user will utilise a tablet or other mobile device to "look" at a real automobile or a physical model of one. The user will next choose the replacement part for the vehicle. The user will be able to virtually interchange the part thanks to the application's connection to an online part database (store). The idea of an AR application aimed at assisting automotive designers and customizers has been described in this article. The programme is made for mobile devices that can produce AR video composites. From the article, it can be stated that the MAR uses a technique for identifying replacement parts on an actual automobile using a neural network. It also benefits from the principles of cloud computing because the computationally intensive

processes are carried out on the server. The server also has a sizable database of interchangeable auto parts. Consequently, this idea ensures good performance and scalability.

Another research is by Nur Intan Adhani and Dayang Rohaya Awang Rambli (2012) on their article ‘A Survey of Mobile Augmented Reality Application’. These post from the initial MAR application's development in 1997 to the present, turn provides an overview of possible or actual uses of MAR applications. Putting a focus on sports, The objective is to observe the trend and the relevance of MAR in the fields of gaming, entertainment, cultural heritage, health, education, and training. This will depend on where it may be utilized. According to study results, Mobile Augmented Reality can encourage user social interaction and fun learning in the areas of sports, gaming, and educational entertainment. While the thing is only visible on-screen devices that can control the virtual object, a user can still sense how genuine it is while using MAR. MAR in the field of cultural heritage can reconstruct historic artefacts and structures in addition to enhancing the user's educational experience. This will enable the creation and preservation of educational resources in the event of a catastrophe. Medical operations that once could have been life-threatening can now be done less frequently. In this instance, medical personnel can now observe a patient's interior organs and skeletal structure using MAR images superimposed over the outside of the body. As a conclusion, it can be said that mobile AR has the potential to increase healthcare's training and procedure efficiency and efficacy.

Next, Danakorn Nincarean, Mohamad Bilal Ali, Noor Dayana Abdul Halim and Mohd Hishamuddin Abdul Rahman (2013) on their article Mobile Augmented Reality: the potential for education mentioned about information about Mobile Augmented Reality and serve as an example of its educational potential. As Information Technologies advance,

teachers have long attempted to integrate new technology into the classroom to enhance student learning. One of the cutting-edge tools with enormous instructional potential is increasingly being acknowledged by educational experts is Augmented Reality (AR). the capability of fusing the real and the virtual worlds has opened up fresh possibilities for raising the level of instruction and learning. The utility of AR can be further boosted when integrated with other types of technologies, such as mobile devices. The name MAR appears when AR is connected to cutting-edge technology like a mobile device.

### 2.4 Multimedia

Multimedia is a combination of text, graphics, sound, animation, and video that displayed by a computer (Gilakjani, 2012; Yong, 2013; Smith, 2013). Multimedia is a term that refers to a collection of interactively accessible material, such as video, photos, audio, and text, that is provided electronically. Computers released in the 1990s were called "multimedia computers" because they included a CD-ROM drive. Depending on your point of view, multimedia can be described in a variety of ways. Multimedia uses computers to display text, audio, video, and images in a variety of ways, combining various aspects in a variety of formats and combinations (Gilakjani, 2012). Multimedia such as images, audio, video and animation of fashionable clothes through the use of the app attracts customers and their minds forcefully buy the attractive products. The popular application of multimedia specifically for business purposes helps marketers to 19 enhance business growth through the process of online marketing, social media marketing and many others.

### 2.5 Conventional Apparel Fitting

According to Childers et al. (2001), there are two factors that determine whether or not people shop in traditional or online stores; functional motive is concerned with making a smart decision, while hedonic motive is concerned with enjoying the purchasing

experience. In reducing the product risks and enhancing the value of entertainment in online shopping, retailers are resorting to the used of enhanced product visualization techniques in which sensory input is included in the online shopping experience (Kim & Forsythe, 2008). When customers come into a store, retailers want to make sure that every component of the surroundings reflects the brand's excellence. Installing beautifully built fitting rooms can improve the customers' experience and encourage them to buy. According to the Cambridge dictionary, a fitting room is an area in a store where customers can try on things to make sure they fit before purchasing them. Trying on clothes physically at a store's fitting room is a time-consuming activity that often necessitates multiple attempts before a shopper can make a design, colour, or size selection (Yuan et al., 2013).

### 2.6 Virtual Try-On Fitting

From Cambridge Dictionary, virtual is an adjective that meaning almost a particular thing or quality. From Merriam-Master, virtual refers to something that exists in essence or effect but is not officially acknowledged. Next, virtual also refers to something that occurs or is replicated on a computer or computer network, such as in a Virtual Reality (VR).

Meanwhile, According to TechTarget, Virtual Reality (VR) is a 3D world that users can explore and interact with that closely matches reality as perceived by their senses. Users may also need to wear gear like helmets or goggles to interact with the environment, which is created by computer technology and software. Other than that, on website Britannica, VR apps use interactive devices that can be worn as goggles, headsets, gloves, or bodysuits to envelop viewers in an atmosphere that is computer-generated and closely resembles reality.

VTO allowing consumers to virtually try on digital apparel utilizing computers (or other

items). VTO implies that customers use their phones or tablets to digitally try on things, such as apparel, jewellery, and makeup. By using their device's camera, the technique leverages augmented reality to layer images over the real world. When using VTO, consumers can snap images of themselves using the virtual product and post them online or with their friends and family to discuss the experience. To observe how it seems, they might even solicit assistance. In this manner, word spreads spontaneously, and the likelihood of returns is minimized. All these being said, VTO Technology is no longer a futuristic concept; rather, it is a vital instrument that guarantees a convenient buying experience and should be on the to-do list of any luxury marketer.

The previous years, the use of VTO applications has become increasingly popular as users can try on a variety of outfits without needing to change physically. Users are able to make decisions as a result of this, which helps to increase sales (Hauswiesner et al., 2013). Product information obtained through VTO can be equivalent to that obtained from actual product inspections. In addition, according to Kim and Forsythe (2008), VTO increases the fun factor of internet buying via its interactivity and the involvement of the customers. This technology enables the creation of virtual models by the shoppers based on their own measurements, hair colour, body shape and facial characteristics. Shoppers can zoom in and out on the products, turn and look at things from different perspectives, and see the product in a variety of colours (Kim & Forsythe, 2008).

Digital objects can be added into pictures or videos using Augmented Reality (AR) technology, allowing virtual things to be integrated into videos (Van Krevelen & Poelman, 2010). It can be used in a variety of industries, such as education, e-commerce, maintenance, design, and enhancing people's perceptions of reality. (Zhang et al., 2017). Customers can preview items and try them out comfortably while they are at home using the VTO application based on augmented reality technology. Several researchers

have proposed the VTO applications for clothes that include; Giovanni et al. (2012), and Cao et al. (2015) while Zhang, Guo, Laffont, Martin, and Gross (2017); Yuan, Tang, Liu, Ling, and Fang (2017); Cuaresma and MacKenzie (2017). Meanwhile, Rahman et al. (2010) and Oztel and Kazan (2015) have proposed VTO applications for makeup, Mottura et al. (2007) for eyeglasses, Eisert et al. (2008) for shoes. The use of VTO technology can assist in expediting the buying process by allowing consumers to try on items without having to physically put them on (Yuan et al., 2013). It allows side-by-side comparison of multiple clothes and enables users to view the outfits from various angles thus, enhancing the shoppers' experience. The VTO also can be used as digital signage for advertising in order to attract the crowds (Yuan, Khan, Farbiz, Yao, Niswar, & Foo, 2013).

### 2.7 Virtual Try-On for Web

Web technologies play an important role not only in influencing shoppers when they choose, search, and compare products, but also interacting with the products (Pantano & Naccarato, 2010). Alternatives such as metaverse or virtual shopping (Domina et al., 2012; Bourlakis et al., 2009) may give an impression of possibilities, but actual products experience online is at an early stage. Online simulations may aid users in making interim decisions, while online simulations may give retailers with more opportunities to interact and influence users. On a website, the VTO technology enables the users to select for instance complementary clothes such as shirts, shoes and skirts from the catalogue and see the outfit on the screen (Merle, Senecal, & St-Onge, 2012).

Image interactivity is the interactivity of website features that enables the production and modification of images of environment or product to mimic the real acquaintance with the environment or product (Fiore & Jin, 2003). On the website, users can change

product design characteristics, backgrounds, contexts, viewing angles or distances, and mimic product operations, resulting in enriched product information via visual signals, thanks to image interaction technology (IIT) (Li et al., 2001, 2002; Fiore & Jin, 2003). A comparison study by Cordier, Lee, Seo, and Magnenat-Thalmann (2001) between retailer's website using 2D product catalog and a mixture of IIT feature indicated that after using the IIT feature, users reported greater purchase intentions, revisit intentions, and spent more time than expected on the website and had a more positive attitude towards the website. The findings of a study by Patodiya and Birla (2017) demonstrated that the VTO application does have an impact on decisions to buy clothing online, and that awareness of the VTO application in those decisions is unrelated to demographics. (age and gender).

## 2.8 Previous Research on Virtual Try-On

### 2.8.1 Virtual Try-On for clothes

While internet clothing shopping is convenient, people are concerned about how particular garments in product photos will look on them when they purchase clothing. As a result, allowing customers visual fitting will enhance the shopping experience, change consumer purchasing behavior, and reduce costs for merchants. Different firms, such as triMirror and Fits Me, have built virtual fitting rooms/mirrors as a result of this. triMirror is the first real time solution that allows for try-on of actual clothes on customizable avatar. It is accurate, 3D visualized, animated, beautiful and entertaining, and valuable to shoppers. Figure 2.1 shows a snapshot of triMirror.


*Figure 2.1.* Snapshot of triMirror

Meanwhile, Fits.me is an idea for an online fitting room that allows customers to digitally try on clothing to see how it might fit them. Fits.As seen in Figure 2.2, Me integrates shopper and garment data so that customers can see exactly how the clothing will fit and look on them.


*Figure 2.2.* Snapshot of Fits.Me

Virtual Try-On Network (VITON) was introduced by Han et al. (2017), which easily transfers a chosen article of clothing onto the appropriate area of a person. The output of each step in the VITON approach is shown in Figure 2.3.

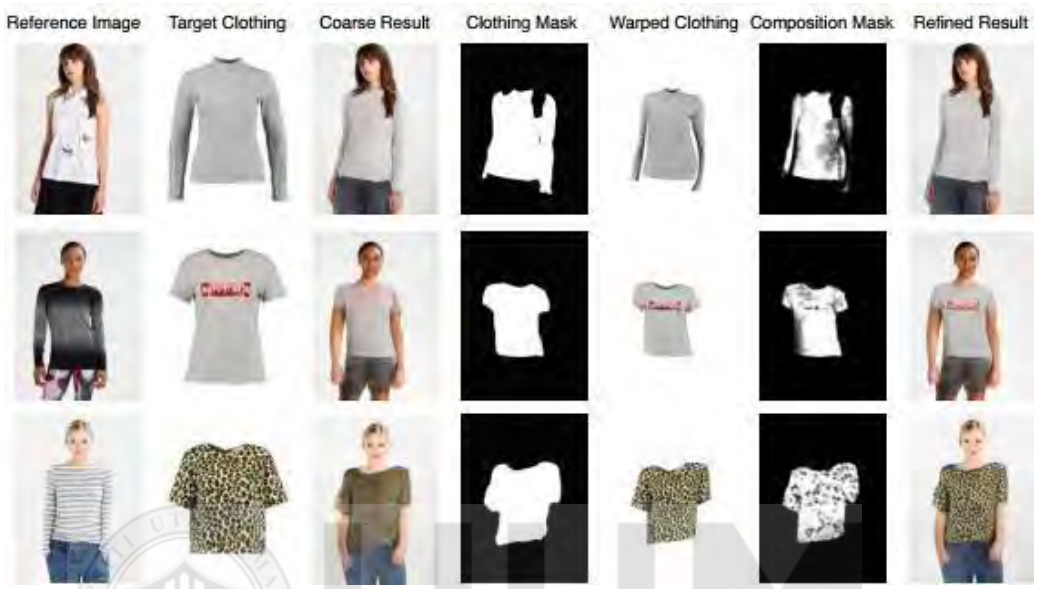


*Figure 2.3.* Output of each step in VITON approach (Han et al., 2017)

In a virtual mirror environment, Hilsmann and Eisert (2009) provided a method for real-time imaging of clothing using a dynamic texture superimpose technique from monocular pictures. The system takes the user's image with minimal clothes and covers it with a segmented image of a model wearing the target outfit as shown in Figure 2.4.

*Figure 2.4.* Input image, mesh used for tracking, mirrored augmented output images (left to right) (Hilsmann & Eisert, 2009)

A VTO application developed by Spanlang et al. (2005) requires the user to scan and document once, then the virtual clothes will appear on the model. With today's new

generation of sensing technologies, such as the Microsoft Kinect, which can produce high-quality videos, VTO applications can dramatically expand their capabilities (Shotton et al., 2011).

### 2.8.2 Virtual Try-On for Eyeglasses

Besides clothing, for those who wear eyeglasses, Zhang et al. (2017) have developed a virtual mirror system that allows various eyeglasses with lenses that have been prescribed to be tried out by users as shown in Figure 2.5. Their system requires input that includes; image of users without eyeglasses, the eyeglasses prescription of the uses and a 3D representation of the eyeglasses frame. The system produces 3D corrective lenses on the frame of the eyeglasses and alters the video arrangement by inserting virtually the eyeglasses onto the user's image. This technique provides an opportunity for users to assess the appearance when wearing a pair of new eyeglasses.

*Figure 2.5.* Prescription eyeglasses virtual try-on (Zhang et al., 2017)

Augmented Reality technology was by Yuan et al. (2011) to create a 3D eyeglasses VTO system. The system enables the user to choose virtual eyeglass models to try, and it will automatically adjust the fit to the user's face. The device works as a mirror, enabling the user to see their own face through 3D virtual eyeglasses, as shown in Figure 2.6.

*Figure 2.6.* The 3D virtual eyeglasses try-on system (Yuan et al., 2011)

The Magic Glasses, a 3D virtual eyeglasses system using 2D Internet imagery of human faces wearing eyeglasses was proposed by Yuan et al., (2017). Only a 2D frontal facial shot of anyone wearing the target eyeglasses is required. The system requires only 2D frontal facial images anyone who wears the target eyeglasses. Figure 2.7 shows the Magic Glasses' input and output images. Based on the input image of the desired glasses, the system fits the glasses to the person who is in front of the Kinect device. While using the augmented video stream, the user can engage with the virtual eyewear. By exploring the Internet, Magic Glasses allows varieties of eyeglasses to be used for VTO.

*Figure 2.7.* Input image (left) and output of Magic Glasses (right) (Yuan et al., (2017)

**2.9 Virtual Try-On for Hijab**

Virtual Try-On for hijab based on the researcher's examination of the literature, has not gotten much attention. Despite the fact that there are multiple VTO hijab applications accessible on Google Play, no empirical study on the apps' utilisation among users has been conducted. Nonetheless, Nugraha and Nasrudin (2015) conducted the only study that presented a technique of displaying hijab virtually using AR. Using the elliptical mask technique, an algorithm was developed that fits the hijab onto the user's face. They also conducted a quantitative study among 30 respondents to assess the effectiveness of the virtual hijab fitting technique. The findings imply that 93.3 percent of respondents strongly approve or agree that it is a good idea to use the approach for virtual hijab fitting.

The VHT app is designed to assist women shoppers to peruse, choose, and try on virtually the hijab based on their preferred colour, pattern, and design to suit their clothes, make-up, and skin tone. Women shoppers can try-on the hijabs during their leisure time. Shoppers can try on hijabs in a variety of colors, patents, and designs, without needing to try on at the store’s fitting room. VHT app can also be made available at the shopping premises so that every shopper can try on the hijabs without

having to go to the fitting room. The introduction of the VTO technology, especially for hijab business in Malaysia, will be something that has never been done before and it will make it easier for women shoppers to purchase the hijabs in the future.

## 2.10 Previous studies on the application of Mobile AR

As stated in Table 2.1, the researcher acquired some information from previous studies related to MAR for this study. Table 2.1 lists several previous studies on the Mobile Augmented Reality. Domínguez Alfaro, et al. (2022) in their articl entitled "*Mobile Augmented Reality Laboratory for Learning Acid-Base Titration"* found that MAR and VR enabled the constant use of laboratory techniques in high school and college chemistry. Besides that, Jiang, et al. (2022) in their article "*The Impact of Perceived Interactivity and Intrinsic Value on Users' Continuance Intention in Using Mobile Augmented Reality Virtual Shoe-Try-On Function"* found that attitudes and intentions of consumers to use the AR Virtual Shoe-Try-On feature are influenced by perceived interactivity and intrinsic value.



Based on the findings as stated in Table 2.1, Mobile Augmented Reality is able to enhance the user Intention To Use and give positive impact towards the objective of used.

Table 2.1

*Previous studies related to Mobile Augmented Reality*

| Article | Reference | Study's Goal | Technology Used | Finding |
|---|---|---|---|---|
| Mobile Augmented Reality Laboratory for Learning Acid-Base Titration | Domínguez Alfaro, Gantois, Blattgerste, Croon, Verbert, Pfeiffer, & Van Puyvelde, (2022). | To assess the prototype of a MAR lab design that had been developed. | MAR and Virtual Reality | This mobile app was created to make it possible to practice lab techniques everywhere in the context of |

| | | | | |
|---|---|---|---|---|
| | | | | high school and college chemistry courses. |
| The Impact of Perceived Interactivity and Intrinsic Value on Users' Continuance Intention in Using Mobile Augmented Reality Virtual Shoe-Try-On Function | Jiang, Sun, Yang, & Gu, (2022) | To investigate a theoretical model that explains how consumers' perceptions of interactivity influence intrinsic value, which in turn influences attitude and, in turn, adds to the theoretical model. | MAR | Perceived interaction and intrinsic value affect consumers' attitudes and intends to use the augmented reality (AR) virtual shoe-trying function. |
| A Survey on Mobile Augmented Reality With 5G Mobile Edge Computing: Architectures, Applications, and Technical Aspects | Siriwardhana, Porambage, Liyanage, & Ylianttila, (2021). | To present an extensive literature survey highlighting how 5G and MEC are advocating future MAR applications to overcome the current technological barriers | MAR | This study demonstrates that through improving the quality of the user experience and the wellbeing of the smart next generation society, future MAR applications will give value to a wide range of application sectors. |
| Mobile Augmented Reality Heritage Applications: Meeting the Needs of Heritage Tourists | Yin, Jung & Lee, (2021). | This study therefore aims to identify heritage tourists' needs and involvement when developing mobile AR heritage | MAR | The Asian tourist market should be taken into account when using those topics. |

| | | | | |
|---|---|---|---|---|
| | | applications using a grounded theory approach. | | |
| Effect of Mobile-Augmented Reality (MAR) in Digital Encyclopedia on The Complex Problem Solving and Attitudes of Undergraduate Student | Putra, Sumarmi, Sahrina, Fajrilia, Islam, & Yembuu, (2021) | The goal of the study was to see how mobile augmented reality affected students' abilities to solve complicated problems and their attitudes toward making responsible decisions. | MAR | The findings revealed that mobile augmented reality significantly improved the students' capacity for addressing difficult problems and disposition toward making ethical decisions. |
| Measuring User Experience, Usability and Interactivity of a Personalized Mobile Augmented Reality Training System | Papakostas, Troussas, Krouska, & Sgouropoulou, (2021). | The implementation of training systems using augmented reality (AR) in firefighting | MAR | The cited acceptance variables assist AR developers in improving the firefighters' training operational experience. |
| Determinants of the Intention to Adopt Mobile Augmented Reality Apps in Shopping Malls among University Students | Saprikis, Avlogiaris & Katarachia, (2021). | An empirical study was conducted with the goal of offering crucial recommendations and investigating an integrated conceptual framework that attempts to establish the importance of | MAR | The results show that performance expectations, enjoyment, and reward are all decisive factors in whether a particular technology gets accepted in a mall or not. |

| | | | | |
|---|---|---|---|---|
| | | specific criteria that allow the use of mobile augmented reality apps in shopping malls. | | |
| Design of a Mobile Augmented Reality Platform with Game-Based Learning Purposes | Costa, Manso & Patrício, (2020). | Every day, research proving the benefits of augmented reality in promoting student engagement in learning grows. | MAR | Playing the game and learning about the Solar System is encouraged for students. |
| Effects of Mobile Augmented Reality and Self-Regulated Learning on Students' Concept Understanding . | Muali, Setyosari, Purnomo & Yuliati, (2020). | Based on their self-regulated learning levels in the solar system lesson, assess changes in students' knowledge levels after employing mobile augmented reality versus traditional learning. | MAR | Mobile augmented reality learning significantly enhances students' comprehension of subjects while they are learning. |
| Home Sales Brochure Application Using Augmented Reality and Android-Based Virtual Reality On CV. | Aini & Aisa (2018) | The goal of this study is to develop a program that generates 3D homes. | MAR and Virtual Reality | To successfully construct a 3D home model for the purpose of marketing or selling properties, this program was created. |
| Augmented Reality Technology Implementation in Local Automobile Advertising | Yi, Wahid, Hamid, Murli, & Othman (2018) | The paper details how augmented reality was used to promote through mobile phone. Quick responses to customer inquiries | MAR | This study has successfully created to offer alternative advertising possibilities to car users. |

| |
|---|
| are possible with<br>this application. |

## 2.11 Factors Influencing Acceptance of Mobile Augmented Reality Application Based on Technology Acceptance Model (TAM)

People now use technology for their daily activities as a result of how far technology has evolved. The development of Mar apps, which have been used for a multitude of purposes, including online commerce, gaming, and teaching, is one of the most recent developments. The successor to AR, MAR is primarily designed for use with mobile devices like smartphones and tablets. MAR applications give consumers a distinctive and interactive experience by fusing the physical and digital worlds.

A MAR program called Virtual Try-On let customers to virtually try on things like apparel, eyewear, and makeup before making a purchase. Many companies, particularly in the fashion sector, have adopted this technology to enhance the online shopping experience for customers. Customers can view how various things appear on them with VTO without actually trying them on. The most recent MAR application, namely Virtual Try-On, and its impact on user acceptance are the main topics of this literature study.

What are the factors that influence the acceptance of MAR applications based on the Technology Acceptance Model (TAM)? is the main question driving this work. Particularly in the fashion industry, interest in the creation and application of Virtual Try-On (VTO) technology has grown. Liang and Turban (2011) claim that the TAM can be utilized to explain why new technologies like VTO are accepted and that the primary factors of technology acceptance are Perceived Usefulness (PU) and Perceived Ease Of Use (PEOU) 37. While PEOU implies a user's view that the technology will be easy to use, PU denotes a user's belief that a technology would increase their performance.

According to Kim et al. (2020), the TAM framework can be used to analyze how VTO technology is accepted. The study examined the factors influencing VTO adoption in the fashion industry and found that PU and PEOU are important indicators of VTO acceptability. The study also found that how realistic VTO is viewed by the user significantly affects how they feel about the device. To determine the impact of individual characteristics on VTO adoption in the fashion industry, Wang and Sun (2021) conducted a second study. The study found that user approval of VTOs is significantly influenced by both PU and PEOU. User acceptability can also be influenced by individual differences such as cognitive style and the need for uniqueness.

Sung et al. (2022) examined the influence of social influence on the acceptance of VTO technology in a more recent study. According to the study, the user's intention to use VTO is highly influenced by subjective norm, which is the user's impression of societal pressure to use a technology. The study also discovered that a user's attitude about using technology is substantially influenced by how much they seem to like using VTO. However, despite VTO's rising popularity, questions remain regarding the technology's efficacy and accuracy. The accuracy of VTO technology in the fashion business can have a considerable impact on the user's happiness with the technology, according to a study by Sun et al., (2020). The 38 study also discovered that a user's inclination to use VTO in the future can be influenced by their past experiences with the technology.

In recent years, notably in the fashion industry, MAR applications, particularly Virtual Try-On, have grown in popularity. The elements that affect the acceptability of VTO technology, including as Perceived Usefulness, Perceived Simplicity Of Use, and Perceived Realism, have been explained using the Technology Acceptance Model (TAM). Additionally discovered to have

an impact are individual variations and social influence.

## 2.12 Perceived Augmentation

Perceived Augmentation is another factor that has been investigated in the literature on the acceptance of MAR applications, including Virtual Try-On (VTO). Perceived Augmentation refers to the extent to which a user perceives that the technology adds value to their experience beyond what is available in the real world. The degree of Perceived Augmentation, or the extent to which the AR application enhances the real-world environment, has also been proposed as an important factor (Gupta et al., 2020). some studies have proposed extending the TAM model to include additional variables that could influence user acceptance of MAR applications. For example, a study by Ariffin et al. (2018) proposed adding trust as a new variable to the TAM, as trust has been found to be an important factor in the adoption of new technologies. PA refers to the extent to which MAR applications enhance users' perception of reality by providing them with additional information or sensory experience beyond what is currently available to them. This section reviews recent studies on PA in MAR applications and how it affects user acceptance.

Several studies have shown that PA is a significant predictor of user acceptance of MAR applications. For example, a study by Lu and Yang (2018) found that the perceived level of augmentation significantly influences users' Perceived Usefulness, Perceived Ease Of Use, and Intention To Use the application. Similarly, a study by Ma and Agarwal (2018) found that Perceived Augmentation positively affects user satisfaction, Intention To Use, and actual usage behavior of MAR applications. These studies suggest that the extent to which MAR applications provide additional information or sensory experience beyond what is currently available to users significantly influences their acceptance and usage of such applications.

Some studies have also identified specific attributes of PA that influence user acceptance of MAR applications. For instance, in a study by Kim et al. (2019), they found that the level of interactivity and the degree of sensory feedback are two attributes of PA that significantly influence user acceptance. Similarly, a study by Kim et al. (2020) found that the quality of virtual objects and the level of user engagement are significant predictors of user satisfaction with MAR applications. These studies suggest that specific attributes of PA may play a crucial role in influencing user acceptance of MAR applications.

Moreover, a few recent studies have proposed new frameworks and models for evaluating PA in MAR applications. For example, in a study by Huh and Lee (2018), they proposed a new model called the "MAR Value Co-creation Model," which takes into account not only users' Perceived Augmentation but also the value co-creation process between the user and the application. Similarly, in a study by Jeon et al. (2020), they proposed a new framework that integrates both sensory and cognitive factors into the evaluation of PA in MAR applications. These studies suggest that evaluating PA in MAR applications is a complex and multi-dimensional process that requires a comprehensive framework or model.

In conclusion, PA has been identified as a significant predictor of user acceptance of MAR applications in recent studies. Specific attributes of PA, such as the level of interactivity, sensory feedback, quality of virtual objects, and user engagement, have been found to play a crucial role in influencing user acceptance. Additionally, new frameworks and models have been proposed to evaluate PA in MAR applications, which take into account not only users' Perceived Augmentation but also other factors such as value co-creation and cognitive factors.

According to a study by Choi and Lee (2018), users' attitudes regarding using AR-based fashion VTO applications are significantly influenced by their Perception of Augmentation. The study

also discovered that the user's intention to utilize the technology is significantly influenced by perceptions of the technology's usefulness and usability. In a related study, Kim and Park (2019) discovered that Perceived Augmentation, along with Perceived Usefulness and Perceived Simplicity of use, greatly influences the user's attitude about utilizing AR-based makeup VTO applications. However, better user adoption may not necessarily result from the Perceived Enhancement of VTO technology. In a study by Zhang et al. (2020), it was discovered that users' attitudes toward using VTO technology can be negatively impacted by the perceived over-augmentation of the technology, where the virtual elements are perceived to be too much or too unrealistic.

The research from (Rauschnabel, P. A., Felix, R., & Hinsch, C., 2019) develops and empirically tests a theoretical framework that theorises how users perceive and assess the advantages and augmentation quality of AR apps, and how this assessment leads to changes in brand sentiment. According to the study, brand attitude shifts and customer gains from AR apps are mediated through consumer inspiration. This study suggests a conceptual model that addresses the most pressing issues facing the industry, with the change in brand attitude (after vs. before using the app) serving as the focus outcome variable (BCG, 2018). According to research, Perceived Augmentation quality contributes to positive app reviews and inspires creativity in addition to providing utilitarian and hedonistic rewards. Then, it is suggested that these two elements be used to gauge shifts in brand attitude. A pertinent factor for the evaluation of AR apps and more general brand-related outcomes is the perception of the augmentation quality of the AR experience. The degree to which a user views the augmented content as realistic is known as Perceived Augmentation quality. (Rauschnabel, P. A., Felix, R., & Hinsch, C. (2019). Augmented Reality marketing: How mobile AR-apps can improve brands through inspiration. Journal of Retailing and Consumer Services, 49, 43-53.). Consumers believe they are having an authentic experience because of how well physical reality and virtual information are viewed as blending together

(Hilken et al., 2017). Our theoretical justification for the impact of Perceived Augmentation quality is based on perceptual fluency, which is described as the simplicity with which users can recognise, interpret, and process the characteristics of a virtual stimulus that enhances their view of the actual world (Rauschnabel, P. A., Felix, R., & Hinsch, C. (2019). Augmented Reality marketing: How mobile AR-apps can improve brands through inspiration. Journal of Retailing and Consumer Services, 49, 43-53). Based on the hyphothesis, Perceived Augmentation quality has a positive effect on attitude toward the AR app.( Rauschnabel, P. A., Felix, R., & Hinsch, C. (2019). Augmented Reality marketing: How mobile AR-apps can improve brands through inspiration. Journal of Retailing and Consumer Services, 49, 43-53). The results of our study indicate that inspiration is boosted by both hedonic advantages (H5) and Perceived Augmentation quality (i.e., high degrees of perceived realism and integration).

Other researcher that used Perceived Augmentation as their model has shown the positive results (Daassi, M., & Debbabi, S., 2021). Intention to reuse AR-based apps: the combined impact of perceived realism, product presence, and immersion. The A study was conducted to determine the elements that influence people's use of and adoption of AR-based apps. The findings of a study with 224 participants indicate that a pattern of mediation integrating three connected cognitive abilities elements, specifically, perceived realism, product presence, and sense of immersion, promotes the relationship between Perceived Augmentation and customers' behavioural intention and Perceived Augmentation is favourably correlated with immersion sense. Perceived Augmentation was measured using Javornik et al.'s scale. The results demonstrate that Perceived Augmentation functions as a perceptual stimulation that gives the customer an immersive experience. A greater sense of the presence of the product results from this sense of immersion. Customers who experience the product's physical presence therefore rate the encounter as being closer to what may normally occur in a genuine buying environment.

## 2.13 PA ATTRIBUTE

Perceived Augmentation is a concept in Mobile Augmented Reality (MAR) that refers to the extent to which users perceive that the technology has enhanced their interaction with the real world. In the past few years, many studies have investigated the factors that influence Perceived Augmentation in MAR applications, and several attributes have been identified as important in shaping users' perceptions. One attribute that has been widely examined is the level of interactivity provided by the MAR application. Interactivity refers to the extent to which the user can manipulate the virtual objects in the application, and studies have found that a higher level of interactivity is associated with higher levels of Perceived Augmentation (Mangiatordi et al., 2021; Schönrock-Adema et al., 2019). Another important attribute is the level of realism of the augmented objects. Studies have shown that users tend to perceive higher levels of augmentation when the augmented objects are realistic and can seamlessly integrate with the real world (Kaya et al., 2020; Wang et al., 2019). The quality of the graphics and visual effects is also an important attribute in shaping Perceived Augmentation. Several studies have found that high-quality graphics and visual effects contribute to a higher level of Perceived Augmentation (Rahman et al., 2018; Zhang et al., 2020).

In addition to these attributes, the ease of use and the level of control provided by the MAR application have also been found to influence Perceived Augmentation (Javahery et al., 2019; Wang et al., 2020). Overall, the literature suggests that Perceived Augmentation is influenced by several attributes, including interactivity, realism, graphics quality, ease of use, and level of control. By understanding these factors, developers can design MAR applications that enhance users' perception of the technology's augmentation capabilities. Here are some examples of research on Perceived Augmentation based on attributes:

i. In a study by Li et al. (2018), the Perceived Augmentation of a mobile AR app was analyzed based on four attributes: vividness, interactivity, personalization, and enjoyment. The results showed that all four attributes had a significant positive effect on

Perceived Augmentation.

ii. A study by Liu and Li (2019) analyzed the Perceived Augmentation of a mobile AR app for educational purposes based on three attributes: information content, interface design, and user engagement. The results showed that all three attributes had a significant positive effect on Perceived Augmentation.

iii. In a study by Xu et al. (2020), the Perceived Augmentation of an AR app for furniture shopping was analyzed based on three attributes: spatial visualization, personalization, and social interaction. The results showed that all three attributes had a significant positive effect on Perceived Augmentation.

iv. A study by Li et al. (2021) analyzed the Perceived Augmentation of an AR-based museum guide app based on three attributes: cognitive support, emotional support, and interactivity. The results showed that all three attributes had a significant positive effect on Perceived Augmentation.

Below is the example of question that can researcher use to evaluate Perceived Augmentation of user.

| | |
|---|---|
| Realism | • The AR objects appeared realistic<br>• The AR objects were believable |
| Enjoyment | • Using AR objects was enjoyable<br>• AR objects made the experience more fun |
| Interactivity | • The AR objects responded well to user interactions |

| | |
|---|---|
| | • The AR objects provided engaging interaction |
| Information | • The AR objects conveyed useful information<br>• The AR objects provided helpful guidance |
| Personalization | • The AR objects were personalized to the user<br>• The AR objects were tailored to the user's preferences |
| Novelty | • Using AR objects was a new experience for me<br>• AR objects were innovative and cutting-edge |
| Social Influence | • Other people's reactions to AR objects affected my opinion of them<br>• I would feel more positively about AR objects if they were popular among my friends |

## 2.14 Perceived Enjoyment

The degree to which a technological activity is seen to be delightful, independent of any potential performance consequences, is known as Perceived Enjoyment (Davis, Bagozzi and Warshaw, 1992). The entertainment sector has recently used social network functionality to further Virtual Reality technologies. This study experimentally examines how customers' intentions to utilise Virtual Reality devices are impacted by the inclusion of social network characteristics as a dissemination technique. TAM was utilised for this survey, which involved 350 South Korean participants to analyse the acceptability of Virtual Reality. User adoption behaviours were analysed rigorously enhancing the fundamental TAM with reported satisfaction, social connections, and social relationships. According to the study's findings, Perceived Enjoyment, which is the key component of TAM, has a greater impact on Intention To Use than Perceived Usefulness and is increased by social interactions and the strength of social bonds (Lee, J., Kim, J., & Choi, J. Y. (2019). The technological adoption model for Virtual Reality gadgets integrates enjoyment, social engagement, and the strength of social relationships. Informatics and Telematics, 39, 37-48. Although the research that used TAM to study the initial adoption behaviour of information devices primarily focused on practicality, recently it has been described how important fun is to user acceptability (Sun and Zhang 2006). The degree to which utilising Information Technology is regarded as enjoyable is known as Perceived Enjoyment (Venkatesh, 2000). Hsiao and Yang (2011) studied TAM research and discovered that felt Enjoyment is a common basic component in TAM and has a significant impact on usage intention. According to a TAM meta-analysis by Shamy and Hassanein (2017), Perceived satisfaction is a critical factor in the decision to utilise novel technologies, including wearable, robotic, and Virtual Reality (VR) gadgets, all of which are experiencing tremendous growth. In other words, Perception of Enjoyment has the potential to influence usage attitude in addition to Intention To Use (Lee, J., Kim, J., & Choi, J. Y. (2019). Adoption of Virtual Reality devices: a technology acceptance framework that takes into account enjoyment, social interaction, and the strength of interpersonal bonds (Telematics and

Informatics, 39, 37-48). Researchers concur that the degree to which a user believes using a VR device to be enjoyable can be used to characterise the Perceived Enjoyment of VR based on the material that has already been published. Perceived Enjoyment, one of the components of TAM, had the greatest overall impact on the intention to use VR. In fact, all of the TAM's components were highly correlated with felt enjoyment. As a result, people' attitudes towards VR are strongly influenced by how much they seem to like it. Perceived Usefulness and Perceived Ease Of Use are also strongly correlated with reported satisfaction. Perceived Enjoyment is indirectly influenced by intention to use via attitude since attitude is the primary factor in raising intention to use. To put it another way, people with strong social relationships report greater levels of delight from sharing the novel sensations brought on by utilising VR with other users (Lee, J., Kim, J., & Choi, J. Y. (2019). The technological adoption model for Virtual Reality gadgets integrates enjoyment, social engagement, and the strength of social relationships. Telematics and Informatics, 39, 37-48. According to Qu et al. (2019), TAM helps in creating a concrete understanding of the potential gains and an investment that can occur in the future. The understanding of the technology acceptance for the better prediction of the use of new information resources can increase the personal control over the marketing process.

**2.15 Perceived Ease Of Use (PEOU)**

Several other studies have also found PEOU to be a significant predictor of user acceptance of Virtual and Augmented Reality technologies. For example, in a study by Venkatesh and Davis in 2000, they found that PEOU was a key determinant of user acceptance of information technology, including Virtual Reality applications. Additionally, in a study by Hsiao and Chen in 2017, they found that PEOU had a significant effect on user satisfaction with virtual reality technology in the context of education. 43 In the context of Augmented Reality, a study by Wu et al. in 2019 found that PEOU was a significant predictor of user intention to use Augmented Reality technology for educational purposes. Similarly, in a study by Koo and Kim in 2018, they found

that PEOU was a significant predictor of user acceptance of Augmented Reality technology in the context of mobile Tourism applications. Overall, these studies support the importance of PEOU in predicting and measuring user acceptance of Virtual and Augmented Reality technologies. Designing these technologies to be perceived as easy to use and learn to use may increase user adoption and usage, and ultimately lead to greater user satisfaction and success.

### 2.16 Perceived Usefulness (PU)

Perceived Usefulness (PU) is another key factor that has been found to influence user acceptance of Virtual and Augmented Reality applications. PU refers to the degree to which a technology is perceived as useful in facilitating users' tasks or achieving their goals. The more useful a technology is perceived to be, the more likely users are to adopt and use it. Several studies have investigated the relationship between PU and user acceptance of Virtual and Augmented Reality technologies. For example, in a study by Lin et al. in 2020, they found that PU was a significant predictor of user Intention To Use Augmented Reality technology in the context of tourism. Similarly, in a study by Sohail et al. in 2019, they found that PU was a significant predictor of user acceptance of Virtual Reality technology in the context of e-learning. Other studies have also found PU to be a significant predictor of user acceptance of Virtual and Augmented Reality technologies. In a study by Lu et al. in 2018, they found that PU had a significant effect on user satisfaction and Intention To Use Augmented Reality technology in the context of museum exhibitions. Additionally, in a study by 44 Lee and Kim in 2019, they found that PU had a significant effect on user acceptance of Virtual Reality technology in the context of telepresence. Overall, these studies suggest that PU is an important factor to consider when predicting and measuring user acceptance of Virtual and Augmented Reality technologies. Ensuring that these technologies are perceived as useful in facilitating users' tasks or achieving their goals may increase user adoption and usage.

## 2.17 Attitude Towards Use (ATU)

Attitude Towards Use (ATU) is another significant factor that has been found to influence the user acceptance of Virtual and Augmented Reality technologies. ATU refers to the degree to which users have a positive or negative attitude towards using a particular technology. The more positive the attitude towards the technology, the more likely users are to adopt and use it. Several studies have examined the relationship between ATU and user acceptance of Virtual and Augmented Reality technologies. For instance, in a study by Kim et al. in 2020, they found that ATU significantly predicted the Intention To Use AR technology in the context of smart healthcare. Similarly, in a study by Alzahrani et al. in 2020, they found that ATU had a significant effect on the Intention To Use VR technology in the context of higher education. Other studies have also reported ATU as a significant predictor of user acceptance of Virtual and Augmented Reality technologies. In a study by Wang et al. in 2019, they found that ATU had a significant effect on user adoption and usage of Augmented Reality technology in the context of online shopping. Additionally, in a study by Shahrabani and Popper-Giveon in 2020, they found that ATU had a significant effect on the Intention To Use VR technology in the context of mental health services. 45 These findings suggest that ATU is a critical factor that should be taken into account when predicting and measuring user acceptance of Virtual and Augmented Reality technologies. Ensuring that users have a positive attitude towards using these technologies may increase their adoption and usage.

## 2.18 Intention To Use (ITU)

Intention To Use (ITU) is a key factor in determining the user acceptance of Virtual and Augmented Reality technologies. ITU refers to the degree to which users intend to use a particular technology, and is often considered as a precursor to actual technology adoption and usage. Several studies have examined the relationship between ITU and user acceptance of Virtual and Augmented Reality technologies. For instance, in a study by Park et al. in 2019, they found that

ITU significantly predicted the adoption and usage of VR technology in the context of cultural tourism. Similarly, in a study by Huang et al. in 2020, they found that ITU had a significant effect on the intention to use AR technology in the context of physical fitness. Other studies have also reported ITU as a significant predictor of user acceptance of VR and AR technologies. In a study by Chen et al. in 2021, they found that ITU had a significant effect on the adoption and usage of AR technology in the context of fashion e-commerce. Additionally, in a study by Lin and Wang in 2018, they found that ITU had a significant effect on the adoption and usage of VR technology in the context of education. These findings suggest that ITU is a critical factor that should be taken into account when predicting and measuring user acceptance of Virtual and Augmented Reality technologies. Increasing users' intention to use these technologies may increase their adoption and usage

**2.19 Summary**

In summary, there are many past studies done by previous researchers related to the topic studied by this researcher. Every highlight that is done can explain that various theories are used to strengthen the research that is carried out. Based on previous studies, the application of theory in a study can show a parallel relationship. Therefore, this literature highlight chapter is a chapter that helps researchers to explore more studies and improve reading in obtaining information and also understanding related to the topic that will be conducted. Finally, previous research on VTO and the application of mobile AR was incorporated to provide a better understanding of earlier studies in these two domains.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

The most crucial stage of the entire research process is research technique. It is a systematic strategy that, according to Vaishnavi and Kuechler (2008), consists of methodologies, processes, and instruments to help in delivering solutions in order to solve the research problem. Before beginning a new research project, it is crucial to select the most appropriate and exact approach. The research process was adapted from the design research by Vaishnavi and Kuechler (2008) and it comprises of five phases namely; i) awareness of problems, ii) suggestions, iii) development, iv) evaluation, and v) conclusion. The research process is shown in Figure 3.1.

## 3.2 Awareness of Problem

The basic framework of this research will be planned based on the study of previous researches in areas related to VTO technology. Through this literature review, the problems related to the study of VTO technology will be identified. This will lead to the formulation of suitable methodology for this research. It is to prove that the integration of AR and mobile technology can be a solution for this research. This phase involved identifying the existing problems and exploring the research questions to be addressed in this study. The problems identified were related to the factors influencing MAR application acceptance, and the research questions were formulated based on these problems.

## 3.3 Suggestion

In this phase, the researchers reviewed the relevant literature on the latest application of MAR and identified the gap in the current knowledge. The researchers also identified the need for a

prototype of the VHT App to measure user acceptance and validate the new MAR acceptance model. This phase starts with the planning process involving the definition of the scope of the research and the identification of the target users. It continues with the establishment of the research constraints whereby it is a systematic approach to overcome any limitations pertaining to the research. Next is the determination of the resources that will be used for the development of the VHT app. The resources will be used while conducting the research and thesis writing. Furthermore, this phase also needs to determine the VHT app components which are required by the VHT app in the following phase that is the design and development phase. The resources are appropriate to use in order to conduct the research study and thesis writing effectively. Moreover, this particular phase also needs to determine the components of the VHT app, which are essentially required for the VHT app in the different phase. All these are essential for the design and development phase ahs also mentioned thoroughly.

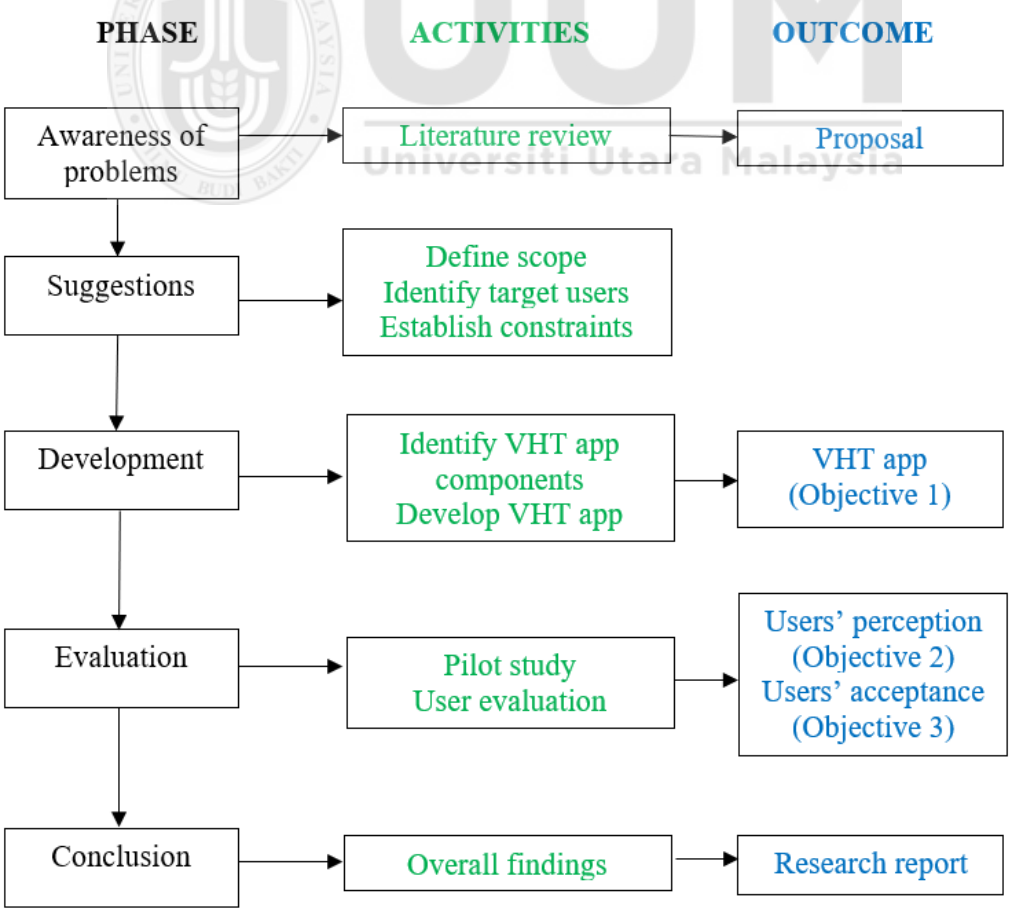


*Figure 3.1.* Research Process

## 3.4 Design and Development

In this phase, the researchers reviewed the relevant literature on the latest application of MAR and identified the gap in the current knowledge. The researchers also identified the need for a prototype of the VHT App to measure user acceptance and validate the new MAR acceptance model. This phase starts with the design of the VHT app. All the required information pertaining to the user requirements of the VHT app as well the try-on technology is required. The collected information will initially be used to develop the conceptual idea in the form of sketches. Once the idea has been finalized, the wireframe will be constructed in detail. Wireframe is a blueprint of low fidelity presentation of the overall flow of a mobile application and is an important step in the development process of a mobile application (Prismetric, 2016). In addition, wireframe gives simple approach to accept usefulness and ease of use of an application which allows users to imagine and explore the diverse segments (AppsMarche, 2016). The purpose of the wireframe is to define the information hierarchy of the design in order to facilitate the interface layout process according to how the designer wants the user to use the app. Besides that, the wireframe is useful in showing how the user interacts with the interface through the use of buttons, links, and menus. Lastly, the wireframe will be prepared to avoid any problems in completing the VHT app.

Figure 3.2 shows an example of wireframe.

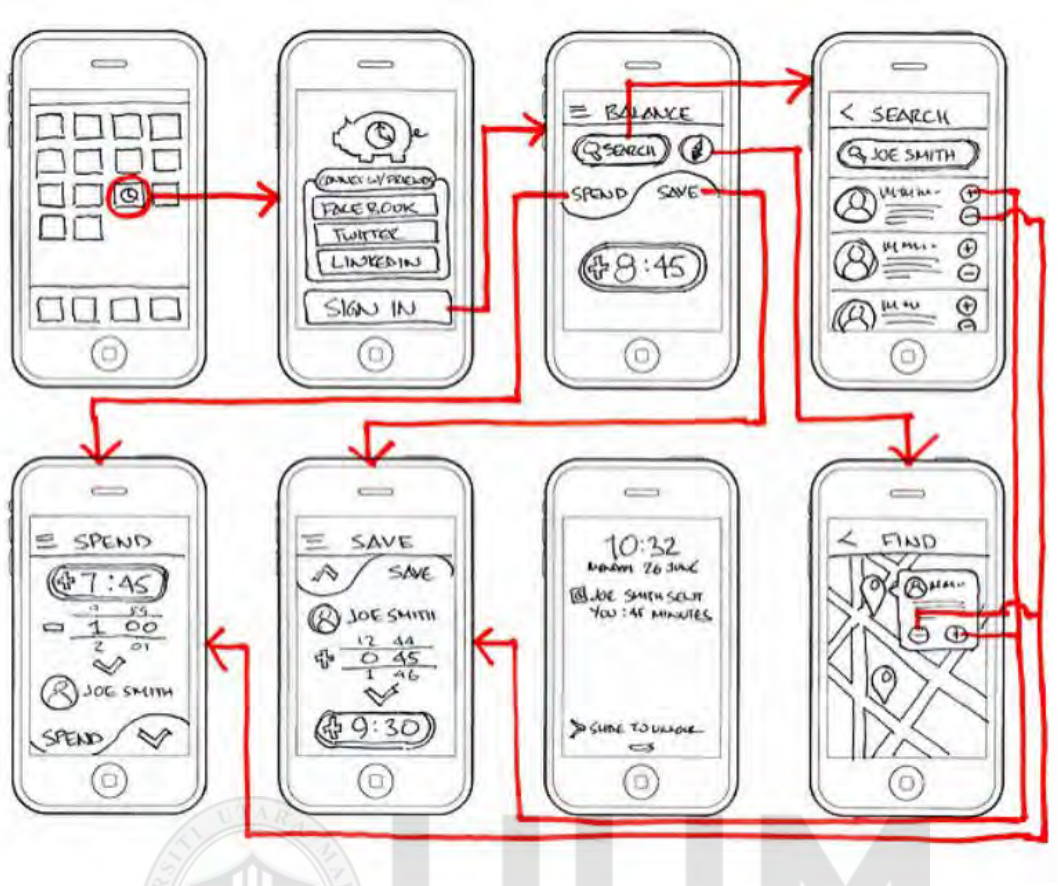


*Figure 3.2.* An example of wireframe for mobile app development.

Every project needs wireframes to function, and designing mobile apps is no different. Between low-fidelity sketches and the first interactive prototypes, wireframes perform as a transitional stage. Wireframing for mobile differs greatly in practise. There are nine steps for wireframing a mobile app.

i. Mapping out a target user flow A User flow is the sequence of actions a user takes to accomplish a certain task. One essential component of user flow is the user goal. User flows may not be linear since a user may take several distinct paths to reach a single goal.

ii. Draw the main section of the user flow. Drawings make it possible to quickly produce ideas that can be shared, improved upon, and get input from others. Always try to imagine yourself as the user when you are sketching. Consider the objective a user has in mind.

iii. Start wireframing by setting a Mobile Frame The frame will act as a natural

constraint, and it will prevent from putting too many elements on the screen. A frame will create an illusion of an actual design.

iv. Use boxes to plan your arrangement. Start by drawing boxes on the canvas and plan the layout based on how the researcher wants the user to process the information. Place a lot of emphasis on the sequence in which the researcher wants the users to receive the material.

v. Native design patterns for Android and iOS make it easier for designers to build a recognizable experience. Reusable content blocks are served by design patterns. You could utilize them to address typical issues (such as global navigation).

vi. Bring a true copy and start adding genuine information in place of placeholders and dummy text. Check to see if the page flows for the user after adding actual copy to it. The sequence of some of the items on the page might be off. This is the ideal time to rearrange the page's content and enhance its composition.

vii. Check if the content is scalable. While wireframing, it's acceptable to begin with a middle-sized screen, but it's also crucial to verify how material appears on various screen sizes (both smaller and larger displays) and adapt it as necessary. Ensure content scales well while it’s fine to start with a middle size screen when wireframing, it’s also essential to check how content looks on different screen sizes (both smaller and larger screens) and adjust it if required.

viii. Link the pages collectively to establish a flow It is preferable to build a flow out of your design rather than shipping it as a collection of separate displays. The team finds it simple to comprehend the specifics of the interaction scenarios they discuss regarding how users are expected to interact with a product thanks to UX flows. You'll be forced to consider the app's functioning by UX flows.

ix. Evaluate the design choices The final (and most crucial) stage in wireframing is testing. This phrase is frequently used in the context of prototypes because testing.

After the wireframe has been completed, the next part of this phase is the development of the VHT app. The interface layout as well as the user interaction as defined in the wireframe will be implemented in the VHT app development. Since the VHT app is based on Augmented Reality technology, the suitable and appropriate tools to be used for the development include Unity 3D and Vuforia. These tools support a wide range of digital contents and formats such as images, 3D models, video, audio and text. For the VHT app, the required digital contents will be gathered that include images of varieties of hijabs. Most of the images will be downloaded from the online hijab stores. These images will be edited and resized in Adobe Photoshop before they are used in the development of the VHT app.

The two technique that used with AR applications are face detection and display technique. Face detection process on AR application uses Haar Cascade Classifier from the Open CV framework. Face detection is carried out to obtain information about the users' face. From the detected face, information about the width and height of the face as well as coordinate points of the face are required. Next, Milgram divides the AR display techniques into two part which are "see through" AR display and monitor based AR display.

The VHT app was developed for Android mobile platform using Unity 3D and Vuforia. It was developed specifically to allow women to look through, pick, and try on the selected hijab depending on colour, design, and pattern to complement their clothes, skin tone, and make-up. Users can explore the collection of hijabs and try on the preferred hijabs owing to the app's floating buttons which provide natural interactive user interface. Hijabs can be tried on by women on their own or with the assistance of friends or husbands at any time and in any location. They can try on the VHT app's hijabs to see if they like the designs, patents, colours, and other features without having to go to a store. They can take a picture and publish it on social media after they are satisfied with how their favourite hijab looks on them.

The flash screen appears for a few seconds when users initially use the VHT app, as shown in Figure 3.3. As shown in Figure 3.4, the app will then display its main interface. Two buttons are provided for selection, one for Help and the other for Hijab Collection. The Hijab Collection button, as shown in Figure 3.5, will direct the user to the app's hijab collection. The app includes a total of 20 hijabs in various designs and colours at the time of development. Customers' needs can be met by changing and adding to the hijab collection. Users can look through the entire assortment of hijabs and try on any that they choose. Users have unlimited access to all of the hijabs in the collection and can try as many as they want. In the meanwhile, the Help button instructs users on how to use the app.

To try on a hijab, firstly the users must choose their preferred hijab, following which the try-on screen will appear, as depicted in Fig 3.6. The information button located at the bottom of the screen can be used to get further information. For try-on, the user has two alternatives: snapshot or stored image. For the snapshot feature, the user can try on the hijab in real time. However, this technique necessitates someone else adjusting the distance between the mobile device and the hijab's face. The image of the user's face is required for the next option, which allows the hijab to be virtually fitted to the face of users. Superimposing the preferred hijab on the user’s facial photo using the VHT app is illustrated in Figure 3.7. After completing the hijab try-on in either option, the user can take a photo of the scene and share it via social media channels.


*Figure 3.3.* VHT app's flash screen




*Figure 3.4.* VHT app's main interface


*Figure 3.5.* Hijab samples provided by the VHT app


*Figure 3.6.* VHT app's try-on screens

*Figure 3.7.* From the original user's photo to a virtual hijab-clad user's image

## 3.5 Evaluation

This phase included two types of evaluations: expert and user. The evaluation design used in this study is shown in Figure 3.8

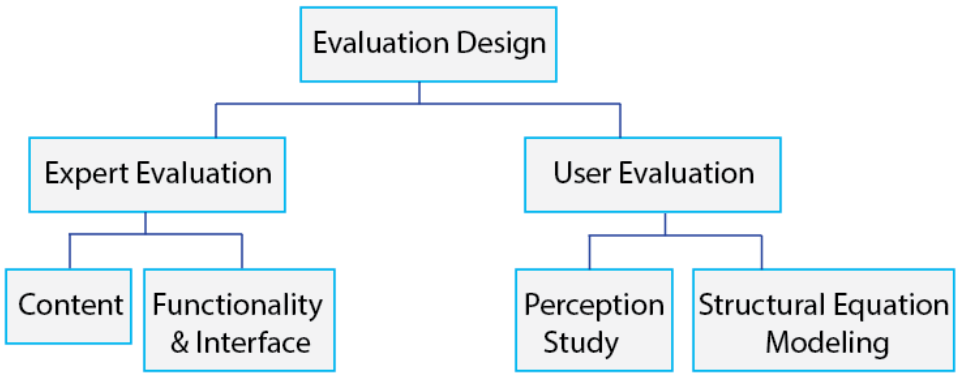


*Figure 3.8.* This study Evaluation Design

### 3.5.1 Expert evaluation

The purpose of the expert evaluation process is to ensure that the content of VHT app is valid and appropriate for the target users and also to assess the functionality and user interfaces of the VHT app. Expert evaluation consists of two parts; a) content evaluation, and b) functionality and interface evaluation. A content expert will be assigned to evaluate whether the content of the VHT app is valid and fulfills the need of the VHT app users and in this case female youngsters who are interested in hijab try-on. The content expert might be somebody who is involved in the sale of hijab such as hijab boutique owner or hijab retailers. Meanwhile, an expert with experience developing mobile or Augmented Reality apps will be selected to assess the VHT app's functionality and interface. Someone who is experienced with the design and development of mobile apps, such as a lecturer or developer, could be the expert. Prior to the user evaluation, any input and recommendations from the two experts will be taken into account in enhancing the VHT app.



### 3.5.2 User evaluation

The VHT App was evaluated by a sample of 120 women (female youngsters) respondents aged between 15-39 years old. The justification for this age range was that they are the primary users of mobile applications and more likely to adopt new technology. The respondents were selected using a convenience sampling method, and the instrument for data collection was a self-administered questionnaire adapted from previous studies. The questionnaire was designed to measure the factors influencing user acceptance of the VHT App based on the TAM. The questionnaire consisted of items to measure Attitude Towards Use (ATU), Intention To Use (ITU), Enjoyment (E), Perceived Usefulness (PU), Perceived Augmentation (PA), and Perceived Ease Of Use (PEOU).

A perception study was conducted to investigate how participants perceived using the VHT app

in terms of Perceived Augmentation, Enjoyment, Perceived Usefulness, Perceived Ease Of Use, Attitude Towards Use, and Intention To Use. It is important to note that some terms used in the study may be inconsistent, and the sources of the adapted questionnaire should be discussed to ensure that the instrument used for data collection is valid and reliable. To measure Enjoyment, the items used were adapted from MäNtymäKi & Salo (2011), while the items for Perceived Augmentation were adapted from Javornik (2016). The items for Perceived Ease Of Use, Perceived Usefulness, Intention To Use, and Attitude Towards Use were adapted from Davis (1989). However, further discussion is needed to validate the questionnaire and ensure that the adapted items are consistent with the study's objectives. Additionally, it is important to note that users are more likely to have a positive attitude towards new technology when they are having fun, as it increases their likelihood of accepting it (Li & Huang, 2009).

Perceived Augmentation is a psychological correlate of AR ability to virtually influence a user's physical environment experience. It refers to how users Perceive Augmented reality in altering physical surroundings with virtual annotations, such as virtual enhancement and physical virtual congruency. Virtual enhancement is the overlay of virtual annotations over our experience of reality, while physical-virtual congruency simulates virtual annotations fitting into physical reality to make virtual elements part of it (Javornik, 2016). After user evaluation, data were collected for data analysis. It is crucial to validate the questionnaire to ensure its consistency and reliability in measuring the study's objectives accurately. A perception study was undertaken to find out how participants perceived about using the VHT app with regards to Perceived Augmentation, Enjoyment, Perceived Usefulness, Perceived Ease Of Use, Attitude Toward Use, and Intention To Use. Users are more likely to be intensely focused and have a good attitude about new technology while they are having fun, which increases their likelihood of accepting it (Li & Huang, 2009). The feeling of gaining from the application's transmitting message is implied by the concept of enjoyment where users having joy, fun, entertainment as a result of their

involvement with the MAR applications (Nysveen et al., 2005; MäNtymäKi & Salo, 2011; MA,2012; Bressler & Bodzin, 2013).

This study adheres to the definitions of Nysveen et al. (2005), and MäNtymäKi & Salo (2011) which state that a user has enjoyment when he/she have joy, fun, or entertainment while using an application. Perceived Augmentation is a psychological correlate of AR's ability to virtually influence users' physical environment experience. Virtual enhancement and physical virtual congruency refer to how users Perceive Augmented reality in altering the physical surroundings with virtual annotations. An overlay of virtual annotations over our experience of reality is defined as virtual enhancement. The simulation of virtual annotations fitting into physical reality, ostensibly making virtual elements part of it, is referred to as physical-virtual congruency (Javornik, 2016).

Perceived Ease Of Use is how certain a person is that utilising a system would be effortless (Davis, 1989). Perceived Usefulness is the extent the users believe that utilising the technology would help them perform better (Davis, 1989). The extent to which a person has established a deliberate plan to perform or not perform a specific future activity is referred to as Intention To Use (Venkatesh et al., 2003). The extent of evaluative effect associated with using the target system in one's job is referred to as Attitude Towards Use (Davis, 1989). The items for Enjoyment were adapted from MäNtymäKi & Salo (2011) and the items for Perceived Augmentation were adapted from Javornik (2016). The items for Perceived Ease Of Use, Perceived Usefulness, Intention To Use and Attitude Towards Use were adapted from Davis (1989). After the user evaluation, all the data required by this research are collected for data analysis. All the data was analyzed using SPSS. SPSS is a data management and statistical analysis tool which is used to conduct the descriptive statistics analysis.

### 3.5.3 Structural Equation Modeling

For this research, the path model was established and tested using Structural Equation Modeling (SEM) and Partial Least Squares (PLS). According to Haenlein and Kaplan (2004), SEM is frequently used examine single or multi-order causal models in behavioural and sciences, psychometric evaluations, and market research. SEM is well suited to exploratory research in which latent (unobservable) variables are regularly used. The research model includes observable indicators that are linked to their respective variables in addition to latent variables. A variable in SEM might be exogenous or endogenous. Exogenous variables are also known as independent variables because they have path arrows pointing from them. While endogenous variables also known as dependent variables have at least one path arrow going to them. Both dependent and independent variables can be included in models. Partial Least Squares Structural Equation Modeling (PLS-SEM), which focuses on analysis of variance, exploration, and prediction using SmartPLS was applied in this study. PLS is beneficial for structural equation modelling in information systems research (Urbach & Ahlemann, 2010) as well as applied research projects (Bacon, 1999).



## 3.6 Conclusion

This phase focuses on establishing how the women participants perception and acceptance of the VHT app as a tool for trying on hijabs. The collected data was analyzed in SPSS using descriptive statistics and SmartPLS for acceptance. Prior to the user evaluation, a pilot study was conducted for the purpose of pre-testing the research instrument. The results of all of these analyses were then discussed in depth in order to develop conclusions for this study.

## 3.7 Summary

This chapter goes through all of the research processes that took place in this study. The entire procedure of this study was conducted using the research methodology depicted in Figure 3.1.

The approaches described in this chapter contributed to the VHT app, which is the study's main outcome. This chapter goes through the construction of the VHT app as well as the app's interfaces in great depth. Expert evaluations of content, and functionality and interface, were conducted prior to user evaluation. In addition, a pilot study was undertaken for the purpose of pre-testing the instrument of research. Finally, user evaluation incorporating perception and acceptance studies of the VHT app for hijab try-on were conducted among women participants.

# CHAPTER FOUR

# THEORETICAL FRAMEWORK

## 4.1 Overview

The components of the theoretical framework employed in this study are discussed in this chapter which include Technology Acceptance Model, research model and all the attributes and the hypotheses. A comprehensive framework that consists of relevant measurements and their interrelationships is developed.

## 4.2 The Technology Acceptance Model

Acceptance of or the level of readiness to use a technology has been a crucial topic of research in Information Systems (Kerr & Hiltz, 1982). According to Blair (1974), users who wanted to accept new technologies must be willing to let go of old habits and incorporate new ones into their everyday routines. The well-known Technology Acceptance Model (TAM) established by Davis (1989) to predict and explain the application of technology is frequently associated with acceptance. The original version of TAM is shown in Figure 4.1. According to Fielt et al. (2004), acceptance is defined as the use and contentment of the intervenor's customers with the intervenor's services.



Meanwhile, Dillon and Morris (1996) defined user acceptance as user's psychological state in relation to his/her intention to utilise a technology. Two variables, Perceived Usefulness and Perceived Ease Of Use are used in TAM as determinants of user acceptance (Davis, 1989). TAM explores the factors that influence the behavioural Intention To Use the technology and suggests that Perceived Ease Of Use and Perceived Usefulness determine the intent to adopt certain technology (Davis, 1986). TAM was adapted from the theory of reasoned action by Fishbein and Ajsen (1980). This theory describes how people behave in various situations. The ultimate goal

of the Technology Acceptance Model is to establish a foundation for tracking the effects of external variables on internal intentions, attitudes, and beliefs.

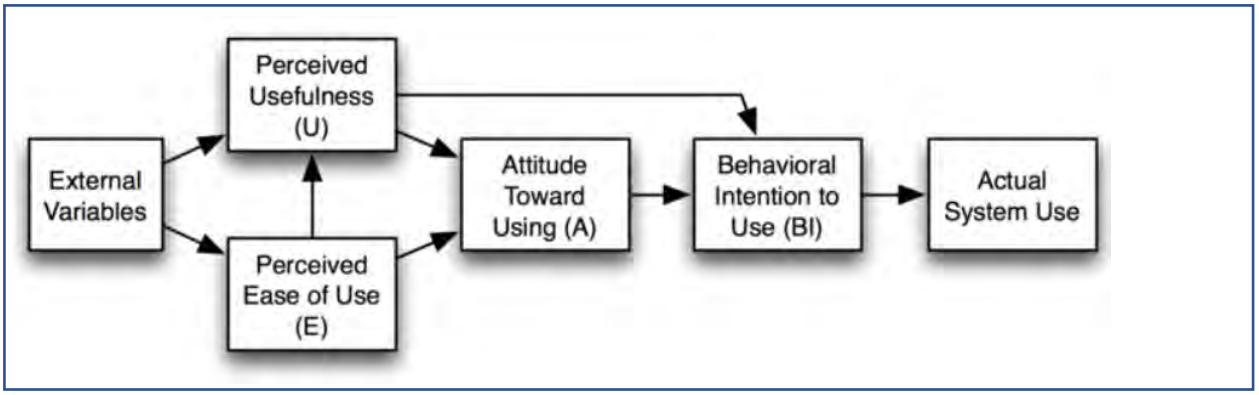


*Figure 4.1.* Original Technology Acceptance Model

In Information System, the TAM Model has been used as an assessments tool and because of its simplicity, it has gained widespread acceptance in the scientific community (Hsu & Chang, 2013). It can be applied in various sectors for the evaluation of information systems or applications, in distance learning and also in marketing and sales (Revythi & Tselios, 2017). Studies on TAM are ongoing and two major theories has been produced from TAM that include; TAM2 (Venkatesh & Davis, 2000) as shown in Figure 4.2 and Unified Theory of Acceptance and Use of Technology (UTAUT) as shown in Figure 4.3 (Venkatesh, Morris, Davis, & Davis, 2003).



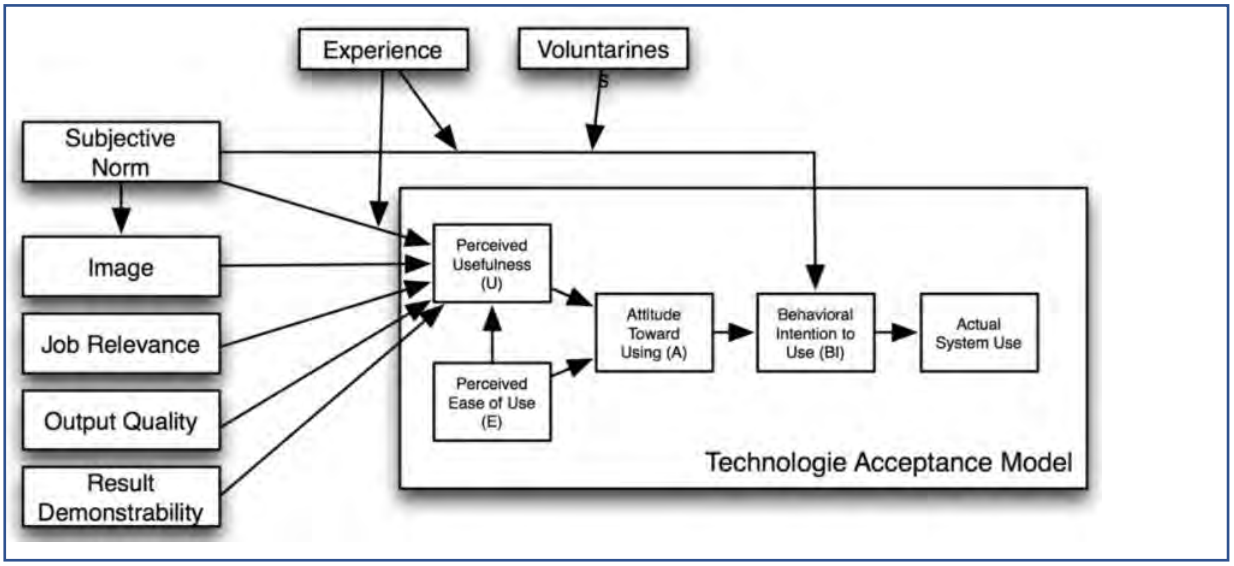


*Figure 4.2.* Technology Acceptance Model 2 (Venkatesh & Davis, 2000)

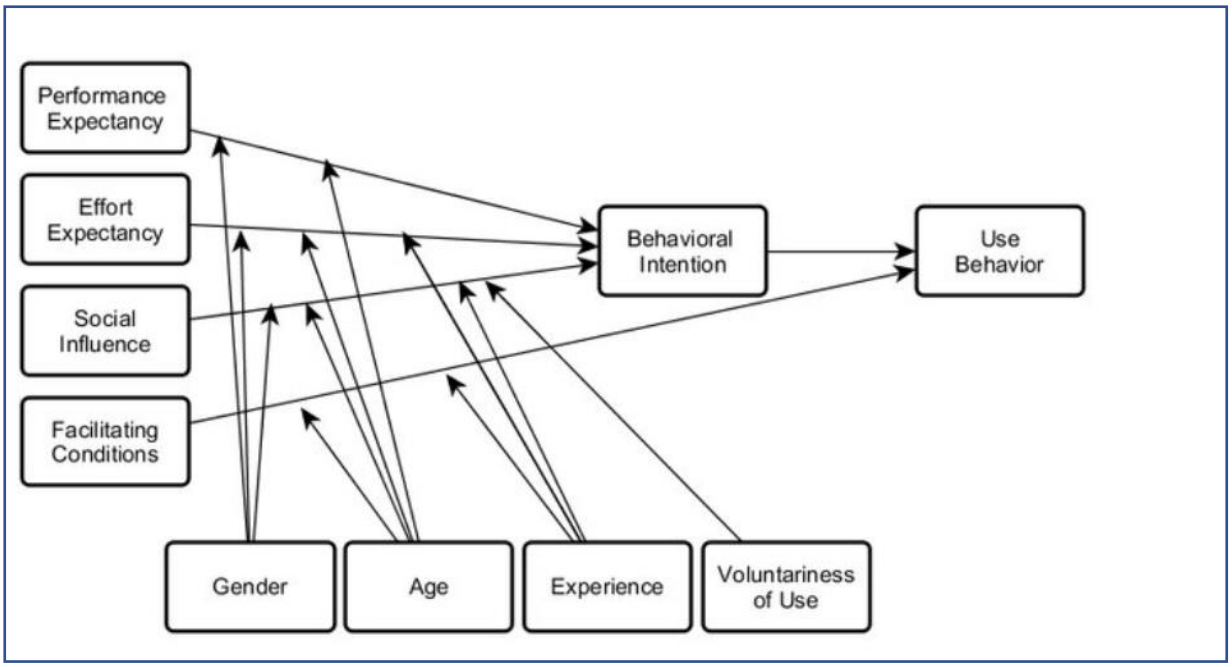


*Figure 4.3.* Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003).

### 4.3 Research Model

A theoretical framework is a set of beliefs about how particular phenomena (or variables or concepts) are related to one another (a model), as well as an explanation of why these variables are thought to be related to one another (a theory) (Sekaran & Bougie, 2009). They emphasize three prominent components for developing any theoretical framework which include;

i. The variables should be clearly defined.

ii. The relationship between the variables in the model should be given.

iii. Clear explanations should be granted why the expected relationship exists.

The research model for this study has been developed as shown in Figure 4.4. The model is based on TAM extended with two external variables namely, Enjoyment and Perceived Augmentation. This model starts with the original TAM Model where the researcher maintains these concepts of Perceived Ease Of Use, Perceived Usefulness, Intention To Use, and Attitude Towards Use as

they were defined and with the  same relationships among them.

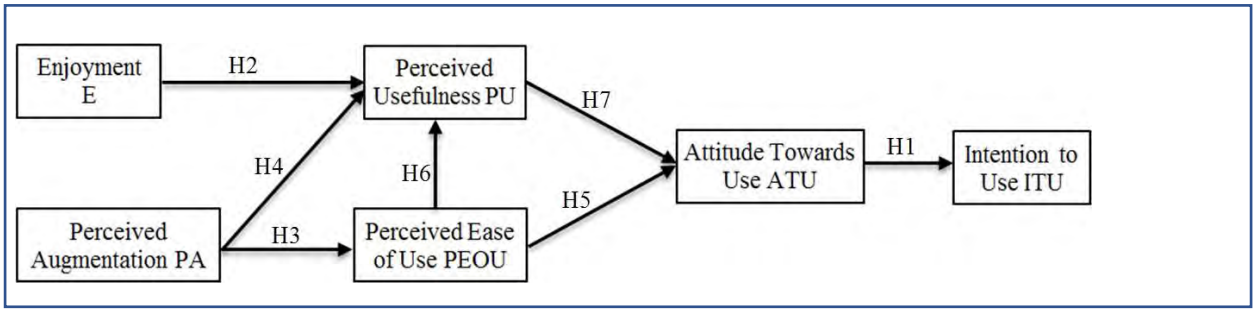


*Figure 4.4.* Research Model

After reviewing the literature, the researcher considered the need to complete the model with exogenous and endogenous variables that could help explain the variance. Therefore, the researcher chose the two variables, Enjoyment and Perceived Augmentation. The variables are described as follows.

### 4.3.1 Enjoyment (E)

Apart from the performance implications, Enjoyment refers to the extent to which engaging in a particular activity is seen to provide pleasure and delight in and of itself (Venkatesh, 2000). The extent to which using the new system or technology is seen to be enjoyable in and of itself, independent of any performance implications ensuing from its use, is referred to as Enjoyment (Venkatesh, 2000). Meanwhile, Van van Heijden (2004) defined enjoyment as the thrill and excitement that comes from using a system in and of itself. Enjoyment is especially crucial because users who are having fun are more likely to be attentive and have a favourable attitude toward new technology, which increases their likelihood of accepting it (Li & Huang, 2009). The feeling of gaining from the application's transmitting message is implied by the concept of Enjoyment where users having joy, fun, entertainment as a result of their involvement with the MAR applications (Nysveen et al., 2005; MA, 2012; MäNtymäKi & Salo, 2011; Bressler & Bodzin, 2013). This study adheres to the definitions of Nysveen et al. (2005) and MäNtymäKi & Salo (2011) which state that when a user has joy, fun, or entertainment while using an application,

this is called Enjoyment.

### 4.3.2 Perceived Augmentation (PA)

It is a psychological correlate of the ability of AR to influence users' physical environment experience virtually. Virtual enhancement and physical-virtual congruency refer to how users PA reality in altering the physical surroundings with virtual annotations. Virtual enhancement is defined as virtual annotations that are superimposed on our perceptions of reality. The simulation of virtual annotations fitting into physical surrounding, ostensibly incorporating virtual elements is referred to as physical-virtual congruency (Javornik, 2016).

### 4.3.3 Perceived Ease of Use (PEOU)

It refers to how certain a person is that utilising a system would be effortless (Davis, 1989). The PEOU is positively related to ITU (Tarhini et al., 2017; Alharbi & Drew, 2014). PEOU is a user perception that refers to the use of a VTO application that is easy to use and requires little effort.



### 4.3.4 Perceived Usefulness (PU)

The extent to which users believe that employing technology would improve their performance is referred to as PU (Davis, 1989). PU is the key determinant of using a given technology, based on several empirical studies (Tarhini et al., 2017; Al-Busaidi, 2013; Khor, 2014; Tan et al., 2012; Ayodele et al., 2016). Users will only accept the VTO method if they believe that using it will increase their ability to choose the right hijab.

### 4.3.5 Attitude Towards Use (ATU)

ATU is the evaluative influence that people associated with utilising the target system in their work (Davis, 1989). Various studies have revealed that ITU is directly influenced by ATU.

### 4.3.6 Intention To Use (ITU)

The extent to which someone has made conscious plans to engage in or refrain from engaging in a given future activity is described as intention to use (Venkatesh et al., 2003).

### 4.3.7 The development process of the prototype

It has become essential to develop the business with effective strategic implementation. Prototype testing is an effective process for making the appropriate decision and developing the business structure. Moreover, learning from the business strategies in order to use technologies for the growth of various product development procedures have been mentioned here. It will attract the consumers specifically the female customer through the rare and specific products.



## 4.4 Hypotheses

Hypotheses are defined as the logical relationships among variables articulated in a form of testable statements (Sekaran & Bougie, 2009). There are seven hypotheses formulated in this study and they are as follows.

$H_1$: ATU has a positive relationship with ITU

$H_2$: E has a positive relationship with PU

$H_3$: PA has a positive relationship with PEOU

$H_4$: PA has a positive relationship with PU

$H_5$: PEOU has a positive relationship with ATU

$H_6$: PEOU has a positive relationship with PU

$H_7$: PU has a positive relationship with ATU

## 4.5 Summary

In this chapter, a theoretical framework has been constructed known as TAM extended with two external variables namely, E and PA. This model starts with the original TAM Model where the researcher maintains these concepts of PEOU, PU, ITU, and ATU as they were defined and with the same relationships among them. There are seven hypotheses formulated in this study defined as the logical relationships among variables articulated in a form of testable statements.

# CHAPTER FIVE

# DATA ANALYSIS AND RESULTS

## 5.1 Introduction

The results of expert and user evaluations that have been conducted in this study are discussed in detail in this chapter. The expert evaluation of the VHT app includes content evaluation, and functionality and interface evaluation. Users' perceptions and acceptance of the VHT app are included in the user evaluation. For the perception study, descriptive statistics were performed with SPSS, and for the acceptance study, Structural Equation Modeling with SmartPLS was used. Before conducting the user evaluation, a pilot study was undertaken for the purpose of pre-testing the research instrument among a small sample in preparing the target sample of the main study (Polit- O'Hara & Beck, 2006; Sekaran & Bougie, 2010). In order to discover any limitations in advance in the questionnaire, a pilot study is performed (Van Teijlingen & Hundley, 2002). According to Cooper, Schindler, & Sun (2006), the appropriate sampling size is between 25 and 100 people from the target demographic for a pilot study. As a result, 25 female youngsters between the ages of 15 and 39 were chosen to participate in the pilot study.

The purpose of conducting user evaluation is to assess users' perception and also acceptance of the VHT app. The Technology Acceptance Model (TAM) questionnaire together with Enjoyment and Perceived Augmentation were used for the acceptance study. TAM's questionnaire, which includes variables like as Perceived Usefulness, Perceived Ease Of Use, Attitude Towards Use and, and Intention To Use, provides the foundation for predicting attitude or behaviour toward a new application or technology.

Before the user evaluation, participants were briefed on the VHT app's functionality and interfaces. The participants were allocated ample time to explore the VHT app on their own

without any interference by the researcher. Once the participants have understood and used the app, they were then given the TAM questionnaires. The purpose of the questionnaires is to collect data related to participants' opinion on the perception and acceptance of the VHT app.

In determining the mean and standard deviation for all items and attributes, descriptive statistics analysis was applied using SPSS version 22.0.

### 5.2 Results of Expert Evaluation

The expert evaluation, which involved six experts in total, was the first evaluation conducted in this study. The VHT app was evaluated for content by an expert while the functionality, interface Perceived Augmentation, and Enjoyment were evaluated by other five experts. The expert for content was Madam Nur Jamalina from Koleksi Jun. The expert for functionality and interface were Madam Ilinur Khairunisa Mohd Ajis, a lecturer who have been teaching Multimedia Technology for more than five years, Mr Danny Tan and Miss Low Cheng Ann are mobile apps developers who have more than five years of experience while the expert for Perceived Augmentation and Enjoyment was Ms.Atiqah Rizal and Ms. Nurul Liyana from Metropoint College who have been teaching Information Technology and Web Application for more than five years.

The content expert's job is to ensure that the content being delivered to the participants is accurate and appropriate. The VHT app was thoroughly reviewed by the content expert, who was provided with plenty of time to do so and was asked to provide the researcher with content feedback. Meanwhile, the other five experts examined the app's functionality, interface, Perceived Augmentation and Enjoyment. To fill out, they were given a form presented in Appendix B. The experts' comments were required prior to the user evaluation in order to correct the flaws and errors.

### 5.2.1 Evaluation of VHT app content

The content expert's feedback is shown in Appendix C. Based on the app's use, the expert decided that the content of the VHT app meets the standards. The expert concluded that the content may be utilised to promote and market hijabs.

### 5.2.2 Evaluation of VHT app functionality and interface

Comments from the three experts for functionality and interface are shown in Appendix D and the results at in Appendix E. The expert's comments and recommendations were considered, and the app was updated appropriately before the user evaluation.

### 5.2.3 Evaluation of VHT app Perceived Augmentation and enjoyment

Comments from the two experts for Perceived Augmentation and Enjoyment are shown in Appendix F and the results at in Appendix G.



## 5.3 Results of Pilot Study

The pilot study was conducted to ensure the reliability of the questionnaire items before conducting the user evaluation. The results of the pilot study indicated that all of the variables in the study have Cronbach's alpha values over 0.7, which indicates that they are reliable and can be applied in the user evaluation. For example, the Enjoyment variable has a Cronbach's alpha value of .862, which is well above the acceptable threshold of 0.70. This suggests that the four items in the Enjoyment variable are internally consistent and measure the same underlying construct. Similarly, the Perceived Augmentation variable has a Cronbach's alpha value of .791, the Perceived Usefulness variable has a Cronbach's alpha value of .829, the Attitude Toward Use variable has a Cronbach's alpha value of .801, the Perceived Ease Of Use variable has a Cronbach's alpha value of .726, and the Intention To Use variable has a Cronbach's alpha value of .728. These results suggest that the questionnaire items are reliable and can be used to measure

the corresponding constructs in the user evaluation. The use of Cronbach's alpha is a well-established method for assessing the internal consistency of questionnaire items, and the values obtained in this pilot study are all above the acceptable threshold, which provides confidence in the questionnaire's reliability.

Table 5.1.

*Cronbach's alpha values for the pilot study (n= 20)*

| | Variables | Number of Items | Cronbach's Alpha |
|---|---|---|---|
| 1 | Enjoyment | 4 | .862 |
| 2 | Perceived Augmentation | 4 | .791 |
| 3 | Perceived Usefulness | 3 | .829 |
| 4 | Perceived Ease of Use | 4 | .726 |
| 5 | Attitude Toward Use | 3 | .801 |
| 6 | Intention to Use | 3 | .728 |



## 5.4 Results of User Evaluation

### 5.4.1 Demographic Characteristic

For the user evaluation, 120 female youngsters between the ages of 15 to 39 were chosen. They were chosen based on their readiness to fill out the survey. The participants were selected using the convenient sampling technique.

### 5.4.2 Reliability Analysis

The reliability analysis was conducted to ensure that the research instrument is consistent. The Cronbach's alpha values were calculated for all attributes using SPSS version 22.0, and the results

are presented in Table 5.2. The Cronbach's alpha values were found to be 0.728 for 71 PEOU 0.814 for PU, 0.775 for ATU, 0.827 for ITU, 0.862 for E, and 0.771 for PA. According to Nunnally (1978), the attributes are considered reliable if their Cronbach's alpha values are greater than 0.7. As all the attributes in this study have Cronbach's alpha values higher than 0.7, they can be considered reliable. These results indicate that the research instrument is consistent and can be used in the subsequent data analysis.

Table 5.2.

*Cronbach's alpha*

| Attribute | Number of items | Cronbach's alpha |
|---|---|---|
| PEOU | 4 | .728 |
| PU | 3 | .814 |
| ATU | 3 | .775 |
| ITU | 3 | .827 |
| E | 4 | .862 |
| PA | 4 | .771 |



### 5.4.3 Descriptive Statistics Analysis

This analysis determined the mean and standard deviation of each attribute item to ascertain the perceptions of the participants towards the use of the VHT app. Table 5.3 presents the descriptive statistics analysis results.

Table 5.3.

*Mean and Standard deviation results*

| Attributes and Items | Mean | SD |
|---|---|---|

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

| | | |
|---|---|---|
| The Hijab seemed to be part of my face. | 4.29 | .525 |
| The Hijab seemed to exist in real time. | 4.25 | .489 |

The survey instrument used a 5-point Likert scale to determine the mean values for all the attributes. The Likert scale is an ordinal scale for determining a person's level of agreement with a proposal. In a Likert scale, responses can only be evaluated or ranked. On the other hand, the gap in responses cannot be quantified. The numerical scale, which excludes a neutral position, measures the distance between numbers of positions, categorising them into two directions such as strongly disagree, disagree, agree, and strongly agree. As a result, Qasim et al. (2018) recommend using a numerical scale to determine how much agree or disagree the participants towards a statement. The distance between Likert scale numbers was calculated using the following equation to convert from Likert scale to numerical scale.

$$RS= (m-n)/b$$

RS stands for the score range, m represents the greatest scale score, n represents the lowest scale score, and b represents the number of categories. As a result of the equation, the score range is 1. The numerical scale and category are presented in Table 5.4.

Table 5.4.

*Numerical scale and category*

| Numerical scale | Category |
|---|---|
| 1 - 1.99 | Strongly disagree |
| 2 - 2.99 | Disagree |
| 3 - 3.99 | Agree |
| 4 - 5 | Strongly agree |

According to Table 5.3, the mean scores for PEOU, PU, ATU, ITU, E, and PA are 4.29 (strongly agree), 4.14 (strongly agree), 4.44 (strongly agree), 4.46 (strongly agree), 4.30 (strongly agree), and 4.29 (strongly agree) respectively. All of the attributes were strongly agreed upon by the participants. ITU has the greatest mean (4.46), while PU has the least mean (4.14).

### 5.4.4 Structural Equation Modeling

The Partial Least Squares Structural Equation Modelling (PLS-SEM) technique utilising SmartPLS 3.2.6 were used to analyse the developed model. The PLS-SEM was utilised in this study to evaluate the models namely; structural and measurement. The measurement model connects to the link between the variables and indicators, while the structural model associates to the link between the latent variables themselves (Hair et al., 2017). PLS-SEM was used since it permits both the measurement and the structural model to be analysed at the same time, resulting in more precise estimations (Barclay et al., 1995).



One of the important aspects of PLS is the issue pertaining to the size of sample (Roldán & Sánchez-Franco, 2012). To achieve acceptable levels of statistical power, Reinartz, Haenlein, and Henseler (2009) recommended increasing the sample size to 100. A total of 120 female youngsters aged 15 to 39 years old were recruited as participants in this study. They were chosen based on their willingness to complete the questionnaire and the participants were chosen based on the convenient sampling technique.

#### 5.4.4.1 Measurement Model Evaluation

According to Hair et al. (2017), there are two types of validity to consider when evaluating a measurement model: Convergent and Discriminant.

**a. Convergent Validity**

Different measures must be taken into account while evaluating Convergent Validity. These measures include Average Variance Extracted (AVE), composite reliability, and factor loading. As suggested by Hair et al. (2017), to be accepted, the AVE values must be higher than 0.5 and the composite reliability and factor loading values must be equal to or more than 0.7. The results for Convergent Validity are presented in Table 5.5. For this study, the measurement items loadings were higher than the suggested value. Additionally, AVE, Composite Reliability (CR), and Cronbach's Alpha values were higher than the levels recommended. As a result, the Convergent Validity is achieved.

Table 5.5.

*Convergent validity results*

| **Variable** | Item code | **Factor loading** | **Cronbach's Alpha** | **Composite reliability** | **Average variance extracted (AVE)** |
|---|---|---|---|---|---|
| Enjoyment | E1 | 0.889 | 0.863 | 0.906 | 0.709 |
| | E2 | 0.869 | | | |
| | E3 | 0.867 | | | |
| | E4 | 0.732 | | | |
| Perceived Augmentation | PA1 | 0.754 | 0.771 | 0.852 | 0.590 |
| | PA2 | 0.820 | | | |
| | PA3 | 0.721 | | | |
| | PA4 | 0.775 | | | |
| Perceived | PU1 | 0.923 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Usefulness | PU2 | 0.812 | 0.827 | 0.897 | 0.744 |
| | PU3 | 0.849 | | | |
| Perceived Ease of Use | PEOU2 | 0.945 | 0.884 | 0.945 | 0.896 |
| | PEOU3 | 0.948 | | | |
| Attitude Toward Use | ATU1 | 0.852 | 0.775 | 0.870 | 0.690 |
| | ATU2 | 0.785 | | | |
| | ATU3 | 0.853 | | | |
| Intention to Use | ITU1 | 0.898 | 0.817 | 0.891 | 0.732 |
| | ITU2 | 0.819 | | | |
| | ITU3 | 0.848 | | | |

**b. Discriminant Validity**

The degree to which one variable in the study model differs from all other variables is known as discriminant validity (Chin, 1998). The Cross-loadings, Heterotrait-Monotrait ratio (HTMT), and Fornell-Larcker criteria were utilised to determine the discriminant validity of this study. Based on the Fornell-Larcker criterion (square root of AVE), the correlation of latent variables must be lower than the correlation of every variable in the correlation matrix (diagonal value), which the current study met as shown in Table 5.6.

Table 5.6.

*Fornell-larcker criterion*

| **Variables** | | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|---|
| 1 | Enjoyment | **0.831** | | | | | |
| 2 | Perceived Augmentation | 0.61 | **0.842** | | | | |
| 3 | Perceived Usefulness | 0.488 | 0.444 | **0.856** | | | |
| 4 | Perceived Ease of Use | 0.252 | 0.408 | 0.462 | **0.768** | | |
| 5 | Attitude Toward Use | -0.005 | 0.333 | 0.416 | 0.407 | **0.947** | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | Intention to Use | 0.522 | 0.472 | 0.986 | 0.487 | 0.444 | **0.863** |

According to David and Detmar (2000), for the cross loadings criterion, each item's loading must be higher than its comparable variable's loading. As a result, the cross loadings criterion has also been met, as shown in Table 5.7.

Table 5.7.

*Cross-loadings criterion*

| | ATU | E | ITU | PA | PEOU | PU |
|---|---|---|---|---|---|---|
| **ATU1** | **0.852** | 0.521 | 0.463 | 0.208 | 0.085 | 0.493 |
| **ATU2** | **0.785** | 0.586 | 0.403 | 0.252 | -0.010 | 0.421 |
| **ATU3** | **0.853** | 0.405 | 0.341 | 0.165 | -0.104 | 0.376 |
| **E1** | 0.716 | **0.889** | 0.421 | 0.267 | 0.221 | 0.453 |
| **E2** | 0.426 | **0.869** | 0.333 | 0.329 | 0.208 | 0.348 |
| **E3** | 0.395 | **0.867** | 0.444 | 0.456 | 0.499 | 0.462 |
| **E4** | 0.516 | **0.732** | 0.251 | 0.316 | 0.123 | 0.285 |
| **ITU1** | 0.462 | 0.542 | **0.898** | 0.517 | 0.444 | 0.923 |
| **ITU2** | 0.405 | 0.148 | **0.819** | 0.345 | 0.313 | 0.777 |
| **ITU3** | 0.381 | 0.432 | **0.848** | 0.306 | 0.297 | 0.822 |
| **PA1** | 0.013 | 0.233 | 0.182 | **0.754** | 0.282 | 0.210 |
| **PA2** | 0.136 | 0.391 | 0.394 | **0.820** | 0.432 | 0.402 |
| **PA3** | 0.348 | 0.276 | 0.372 | **0.721** | 0.210 | 0.401 |
| **PA4** | 0.250 | 0.318 | 0.418 | **0.775** | 0.293 | 0.435 |
| **PEOU2** | 0.040 | 0.218 | 0.390 | 0.381 | **0.945** | 0.416 |
| **PEOU3** | -0.049 | 0.410 | 0.398 | 0.390 | **0.948** | 0.426 |
| **PU1** | 0.462 | 0.542 | 0.898 | 0.517 | 0.444 | **0.923** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **PU2** | 0.483 | 0.190 | 0.795 | 0.359 | 0.381 | **0.812** |
| **PU3** | 0.412 | 0.455 | 0.856 | 0.365 | 0.316 | **0.849** |

According to Kline (2015), the threshold value for observing discriminant validity is all values less than 0.85 for the Heterotrait-Monotrait ratio (HTMT). The HTMT criterion has been met, indicating that discriminant validity has been achieved as shown in Table 5.8.

Table 5.8.

*Heterotrait-Monotrait ratio (HTMT)*

| | **ATU** | **E** | **ITU** | **PA** | **PEOU** |
|---|---|---|---|---|---|
| **ATU** | | | | | |
| **E** | 0.743 | | | | |
| **ITU** | 0.605 | 0.505 | | | |
| **PA** | 0.327 | 0.483 | 0.549 | | |
| **PEOU** | 0.134 | 0.356 | 0.483 | 0.479 | |
| **PU** | 0.650 | 0.528 | 0.197 | 0.580 | 0.516 |



### 5.4.4.2 Structural Model Evaluation

#### a. Coefficient of Determination

According to Hair (2017), the Coefficient of Determination ($R^2$) is the most commonly used metric for structural model analysis. It can be used in determining the model's predictive accuracy. It also indicates the amount of variance in endogenous variables that is confirmed by each exogenous variable that is linked to it. Cohen (1988) suggested categorising $R^2$ values as follows: 0.02 (weak), 0.13 (moderate), and 0.26 (substantial). With reference to Table 5.9, the $R^2$ values for PU, PEOU, ATU, and ITU were 0.373, 0.166, 0.343 and 0.238 respectively. Despite

the fact that $R^2$ value ranges from 0 to 1, there is no agreement on the precise number. The $R^2$ value is determined by the study situation (Hair et al., 2017). Furthermore, $R^2$ of intention to use explains 23.8 %, indicating that this measure has moderate predictive potential.

Table 5.9.

*Assessment of Coefficients of Determination ($R^2$) (Cohen, 1988)*

| **Attributes** | **$R^2$** | **Result** |
|---|---|---|
| Perceived Usefulness | 0.373 | Substantial |
| Perceived Ease of Use | 0.166 | Moderate |
| Attitude Toward Use | 0.343 | Substantial |
| Intention to Use | 0.238 | Moderate |

**b. Path Analysis**

Path analysis was performed on the structural model. Figures 5.1 and 5.2 show the outcomes of the PLS analysis and bootstrapping, respectively. Bootstrapping is a method for getting t-statistics for significance testing that entails re-sampling at random and replacing the original sample in order to determine standard errors for hypothesis testing and establish a bootstrap sample (Hair et al., 2011).

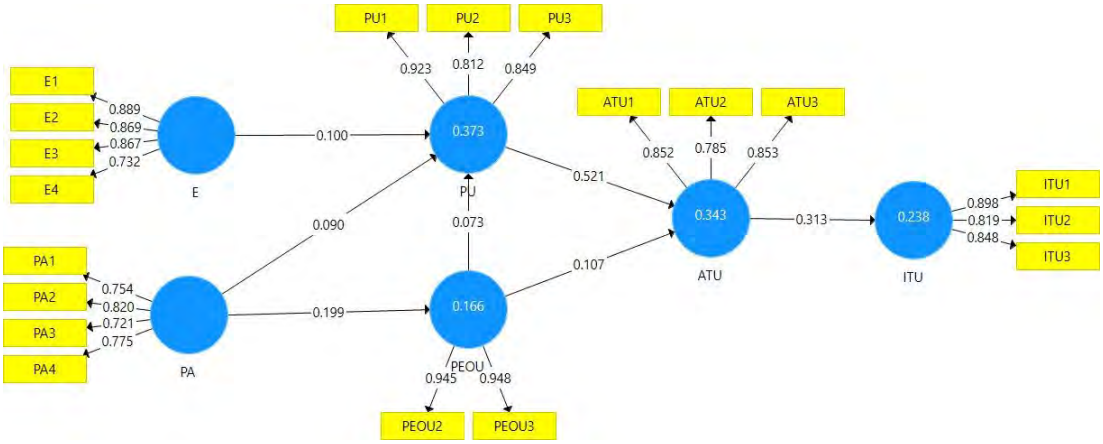

*Figure 5.1.* PLS Result

Coefficient of determination ($R^2$), path coefficients (β), and Path significance (*p* value), were investigated in the structural model. The hypotheses were put to the test by looking for relationships which are statistically significant among variables in the direction predicted. In addition, the following criteria by Hair, Ringle, and Starstedt (2011) were utilised to evaluate the path significances:

a) when the t-statistic surpasses 2.58 for a 0.01 significance level.

b) when the t-statistic surpasses 1.96 for a 0.05 significance level.

c) when the t-statistic surpasses 1.65 for a 0.1 significance level.

All hypothesised path relationships were confirmed as indicated in Table 5.10.

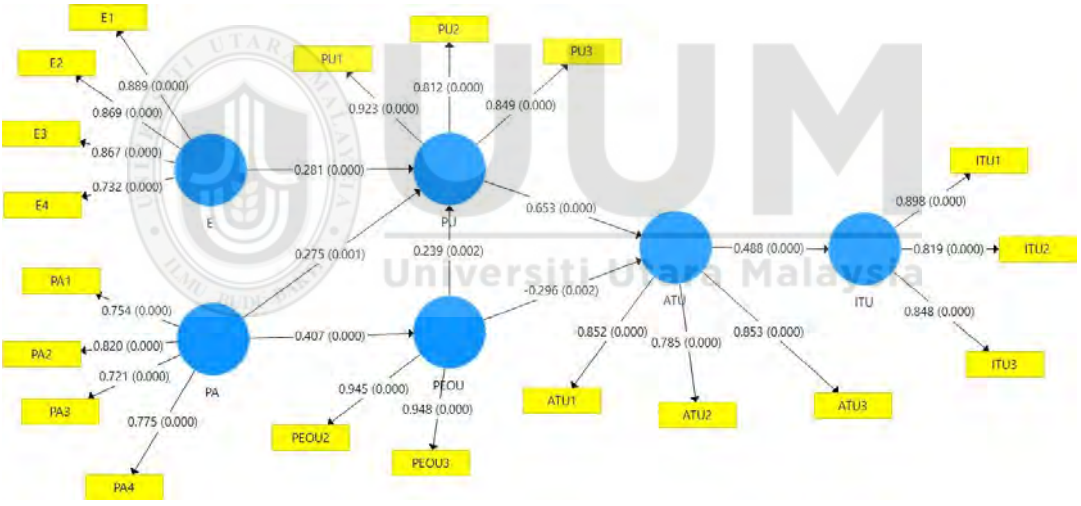


*Figure 5.2.* Bootstrapping results

Table 5.10.

*Hypothesis Testing*

| H | Latent Variables | Beta | SE | T Stat | P Value | Decision |
|---|---|---|---|---|---|---|
| 1 | ATU → ITU | 0.488 | 0.058 | 8.428 | 0.000 | Supported |
| 2 | E → PU | 0.281 | 0.076 | 3.698 | 0.000 | Supported |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | PA → PEOU | 0.407 | 0.062 | 6.540 | 0.000 | Supported |
| 4 | PA → PU | 0.275 | 0.086 | 3.182 | 0.001 | Supported |
| 5 | PEOU → ATU | -0.296 | 0.103 | 2.879 | 0.002 | Supported |
| 6 | PEOU → PU | 0.239 | 0.083 | 2.895 | 0.002 | Supported |
| 7 | PU → ATU | 0.653 | 0.073 | 8.988 | 0.000 | Supported |

The results indicated that PA affects the PU (β=0.275, $p < 0.001$) and PEOU (β=0.407, $p < 0.000$) significantly; hence, supporting hypotheses H4 and H3, respectively. E is significantly affecting the PU (β=0.281, $p < 0.000$) hence, supporting hypothesis H2. PU affects significantly ATU (β=0.653, $p < 0.000$) hence, supporting hypothesis H7. PEOU is significantly affecting the PU (β=0.239, $p < 0.002$) and ATU (β=-0.296, $p < 0.002$); hence, supporting hypotheses H6 and H5, respectively. Finally, ATU is significantly affecting the ITU (β=0.488, $p < 0.000$) hence, supporting hypothesis H1.



**5.5 Summary**

The content, functionality, and interface of the developed VHT app were all evaluated by experts to ensure that it met the requirements and standards. Meanwhile, to determine the user's perceptions and acceptance of the developed VHT app, a user evaluation was undertaken. The users' perceptions were determined using descriptive statistics, and the users' acceptance was determined using structural equation modeling. According to the results, users strongly agreed on all the TAM original attributes plus the two additional attributes; E, and PA. The results also indicated that the TAM has once again shown to serve as a useful theoretical model in understanding the acceptance of users towards the VHT app. Objectives 2 and 3 of this study have been met as a result of the findings. The population and sampling size has been from the age group of 15 to 39 because below the age of 15 cannot provide the appropriate answers regarding the questions. In this age group, people have the adequate knowledge regarding the

topic of this research

# CHAPTER SIX

# CONCLUSION

## 6.1 Introduction

This chapter summarizes the overall conclusions of the study. It goes over the goals that were met, as well as the contribution to the domain of research, limitations that were identified, and recommendations for future research. The sections that follow go over the entire study.

## 6.2 Research Discussion

From this study there are several keywords in the research objectives which are develop the VHT app and determine the users' perceptions and acceptance towards the developed VHT app. As mentioned previously, this research is intended to:

i. To determine the factors that influence MAR application acceptance.
ii. To measure user acceptance of MAR application through a prototype.
iii. To validate the new MAR acceptance model.

Three research questions were formulated to accomplish the given research objectives.

i. What are the factors that influence MAR application acceptance?
ii. How to measure user acceptance of MAR application through a prototype?
iii. How to validate the new MAR acceptance model?

### 6.2.1 The Factors That Influence MAR Application Acceptance

The factors that influence MAR Application acceptance are E, PA, PU, PEOU, ATU and ITU by using user evaluation. 25 youngsters between ages 15 and 39 were chosen to participate in the pilot study. The findings of this study are in line with the findings of a study conducted by Abdul Nasir Zulkifli, Nur Syuhada' Mohd Pozi, Salina Ismail (2020), The study specifically focusing on E, PA, PU, PEOU, ATU and ITU. The findings of the study showed that the participants strongly agreed on all the attributes. The mean value for intention to use is 4.46 which is the highest while the mean value for PU is 4.14 which is the lowest. Objective 1is achieved where the researcher can list the factors that influence MAR application acceptanceby making a questionnaire against 25 youngsters and supported by literature review.

### 6.2.2 Measure User Acceptance of MAR Application Through A Prototype

The second objective which is determining the users' perceptions of the developed VHT app, was accomplished through user evaluation. This objective achieved when all the items and attributes were analyzed by SPSS software. All the items and attributes are included in the questionnaire, including PU, PEOU, ATU, ITU, E, and PU. The goal of the Perception evaluation was to determine the mean and standard deviation for all items and attributes. For the descriptive statistics, the mean values for PEOU, PU, ATU, ITU, E, and PU were 4.29, 4.14, 4.44, 4.46, 4.30, and 4.29 respectively. The results indicated that ITU has the greatest mean (4.46) while PU has the least mean (4.14). Overall, the results showed that all of the measurements were strongly agreed upon by the users and these reflect the high level of users' acceptance towards the use of the VHT app.

#### 6.2.2.1 Validate The New MAR Acceptance Model

According to Hair et al. (2017), there are two types of validity to consider when evaluating a measurement model which are convergent and discriminant. Different measures must be considered while evaluating convergent validity. These measures include Average Variance Extracted (AVE), composite reliability, and factor loading. As suggested by Hair et al. (2017), to be accepted, the AVE values must be higher than 0.5 and the composite reliability and factor loading values must be equal to or more than 0.7. For this study, the measurement items loadings were higher than the suggested value. According to David and Detmar (2000), for the Cross-loading's criterion, each item's loading must be higher than its comparable variable's loading. As a result, the Cross-loadings criterion has also been met. Meanwhile, when the Heterotrait-Monotrait ratio (HTMT), Cross-loadings, and Fornell-Larcker requirements are fulfilled, the discriminant validity is also achieved. R2 was utilized in evaluating the structural model and establish its prediction accuracy. R2 for PU, PEOU, ATU and ITU were 0.373, 0.166, 0.343 and 0.238 respectively. For ITU, its R2 value explains 23.8% of the variance, and as a result, this variable has a moderate predictive potential.



## 6.3 Contribution of the study

The main contributions of this study are the VHT app and the results of Perception and Acceptance evaluations among users and the research model. The contributions are discussed below.

### 6.3.1 The VHT app

The main contribution of this study is the VHT app. The app was developed to enable users to try on hijabs without having to go out to a store and try them on in the fitting room. The features of the VHT app can also be utilized to complement current capabilities that are not available when buying online.

### 6.3.2 Results of Perception Evaluation

The second objective which is determining the users' perceptions of the developed VHT app, was accomplished through user evaluation. It was conducted among 120 female youngsters aged 15 to 39. The participant's selection was based on their willingness to complete the questionnaire. A convenient sampling technique was applied in selecting the participants. The user evaluation was carried out utilizing a set of questionnaires that were adapted from previously validated instruments and tailored to the study's needs. All the items and attributes are included in the questionnaire, including PU, PEOU, ATU, ITU, E, and PA. The goal of the perception evaluation was to determine the mean and standard deviation for all items and attributes. For the descriptive statistics, the mean values for PEOU, PU, ATU, ITU, E, and PA were 4.29, 4.14, 4.44, 4.46, 4.30, and 4.29 respectively. The results indicated that ITU has the greatest mean (4.46) while PU has the least mean (4.14). Overall, the results showed that all of the measurements were strongly agreed upon by the users and these reflect the high level of users' acceptance towards the use of the VHT app.



### 6.3.3 Results of Acceptance Evaluation

SEM was used to describe users' acceptance of the VHT app for hijab try-on. The structural model is based on TAM which includes PEOU, PU, ITU, and ATU of the VHT app. Furthermore, the researcher has proposed that the TAM be enhanced by including E and PA to better understand about the variables the variables that effect the acceptance of the VHT app for hijab try-on. The results suggest that the research model is acceptable. Each item's reliability was satisfactory, as were Cronbach's alpha and composite reliability scores, and latent variables had a high level of internal consistency reliability. Additionally, the measurement's convergent and discriminant validities were both acceptable. The relationships were mostly positive and significant, and all of the hypotheses were confirmed. The findings substantiate the TAM hypotheses (H1, H5, H6 and H7).

### 6.3.4 The Research Model

The research model depicted in Figure 6.1 adds to the body of knowledge about the TAM's robust construction (Davis, 1986, 1989; Venkatesh & Davis, 2000). According to the results of the SEM, PA and E have a significant positive effect on users' PU. These results suggest that when E and PA with VHT app are deeply rooted, the users' PU would undoubtedly increase. The results showed that PA has significant positive impact on PEOU of the VHTapp. When it comes to TAM variables, the findings demonstrated that PEOU had a significantpositive effect on PU, ATU, and ITU the VHT app. The findings also indicated that PU has a significant positive effect on ITU and ATU. TAM's original hypotheses are also supported bythese results.

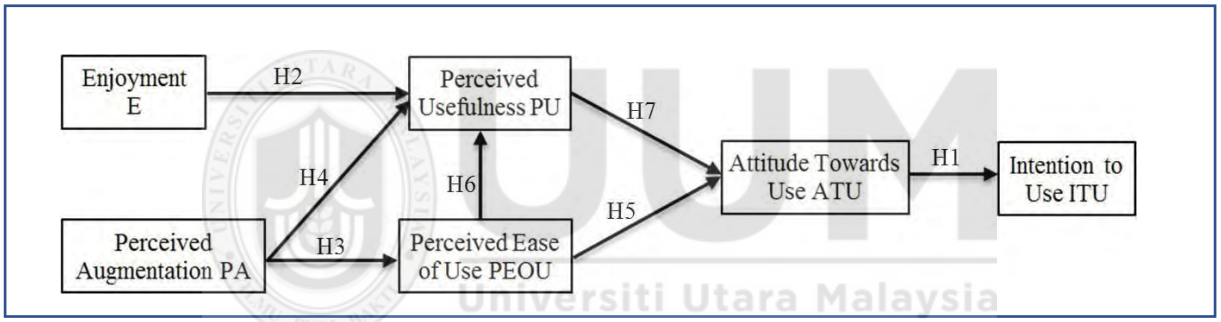


*Figure 6.1.* Research Model

## 6.4 Conclusions

This research contributes to the body of knowledge on user acceptance of VTO technology. Despite the fact that there has been numerous research on TAM, none have focused on VTO to help users with hijab try-on. To further understand users' behavior about possible acceptance of the VHT app, this study incorporated two factors in the TAM: E and PA. As a result of the findings, the following conclusions can be drawn: First and foremost, the TAM has been re-confirmed. The findings showed that this model is a useful tool for determining user acceptance of a system like the VHT app on a theoretical level. Second, users' acceptance of this VTO technology is influenced by factors such as E and PA. As a result, VTO apps should be well-designed to give users with factors such as E and PA, both of which are critical for increasing

the acceptance of these tools. As a result, VTO apps should be well-designed to give users with factors such as Enjoyment and Perceived Augmentation, both of which are critical for increasing the acceptance of these tools

## 6.5 Limitation of the study

The limitations that must be addressed during the research process are described in this section.

i. Designing and developing the VHT app is a great challenge to the researcher whereby need to understand and be well verse with the software which include Photoshop, Unity3D and Vuforia.
ii. The Android operating system was utilized for the development of the VHT app. This means that the VHT app can only be used on Android mobile devices, despite the fact that other operating systems are as useful and functional.
iii. Besides that, high performance mobile phone is required to run the VHT app to ensure the app can run smoothly during user evaluation.
iv. The APK for the VHT app is quite big. Thus, when conducting user evaluation, sometimes the researcher must use own smartphone during evaluation.
v. The participants were given about 15 minutes during the evaluation to acquaint themselves with the VHT app. Since most participants had never used a MAR-based try-on app, it is likely that they should be given more time (one week) to acquaint themselves with the VHT app. They must be able to comprehend the VHT app's functionality as well as all of its interfaces in order to take full advantage of this app.

## 6.6 Future Work

Considering the limitations of this study, for future research, the researcher suggests the following.

i. The VHT app could be developed on other hardware besides mobile device for example desktop or laptop, big screen TV and Microsoft Kinect.
ii. In addition to Android, the VHT app might be developed for iPhone users and other OS platforms.
iii. Larger sample sizes may be used in future studies to help generalize the findings.
iv. Extend the features of the VHT app such as enabling users not just to try-on the hijab but also purchase the hijab through online.
v. Extend the factors that influence the adoption of mobile AR applications in online shopping, and compare the VHT app with other similar applications in the market.

## 6.7 Summary

The overall conclusions of this study are summarized in this chapter. It discusses the objectives that were met, as well as the contribution to the body of knowledge, limitations that were observed, and future work recommendations. This section briefly tells where the researcher achieved the three objectives of the study. The data obtained is also relevant based on the research method used. This section also talks about the contribution of the study. Among his contributions are in terms of the VHT app, results of Perception evaluation, results of Acceptance evaluation and the research model. Limitation of the study also be discussed such as designing and developing the VHT app is a great challenge to the researcher whereby need to understand and be well verse with the software which include Photoshop, Unity3D and Vuforia, the Android operating system was utilized for the development of the VHT app. This means that the VHT app can only be used on Android mobile devices, even though other operating systems are as useful and functional and so on. The last part in this chapter is about future work where the researcher suggests the VHT app could be developed on other hardware besides mobile device for example desktop or laptop, big screen TV and Microsoft Kinect. In addition to Android, the VHT app might be developed for iPhone users and other OS platforms. Larger sample sizes may be used in future studies to help generalize the findings and extend the features of the VHT app such as enabling users not just to try-on the hijab but also purchase the hijab through online.

## REFERENCES


Ahmedova, S. (2015). Factors for increasing the competitiveness of small and medium-sized enterprises (SMEs) in Bulgaria. Procedia-Social and Behavioral Sciences, 195, 1104-1112.

Al-Busaidi, K. A. (2013). An empirical investigation linking learners' adoption of blended learning to their intention of full e-learning. Behaviour & Information Technology, 32(11), 1168-1176.

Alharbi, S., & Drew, S. (2014). Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems. International Journal of Advanced Computer Science and Applications, 5(1), 143-155.

Amed, I., Berg, A., Brantberg, L., Hedrich, S., Leon, J., & Young, R. (2016). The state of fashion 2017. The Business of Fashion and McKinsey & Company.

Appsmarche (2016, July 6). Wireframe in mobile development. http://www.appsmarche.com/wireframe-in-mobile-app-development- appsmarche.html

Arghashi, V., & Yuksel, C. A. (2022). Interactivity, Inspiration, and Perceived Usefulness! How retailers' AR-apps improve consumer engagement through flow. Journal of Retailing and Consumer Services, 64, 102756.

Arici, F., Yildirim, P., Caliklar, Ş., & Yilmaz, R. M. (2019). Research trends in the use of augmented reality in science education: Content and bibliometric mapping analysis. Computers & Education, 142, 103647.

Arifin, Y., Sastria, T. G., & Barlian, E. (2018). User experience metric for augmented reality application: a review. Procedia Computer Science, 135, 648-656.

Arnold, M. J., Reynolds, K. E., Ponder, N., & Lueg, J. E. (2005). Customer delight in a retail context: investigating delightful and terrible shopping experiences. Journal of Business

Research, 58(8), 1132-1145.

Aydinoğlu, N. Z., & Krishna, A. (2012). Imagining thin: Why vanity sizing works. Journal of Consumer Psychology, 22(4), 565-572.

Ayodele, S. O., Oga, O. E., Bundot, Y. G., & Ogbari, M. E. (2016, October). Role of power supply towards e-learning acceptance: VBSEM-AMOS. In 2016 6th International Conference on Information Communication and Management (ICICM) (pp. 151-155). IEEE.

Bacon, L. D. (1999, February). Using LISREL and PLS to measure customer satisfaction. In Sawtooth Software Conference Proceedings (pp. 2-5).

Baker, E.J., Bakar, J.A.A., Zulkifli, A.N., & Che Omar, A. (2019). Development of the MARHIME App Embedding the Mobile Augmented Reality for Hearing-impaired Museum Visitors Engagement Model. International Journal of Innovative Technology and Exploring Engineering, 8(8s), 363- 368.

Banjo, S. (2013). Rampant returns plague e-retailers. The Wall Street Journal. http://online.wsj.com/news/articles/SB10001424052702304773104579270260683155216. (Retrieved: 15th May 2017).

Barclay, D., Higgins, C. A. & Thompson, R. (1995). The partial least squares approach to causal modeling: Personal computer adoption and use as an illustration. Technol. Stud., Special Issues Res. Methodol., 2, 282–324.

Blair, J.H. (1974). “Evaluation and Analysis of an Augmented Knowledge Workshop: Final Report for Phase 1”. Rome Air Development Centre. RADC-TR-74, 79. Grifis Air Force Base, New York. pp 28-31

Bourlakis, M., Papagiannidis, S., & Li, F. (2009). Retail spatial evolution: paving the way from traditional to metaverse retailing. Electronic Commerce Research, 9(1-2), 135-148.

Bressler, D. M., & Bodzin, A. M. (2013). A mixed methods assessment of students' flow experiences during a mobile augmented reality science game. Journal of Computer

Assisted Learning, 29(6), 505-517.

Cao, M., Li, Y., Pan, Z., Csete, J., Sun, S., Li, J., & Liu, Y. (2015). Educational virtual-wear trial: more than a virtual try-on experience. IEEE computer graphics and applications, 35(6), 83-89.

Chaffey, D., (2010). E-Business and E-Commerce Management: Strategy, Implementation and Practice, Prentice Hall Press, Upper Saddle River, NJ.

Chen, R., Perry, P., Boardman, R., & McCormick, H. (2022). Augmented reality in retail: a systematic review of research foci and future research agenda. International Journal of Retail & Distribution Management, 50(4), 498-518.

Chen, Y. H., & Wang, W. C. (2010). An Interactive Virtual Fitting Room for Improved Service in Taiwan. Asian. J. of Dis. Edu, 8(1), 63-80.

Childers, T. L., Carr, C. L., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior. Journal of retailing, 77(4), 511-535.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. Modern Methods for Business Research, 295(2), 295–336.

Choi, E. K., & Lee, J. (2018). Why consumers continue using augmented reality technology in fashion retail? Perceived value, perceived usefulness, and perceived enjoyment. Journal of Business Research, 89, 316-324.

Cohen, J. (1988). Statistical Power Analysis for the Behavioural Sciences. 1st Edn., Lawrence Erlbaum Associates, Hillsdale, NJ.

Cooper, D. R., Schindler, P. S., & Sun, J. (2006). Business research methods (Vol. 9). New York: McGraw-Hill Irwin.

Cordier, F., Lee, W., Seo, H., & Magnenat-Thalmann, N. (2001). From 2D photos of yourself to virtual try-on dress on the web. In People and Computers XV— Interaction Without Frontiers (pp. 31-46). Springer, London.

Cuaresma, J., & MacKenzie, I. S. (2017, July). FittsFace: exploring navigation and selection

methods for facial tracking. In International Conference on Universal Access in Human-Computer Interaction (pp. 403-416). Springer, Cham.

Danakorn Nincarean, Mohamad Bilal Ali, Noor Dayana Abdul Halim & Mohd Hishamuddin Abdul Rahman. (2013). Mobile Augmented Reality: The Potential for Education. 13th International Educational Technology Conference, Universiti Teknologi Mara: Johor.

David, G., & Detmar, S. (2000). The Relative Importance of Perceived Ease of Use in IS Adoption: A Study of E- Commerce Adoption. Journal of the association for information systems, 1(8), 1-28.

Davis F. D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS quarterly, pg. 319-340.

Davis, F. D. (1986). A technology acceptance model for empirically testing new end- user information systems: Theory and results. Massachusetts Institute of Technology: Unpublished doctoral dissertation.

Dillon, A., & Morris, M. G. (1996). User acceptance of new information technology: theories and models. Medford, NJ: Information Today.

Do, H. N., Shih, W., & Ha, Q. A. (2020). Effects of mobile augmented reality apps on impulse buying behavior: An investigation in the tourism field. Heliyon, 6(8), e04667.

Domina, T., Lee, S. E., & MacGillivray, M. (2012). Understanding factors affecting consumer intention to shop in a virtual world. Journal of retailing and consumer services, 19(6), 613-620.

Domínguez Alfaro, J. L., Gantois, S., Blattgerste, J., De Croon, R., Verbert, K., Pfeiffer, T., & Van Puyvelde, P. (2022). Mobile Augmented Reality Laboratory for Learning Acid–Base Titration.

Eisert, P., Fechteler, P., & Rurainsky, J. (2008). 3-D tracking of shoes for virtual mirror applications. In Computer Vision and Pattern Recognition, 2008. CVPR 2008. IEEE Conference on (pp. 1-6). IEEE.

Fan, X., Jiang, X., & Deng, N. (2022). Immersive technology: A meta-analysis of augmented/virtual reality applications and their impact on tourism experience. Tourism Management, 91, 104534.

Farber, M. (2016). Consumers are now doing most of their shopping online. Fortune. http://fortune.com/2016/06/08/online-shopping-increases/

Fielt, E., Janssen, W., Faber, E., & Wagenaar, R. (2004). Confronting the design and acceptance of electronic intermediaries: A case study in the maritime sector. ACM, 392-401.

Fiore, A. M., & Jin, H. J. (2003). Influence of image interactivity on approach responses towards an online retailer. Internet Research, 13(1), 38-48.

Fishbein, M., & Ajzen, I. (1980). Predicting and understanding consumer behavior: Attitude-behavior correspondence. Understanding attitudes and predicting social behavior, 148-172.

Franz, W. J. I. (2017). Economics of vanity sizing. Journal of Economic Behavior & Organization, 134, 336-355.

G. Papagiannakis, S. Gurminder, and M. T. Nadia. (2008). A Survey of Mobile and Wireless Technologies for Augmented Reality Systems. Comput. Animat. Virtual Worlds, 19(1) 19, 3-22.

Gilakjani, A. P. (2012). The significant role of multimedia in motivating EFL learners' interest in English language learning. International Journal of Modern Education and Computer Science (IJMECS), 4(4), 57.

Giovanni, S., Choi, Y. C., Huang, J., Khoo, E. T., & Yin, K. (2012, November). Virtual try-on using kinect and HD camera. In International Conference on Motion in Games (pp. 55-65). Springer, Berlin, Heidelberg.

Haenlein, M., & Kaplan, A. M. (2004). A beginner's guide to partial least squares analysis. Understanding statistics, 3(4), 283-297.

Hair J. F., Ringle C. M. & Sarstedt M. (2011). PLS-SEM: Indeed a Silver Bullet. The Journal

of Marketing Theory and Practice, 19(2), 139-151

Hair, J. F., Anderson, R. E., Babin, B. J. & Black, W. C. (2010). Multivariate Data Analysis: A Global Perspective. Upper Saddle River, NJ, USA.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis. Englewood Cliff. New Jersey, USA, 5(3), 207-2019.

Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. (2017). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), 2nd ed., Sage, Thousand Oaks, CA.

Han, X., Wu, Z., Wu, Z., Yu, R., & Davis, L. S. (2017). VITON: An Image-based Virtual Try-on Network. arXiv preprint arXiv:1711.08447.

Hauswiesner, S., Straka, M., & Reitmayr, G. (2013). Virtual try-on through image- based rendering. IEEE transactions on visualization and computer graphics, 19(9), 1552-1565.

Hilsmann, A., & Eisert, P. (2009, May). Tracking and retexturing cloth for real-time virtual clothing applications. In International Conference on Computer Vision/Computer Graphics Collaboration Techniques and Applications (pp. 94-105). Springer, Berlin, Heidelberg.

Hoegg, J., Scott, M. L., Morales, A. C., & Dahl, D. W. (2014). The flip side of vanity sizing: How consumers respond to and compensate for larger than expected clothing sizes. Journal of Consumer Psychology, 24(1), 70-78.

Hsu, H. H., & Chang, Y. Y. (2013). Extended TAM model: Impacts of convenience on acceptance and use of Moodle. Online Submission, 3(4), 211-218.

Institut für Demoskopie Köln (2015). How high is the average rate of return of goods in your shop per year? http://www.statista.com/statistics/327314/share-of-returns-in-online-shoppingregarding-fashion-and-consumer-electronics/.

Janssen, C. (2018). Consumer acceptance of mobile augmented reality shopping applications in stationary retail trade.

Javornik A. (2015). “Wow, I can augment myself?” Measuring Effects of Perceived Augmentation and Interactivity on Affective, Cognitive and Behavioral Consumer Responses. Conference proceedings of Academy of Marketing 2015. Limerick, Ireland.

Javornik A. (2015) “Wow, It Looks Like It’s Real! But Can You Fix It A Bit?” Measuring Effects of Augmented Reality on Affective, Cognitive and Behavioral Aspects. Proceedings of EMAC -European Marketing Academy Conference. Leuven, Belgium. May 2015

Javornik, A. (2016). ‘It’s an illusion, but it looks real!’Consumer affective, cognitive and behavioural responses to augmented reality applications. Journal of Marketing Management, 32(9-10), 987-1011.

Javornik, A., Marshall, P., Rogers Y. (2016): “Beyond the wow effect of augmented reality” – Development of Perceived Augmentation Concept And Measuring Its Effects On Consumer Experience. Association for Consumer Research (ACR) Conference: Berlin

J. G. Andrews et al., “What will 5G be?” IEEE J. Sel. Areas Commun., vol. 32, no. 6, pp. 1065–1082, Jun. 2014.

Jiang, Q., Sun, J., Yang, C., & Gu, C. (2022). The Impact of Perceived Interactivity and Intrinsic Value on Users’ Continuance Intention in Using Mobile Augmented Reality Virtual Shoe-Try-On Function. Systems, 10(1), 3.

Kerr, E.B. and Hiltz, S.R. (1982). Computer Mediated Communication Systems: Status and Evaluation, New York: Academic Press. pp.58

Ketron, S. (2016). Consumer cynicism and perceived deception in vanity sizing: The moderating role of retailer (dis) honesty. Journal of Retailing and Consumer Services, 33, 33-42.

Ketron, S., & Naletelich, K. (2017). Redefining vanity sizing: when bigger may be better. Journal of Fashion Marketing and Management: An International Journal, 21(4), 438-452.

Ketron, S., & Spears, N. (2017). Liar, liar, my size is higher: How retailer context influences

labeled size believability and consumer responses to vanity sizing. Journal of Retailing and Consumer Services, 34, 185-192.

Khan, M. A., Israr, S., S Almogren, A., Din, I. U., Almogren, A., & Rodrigues, J. J. (2021). Using augmented reality and deep learning to enhance Taxila Museum experience. Journal of Real-Time Image Processing, 18, 321-332.

Khor, E. T. (2014). An analysis of ODL student perception and adoption behavior using the technology acceptance model. International Review of Research in Open and Distributed Learning, 15(6), 275-288.

Kim, J., & Forsythe, S. (2008). Adoption of Virtual Try-on Technology For Online Apparel Shopping. Journal of Interactive Marketing, 22(2), 45-59.

Kim, J., & Park, J. (2019). Augmented reality makeup: The impact of visual realism on consumer response. Journal of Business Research, 103, 214-222.

Kim, J., Kim, Y., & Nam, Y. (2020). Exploring the factors affecting consumer acceptance of virtual try-on technology in fashion e-commerce. Sustainability, 12(18), 7652.

Kim, J., Lee, M., & Kim, J. (2020). The impact of Virtual Try-On (VTO) technology on customer satisfaction: Application of the technology acceptance model in the fashion industry. Sustainability, 12(23), 10053.

Kinley, T. R. (2003). Size variation in women's pants. Clothing and Textiles Research Journal, 21(1), 19-31.

Kline, R. B. (2015). Principles and practice of structural equation modeling. Guilford publications.

Latif Amadu, Sikandar Syed Muhammad, Abubakari Sadiq Mohammed,Grace Owusu & Sadia Lukman. (2018). Using Technology Acceptance Model to Measure the Use of Social Media for Collaborative Learning in Ghana. Journal of Technology and Science Education, 8(4), 321-336.

Lamees Abdulrahman Alaulamie & Abeer Aidh Alshwiah. (2021). Perceptions of Augmented

Reality (AR): A Motivational Approach to the Technology Acceptance Model (TAM) for Pre-service Teachers. Universal Journal of Educational Research, 9(9). 1664-1675.

Li, H., Daugherty, T., & Biocca, F. (2001). Characteristics of virtual experience in electronic commerce: A protocol analysis. Journal of Interactive Marketing, 15(3), 13-30.

Li, H., Daugherty, T., & Biocca, F. (2002). Impact of 3-D advertising on product knowledge, brand attitude, and purchase intention: The mediating role of presence. Journal of advertising, 31(3), 43-57.

Li, Y.-H., Huang, J.-W., 2009. Applying theory of perceived risk and technology acceptance model in the online shopping channel. World Academy of Science, Engineering and Technology 53, 919–925.

Liang, T. P., & Turban, E. (2011). Introduction to the special issue social commerce: A research framework for social commerce. International Journal of Electronic Commerce, 16(2), 5-14.

Liaw, C., & Chen, C. (2013). The impact of virtual fitting room technology on consumers' online purchase intention. Management and Administrative Sciences Review, 2(1), 23-35.

Liu, L., Li, H., & Gruteser, M. (2019, August). Edge assisted real-time object detection for mobile augmented reality. In The 25th Annual International Conference on Mobile Computing and Networking (pp. 1-16).

MA, L. E. (2012). Assessing User Experience in Augmented Reality Applications Using the Positive Engagement Evaluation Model. In Proceedings of the International Conference on e-Learning, e-Business, Enterprise Information Systems, and e-Government (EEE) (p. 1). The Steering Committee of The World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp).

Magnenat-Thalmann, N., Kevelham, B., Volino, P., Kasap, M., & Lyard, E. (2011). 3d web-

based virtual try on of physically simulated clothes. Computer-Aided Design and Applications, 8(2), 163-174.

MäNtymäKi, M., & Salo, J. (2011). Teenagers in social virtual worlds: Continuous use and purchasing behavior in Habbo Hotel. Computers in Human Behavior, 27(6), 2088-2097.

Maple, T. (2015). Ringing in the new year with a rush of online returns, https://www.digitalcommerce360.com/2015/12/31/ringing-newyear-rush- online-returns/.

Marikyan, D. & Papagiannidis, S. (2022) Technology Acceptance Model: A review. In S. Papagiannidis (Ed), TheoryHub Book. Retrieved from http://open.ncl.ac.uk

Mayberry, K. (2015, December 16). How a Muslim headscarf became a fashion empire. BBC.com. http://www.bbc.com/capital/story/20151214-how-muslim-headscarves-became-a-huge-fashion-empire.

Merle, A., Senecal, S., & St-Onge, A. (2012). Whether and how virtual try-on influences consumer responses to an apparel web site. International Journal of Electronic Commerce, 16(3), 41-64.

Mintel (2017). Enabling the Digital Fashion Consumer through Fit and Sizing Technology. http://academic.mintel.com/display/839711/

Minjung Park & Jungmin Yoo. (2020). Effects of perceived interactivity of augmented reality on consumer responses: A mental imagery perspective. Journal of Retailing and Consumer Services, 52. https://doi.org/10.1016/j.jretconser.2019.101912

Mottura, S., Greci, L., Travaini, E., Viganò, G., & Sacco, M. (2007). MagicMirror & FootGlove: a new system for the customized shoe try-on. In The future of product development(pp. 441-450). Springer, Berlin, Heidelberg.

Nayak, Rigolin & Padhye, Rajiv. (2015). Introduction: The Apparel Industry. The Apparel Industry. 10.1016/B978-1-78242-232-7.00001-1.

Nisreen Ameen, Jun-Hwa Cheah & Satish Kumar. (2022). It's All Part of The Customer Journey:

The Impact Of Augmented Reality, Chatbots, And Social Media On The Body Image And Self-Esteem Of Generation Z Female Consumers. Retrieved from https://doi.org/10.1002/mar.21715

Nugraha, A., & Nasrudin, M. F. (2015). Augmented reality system for virtual hijab fitting. In International Visual Informatics Conference (pp. 454-463). Springer, Cham.

Nunnally, J. C. (1978). Psychometric theory. McGraw-Hill, New York.

Nur Intan Adhani & Dayang Rohaya Awang Rambli. (2012). A Survey of Mobile Augmented Reality Applications. 2012 1st International Conference on Future Trends in Computing and Communication Technologies, 89-95.

Nysveen, H., Pedersen, P. E., & Thorbjørnsen, H. (2005). Explaining intention to use mobile chat services: moderating effects of gender. Journal of consumer Marketing, 22(5), 247-256

Oztel, G. Y., & Kazan, S. (2015). Virtual Makeup Application Using Image Processing Methods. no, 5, 401-404.

Pachoulakis, I., & Kapetanakis, K. (2012). Augmented reality platforms for virtual fitting rooms. The International Journal of Multimedia & Its Applications, 4(4), 35.

Pajović, S. (2018). 8 Largest E-Commerce Companies in the World and No Alibaba is Not the Largest Chinese E-Commerce. Axiomq. https://www.axiomq.com/blog/8-largest-e-commerce-companies-in-the- world/

Pantano, E., & Naccarato, G. (2010). Entertainment in retailing: The influences of advanced technologies. Journal of Retailing and Consumer Services, 17(3), 200-204.

Papakostas, C., Troussas, C., Krouska, A., & Sgouropoulou, C. (2021). Measuring user experience, usability and interactivity of a personalized mobile augmented reality training system. Sensors, 21(11), 3888.

Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N., & Chrissikopoulos, V. (2016). Explaining online shopping behavior with fsQCA: The role of cognitive and affective

perceptions. Journal of Business Research, 69(2), 794–803. https://doi.org/10.1016/j.jbusres.2015.07.010

Patodiya, P. K., & Birla, P. (2017). Impact of Virtual–Try–On Online Apparel Shopping Decisions. RJPSS 2017, 42(2), pp. 197-206

Polit-O'Hara, D., & Beck, C. T. (2006). Essentials of nursing research: Methods, appraisal, and utilization (Vol. 1): Lippincott Williams & Wilkins.

Prismetric (2016, Nov 1). The importance of wireframes in mobile app development. https://www.prismetric.com/importance-wireframes-mobile- app-development/

Procházka, David & Stencl, Michael & Popelka, Ondřej & Stastny, Jiri. (2011). Mobile Augmented Reality Applications Mendel. https://www.researchgate.net/publication/51913820_

Putra, A., Sumarmi, S., Sahrina, A., Fajrilia, A., Islam, M., & Yembuu, B. (2021). Effect of Mobile-Augmented Reality (MAR) in Digital Encyclopedia on The Complex Problem Solving and Attitudes of Undergraduate Student. International Journal of Emerging Technologies in Learning (IJET), 16(7), 119-134.

Qasim, M. M., Ahmad, M., Omar, M., Zulkifli, A. N., & Bakar, J. A. A. (2018, September). A process for developing an instrument to measure the persuasion perspectives of parents using PMCOM app. In AIP Conference Proceedings (Vol. 2016, No. 1, p. 020119). AIP Publishing.

Qiao, X., Ren, P., Dustdar, S., Liu, L., Ma, H., & Chen, J. (2019). Web AR: A promising future for mobile augmented reality—State of the art, challenges, and insights. Proceedings of the IEEE, 107(4), 651-666.

Qin, H., Peak, D. A., & Prybutok, V. (2021). A virtual market in your pocket: How does mobile augmented reality (MAR) influence consumer decision making? Journal of Retailing and Consumer Services, 58, 102337.

Qu, C., Ma, J., Zhang, Y., Han, C., Huang, L., Shen, L., ... & Zou, W. (2019). Estrogen receptor

variant ER-α36 promotes tamoxifen agonist activity in glioblastoma cells. Cancer Science, 110(1), 221-234.

Rafique, H., Almagrabi, A. O., Shamim, A., Anwar, F., & Bashir, A. K. (2020). Investigating the acceptance of mobile library applications with an extended technology acceptance model (TAM). Computers & Education, 145, 103732.

Rahman, A. M., Tran, T. T., Hossain, S. A., & El Saddik, A. (2010, October). Augmented rendering of makeup features in a smart interactive mirror system for decision support in cosmetic products selection. In Distributed Simulation and Real Time Applications (DS-RT), 2010 IEEE/ACM 14th International Symposium on (pp. 203-206). IEEE.

R. T. Azuma, "A survey of augmented reality," Presence, Teleoper. Virtual Environ., vol. 6, no. 4, pp. 355–385, 1997.

Reuters, T., & Standard, D. (2015). State of the global Islamic economy 2015-2016 report. http://www.tief2015.org/pdf/report/1910_3_1_shaima_hasan.pdf.

Revythi, A., & Tselios, N. (2019). Extension of Technology Acceptance Model by using System Usability Scale to assess behavioral intention to use e- learning. Education and Information Technologies, 24(4), 2341-2355.

Riar, M., Xi, N., Korbel, J. J., Zarnekow, R., & Hamari, J. (2022). Using augmented reality for shopping: a framework for AR induced consumer behavior, literature review and future agenda. Internet research.

Samar Zaineldeen, Li Hongbo, Aka Lucien Koffi & Bilal Mohammed Abdallah Hassan. (2020). Technology Acceptance Model' Concepts, Contribution, Limitation, and Adoption in Education. Universal Journal of Educational Research, 8(11), 5061-5071.

Saprikis, V., Avlogiaris, G., & Katarachia, A. (2021). Determinants of the intention to adopt mobile augmented reality apps in shopping malls among university students. Journal of Theoretical and Applied Electronic Commerce Research, 16(3), 491-512.

Sekaran U. (2003). Research methods for business: A Skill-building Approach. Hoboken: NJ:

John Wiley & Sons.

Sekaran, U. & Bougie, R. (2010). Research methods for business: A skill building approach. Wiley: London.

Sekaran, U., & Bougie, R. (2016). Research methods for business: A skill building approach. John Wiley & Sons.

Shah, R. (2014). Fixing How Clothes Fit You Can Reshape Online Retail Logistics, http://www.forbes.com/sites/rawnshah/2014/04/11/fixing-how-clothes-fit-you-can-reshape-onlineretail-logistics/

Shin Liao, Jon-Chao Hong, Ming-Hui Wen, Yi-Chen Pan & Yun-Wu Wu. (2018). Applying Technology Acceptance Model (TAM) to explore Users' Behavioral Intention to Adopt a Performance Assessment System for E-book Production. EURASIA Journal of Mathematics, Science and Technology Education, 14(10), 1-12

Shotton, J., Fitzgibbon, A., Cook, M., Sharp, T., Finocchio, M., Moore, R., ... & Blake, A. (2011). Real-time human pose recognition in parts from single depth images. IEEE Conference on Computer Vision and Pattern Recognition. Spanlang, B., Vassilev, T., Walters, J., & Buxton, B. F. (2005). A virtual clothing system for retail and design. Research Journal of Textile and Apparel, 9(1), 74-87.

Spanlang, B., Vassilev, T., Walters, J., & Buxton, B. F. (2005). A Virtual Clothing System for Retail and Design. Journal of Textile and Apparel, 9(1), 74-87.

Siriwardhana, Y., Porambage, P., Liyanage, M., & Ylianttila, M. (2021). A survey on mobile augmented reality with 5G mobile edge computing: architectures, applications, and technical aspects. IEEE Communications Surveys & Tutorials, 23(2), 1160-1192.

Smink, A. R., Van Reijmersdal, E. A., Van Noort, G., & Neijens, P. C. (2020). Shopping in augmented reality: The effects of spatial presence, personalization and intrusiveness on app and brand responses. Journal of Business Research, 118, 474-485.

Statista (2019, January 7). U.S. Apparel Market - Statistics & Facts.

https://www.statista.com/topics/965/apparel-market-in-the-us/

Sugiat, M., Primiana, I., Kaltum, U., & Herwany, A. (2020). Innovative marketing of emerging moslem fashion in the province of west java Indonesia. Journal of Sustainability Science and Management, 15(5), 165-173.

Sun, L., Luo, X., Zhang, Z., & Zhang, J. (2020). Does Virtual Try-On improve online shopping outcomes? An empirical study in the fashion industry. Journal of Retailing and Consumer Services, 52, 101934.

Sun, X., Tang, Y., Gao, X., & Liu, X. (2020). Virtual try-on technology in the fashion industry: A review. IEEE Access, 8, 153383-153395.

Sung, M., Kim, J., & Ahn, J. (2022). Social influence and perceived enjoyment as key factors affecting Virtual Try-On (VTO) acceptance. Telematics and Informatics, 68, 101758.

Sung, Y., Lee, K. M., & Kim, J. (2022). Social influence, perceived enjoyment, and intention to use virtual try-on technology. Telematics and Informatics, 69, 101701.

Tan, G. W. H., Ooi, K. B., Sim, J. J., & Phusavat, K. (2012). Determinants of mobile learning adoption: An empirical analysis. Journal of Computer Information Systems, 52(3), 82-91.

Tarhini, A., Hone, K., Liu, X., & Tarhini, T. (2017). Examining the moderating effect of individual-level cultural values on users' acceptance of E-learning in developing countries: a structural equation modeling of an extended technology acceptance model. Interactive Learning Environments, 25(3), 306-328.

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. Journal of Information technology theory and application, 11(2), 5-40.

Vaishnavi, V. K., & Kuechler, W. (2008). Improving and Innovating Information & Communication Technology: Design Science Research Methods and Patterns. Taylor Francis.

Van der Heijden, H. (2004). User acceptance of hedonic information systems. MIS quarterly, 695-704.

Van Krevelen, D. W. F., & Poelman, R. (2010). A survey of augmented reality technologies, applications and limitations. International journal of virtual reality, 9(2), 1-20.

Van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. Nursing standard, 16(40), 33-36.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management science, 46(2), 186-204.

Venkatesh, V., 2000. Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. Information Systems Research 11 (4), 342–365.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Wang, J., & Sun, Y. (2021). Individual differences and virtual try-on technology acceptance in fashion e-commerce. Journal of Business Research, 132, 126-135.

Wang, Y., Ko, E., & Wang, H. (2022). Augmented reality (AR) app use in the beauty product industry and consumer purchase intention. Asia Pacific Journal of Marketing and Logistics, 34(1), 110-131.

Wang, Y., & Sun, Y. (2021). Who is more likely to adopt Virtual Try-On technology in the fashion industry? Individual differences and the technology acceptance model. Journal of Business Research, 132, 347-356.

Yin, C. Z. Y., Jung, T., & Lee, M. Y. (2021). Mobile augmented reality heritage applications: Meeting the needs of heritage tourists. Sustainability, 13(5), 2523.

Yuan, M., Khan, I. R., Farbiz, F., Niswar, A., & Huang, Z. (2011). A mixed reality system for virtual glasses try-on. In Proceedings of the 10th International Conference on Virtual Reality Continuum and Its Applications in Industry (pp. 363-366). ACM.

Yuan, M., Khan, I. R., Farbiz, F., Yao, S., Niswar, A., & Foo, M. H. (2013). A mixed reality virtual clothes try-on system. IEEE Transactions on Multimedia, 15(8), 1958-1968.

Yuan, X., Tang, D., Liu, Y., Ling, Q., & Fang, L. (2017). Magic Glasses: From 2D to 3D. IEEE Transactions on Circuits and Systems for Video Technology, 27(4), 843-854.

Zhang, Q., Guo, Y., Laffont, P. Y., Martin, T., & Gross, M. (2017). A virtual try-on system for prescription eyeglasses. IEEE computer graphics and applications, 37(4), 84-93.

Zwass, V., (1996). Eletronic Commerce: Structures and Issues. International Journal of Electronic Commerce, 1(1), pp. 3-23.

# Appendix A

**The VHT App**

The VHT 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 color so as to match their existing dresses, make-up, and the 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 VHT 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 VHT app, the first screen that appears for a few seconds is the flash screen as shown in Figure 1. Next the app will display the main interface of the app as shown in Figure 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 Figure 3. At the time of development, altogether 20 hijabs of various colors 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 choose any hijabs that they wanted to try-on. Users can try all the hijabs in the collection and there is no limit to the number of hijabs that they can try. Meanwhile the *Help* button guides the users 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 Figure 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. Figure 5 shows the original image of the user. The VHT 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 and email.


Figure 1: The flash screen of the VHT app


Figure 2: The main interface of the VHT app


Figure 3: Samples of hijab available in the VHT app

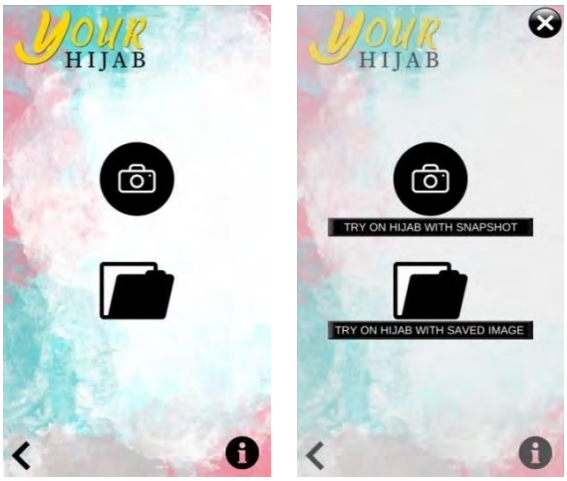


Figure 4: The try-on screen

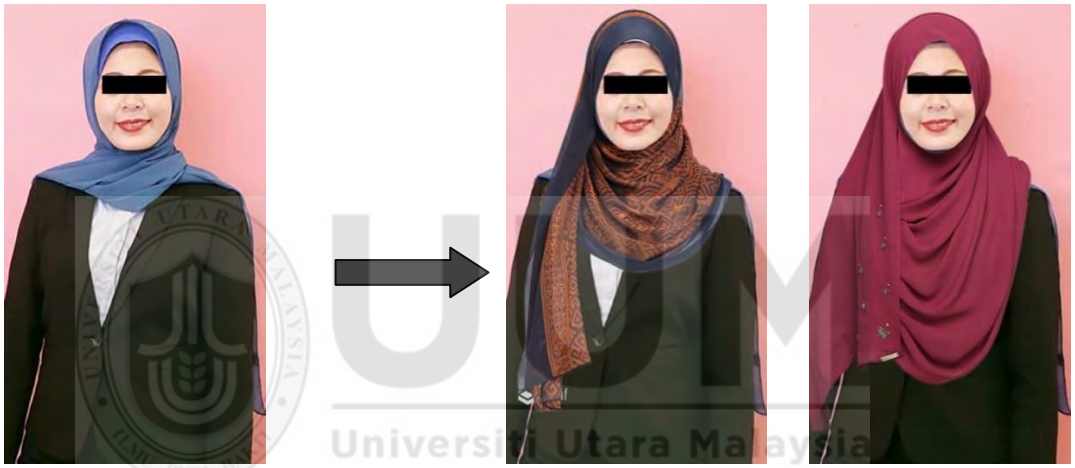

Figure 5: From original user's image to user's image fitted with virtual hijab

# Appendix B

## Content Expert Evaluation Form

I hereby certify that the VHT app has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the content and the general comments are as follows:



Name: Date:

Stamp:

# Appendix C

## Result I: Content Expert Evaluation Form

**Content Expert Evaluation Form**

I hereby certify that the VHT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the content and the general comments are as follows:

Bagi pendapat saya "The Virtual Hijab Try On (VHTO) prototype adalah inovasi yang terbaru yang boleh diaplikasikan didalam sebuah butik hijab. Hal ini kerana, aplikasi tersebut dapat menguruangkan beban atau masa jurujual untuk mengemas tudung yang kebiasaannya pelanggan ingin mencuba dan kebiasaannya akan menyebabkan butik bersepah. Seterusnya, dari segi pembelian secara online juga dapat membantu pelanggan membuat keputusan dalam pembelian sesuatu barang.

Name: Nur Jamalina

Date: 20/8/20

Stamp:

Koleksi Jun's
(Co. No. 001936415-A)
SK19 & SK20, 2nd Floor Komser JBCC,
Jalan Wong Ah Fook,
80000 Johor Bahru, Johor.
Tel: 07-XXX XXX4 Email: juns@xxx.com.my

# Result II: Content Expert Evaluation Form

**Content Expert Evaluation Form**

I hereby certify that the VHT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the content and the general comments are as follows:

- To me, this is the first time I tried a prototype VHT app. Visually, it looks simple and easy to use. The visuals of the picture can be matched to the face. The app functions are also easy to use and can be saved directly into the gallery. But in terms of hijab frame can be improved by listing the types of hijab ~~of~~ as tudung bawal, shawl, and so on according to the trend of hijab style nowadays. So, users can choose the type of hijab according to the hijab style trend that is suitable to be styled by them. Improvements also on the picture can ~~be~~ be displayed first before being shared to social media.



Name: Miss Ilinur

Date: 19/6/20

Stamp:

ILINUR KHAIRUNISA BINTI MOHD AJIS
Bach. of Multimedia (Hons)
Multimedia Lecturer (CDM)
Cosmopoint College Johor Bahru
Tel: 07-2767 500 Fax: 07-2767 504
ilinur.ajis@cosmopoint.com.my

## Result III: Content Expert Evaluation Form

**Content Expert Evaluation Form**

I hereby certify that the VHT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the content and the general comments are as follows:

Interface can refer IG and make it more colourful in order to attract attention. function side, I think it is sufficient but can have more thing to do like direct order from the app.



Name: Low Cheng Hau

Date: 21/4/2020

Stamp:

Leo Technology Sdn Bhd
Co. No. 1398272-M / 202001041951
Suite 33.01, Level 33,
JB City Square Office Tower,
106-108, Jalan Wong Ah Fook,
80000 Johor Bahru, Johor.

# Appendix D

## Functionality and Interface Evaluation

I hereby certify that the VHT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the validity of the functionality and interface and the general comments are as follows:

| Heuristic and Sub heuristics | | | | |
|---|---|---|---|---|
| **Interface (IN)** | | Pick one | | Comment |
| | | Yes | No | |
| IN1 | The instruction given is clear and easy to understand. | | | |
| IN2 | The interface design is attractive. | | | |
| IN3 | The VHT application is easy to use. | | | |
| IN4 | The colour scheme used is appropriate. | | | |
| IN5 | Attractive display of the screen design. | | | |
| IN6 | Appropriate interface. | | | |
| IN7 | The readability of text suits the target. | | | |
| **Multimedia (Image, Video, Text, and 3D model) (MM)** | | Pick one | | Comment |
| | | Yes | No | |
| MM1 | Each multimedia elements used serves a clear purpose. | | | |
| MM2 | Usage of multimedia elements is suitable with the content. | | | |
| MM3 | The presentation of multimedia elements is well managed. | | | |
| MM4 | The use of multimedia elements supports meaningfully the information provided. | | | |
| MM5 | The quality of multimedia elements used is good. | | | |
| MM6 | The use of multimedia elements enhances the content presentation. | | | |
| **Interactivity (IV)** | | Pick one | | Comment |
| | | Yes | No | |
| IV1 | The interactivity is easy to understand. | | | |
| IV2 | The interactivity is not misleading. | | | |
| IV3 | The info functions provided may be useful. | | | |

Name: Date:

Stamp:

# Appendix E

# Result I: Functionality and Interface Evaluation

**Functionality and Interface Evaluation**

I hereby certify that the VIIT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the validity of the functionality and interface and the general comments are as follows:

| Heuristic and Sub heuristics | | | | |
|---|---|---|---|---|
| **Interface (IN)** | | Pick one | | Comment |
| | | Yes | No | |
| IN1 | The instruction given is clear and easy to understand. | ✓ | | |
| IN2 | The interface design is attractive. | ✓ | | |
| IN3 | The VIIT application is easy to use. | ✓ | | |
| IN4 | The colour scheme used is appropriate. | ✓ | | |
| IN5 | Attractive display of the screen design. | ✓ | | |
| IN6 | Appropriate interface. | ✓ | | |
| IN7 | The readability of text suits the target. | ✓ | | |
| **Multimedia (Image, Video, Text, and 3D model) (MM)** | | Pick one | | Comment |
| | | Yes | No | |
| MM1 | Each multimedia elements used serves a clear purpose. | ✓ | | |
| MM2 | Usage of multimedia elements is suitable with the content. | ✓ | | |
| MM3 | The presentation of multimedia elements is well managed. | ✓ | | But need to improvement |
| MM4 | The use of multimedia elements supports meaningfully the information provided. | ✓ | | |
| MM5 | The quality of multimedia elements used is good. | ✓ | | |
| MM6 | The use of multimedia elements enhances the content presentation. | ✓ | | |
| **Interactivity (IV)** | | Pick one | | Comment |
| | | Yes | No | |
| IV1 | The interactivity is easy to understand. | ✓ | | |
| IV2 | The interactivity is not misleading. | ✓ | | |
| IV3 | The info functions provided may be useful. | ✓ | | |

Name: Nur Ilinur

Date: 19/6/20

Stamp: ILINUR KHAIRUNISA BINTI MOHD AJIS
Bach. of Multimedia (Hons)
Multimedia Lecturer (CDM)
Cosmopoint College Johor Bahru
Tel: 07-2767 500 Fax: 07-2767 504
ilinur.ajis@cosmopoint.com.my

# Result II: Functionality and Interface Evaluation

**Interface Expert Evaluation Form**

I hereby certify that the VHT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the validity of the interface and the general comments are as follows:

| Heuristic and Sub heuristics | | Pick one | | Comment |
|---|---|---|---|---|
| **Interface (IN)** | | Yes | No | |
| IN1 | The instruction given is clear and easy to understand. | ✓ | | |
| IN2 | The interface design is attractive. | | ✓ | can refer IG interface |
| IN3 | The VHT application is easy to use. | ✓ | | |
| IN4 | The colour scheme used is appropriate. | | ✓ | Not too attractive |
| IN5 | Attractive display of the screen design. | | ✓ | Too empty |
| IN6 | Appropriate interface. | ✓ | | |
| IN7 | The readability of text suits the target. | ✓ | | |
| **Multimedia (Image, Video, Text, and 3D model) (MM)** | | Pick one | | Comment |
| | | Yes | No | |
| MM1 | Each multimedia elements used serves a clear purpose. | ✓ | | |
| MM2 | Usage of multimedia elements is suitable with the content. | ✓ | | |
| MM3 | The presentation of multimedia elements is well managed. | ✓ | | |
| MM4 | The use of multimedia elements supports meaningfully the information provided. | ✓ | | |
| MM5 | The quality of multimedia elements used is good. | ✓ | | |
| MM6 | The use of multimedia elements enhances the content presentation. | | ✓ | too little interactive content to keep user |
| **Interactivity (IV)** | | Pick one | | Comment |
| | | Yes | No | |
| IV1 | The interactivity is easy to understand. | ✓ | | |
| IV2 | The interactivity is not misleading. | ✓ | | |
| IV3 | The info functions provided may be useful. | ✓ | | |

Name: Low Cheng Hau

Date: 21/4/2020

Stamp:

Leo Technology Sdn Bhd
Co. No. 1398272-M / 202001041951
Suite 33.01, Level 33,
JB City Square Office Tower,
106-108, Jalan Wong Ah Fook,
80000 Johor Bahru, Johor.

# Result III: Functionality and Interface Evaluation

**Interface Expert Evaluation Form**

I hereby certify that the VHT application has been produced by Nur Syuhada' Binti Mohd Pozi from the SMMTC, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the validity of the interface and the general comments are as follows:

| Heuristic and Sub heuristics | | | | |
|---|---|---|---|---|
| **Interface (IN)** | | Pick one | | Comment |
| | | Yes | No | |
| IN1 | The instruction given is clear and easy to understand. | ✓ | | |
| IN2 | The interface design is attractive. | | ✓ | Too empty as a user-to watch |
| IN3 | The VHT application is easy to use. | ✓ | | |
| IN4 | The colour scheme used is appropriate. | ✓ | | |
| IN5 | Attractive display of the screen design. | | ✓ | Too simple and blank |
| IN6 | Appropriate interface. | ✓ | | |
| IN7 | The readability of text suits the target. | ✓ | | |
| **Multimedia (Image, Video, Text, and 3D model) (MM)** | | Pick one | | Comment |
| | | Yes | No | |
| MM1 | Each multimedia elements used serves a clear purpose. | ✓ | | |
| MM2 | Usage of multimedia elements is suitable with the content. | ✓ | | |
| MM3 | The presentation of multimedia elements is well managed. | ✓ | | |
| MM4 | The use of multimedia elements supports meaningfully the information provided. | ✓ | | |
| MM5 | The quality of multimedia elements used is good. | ✓ | | |
| MM6 | The use of multimedia elements enhances the content presentation. | ✓ | | |
| **Interactivity (IV)** | | Pick one | | Comment |
| | | Yes | No | |
| IV1 | The interactivity is easy to understand. | ✓ | | |
| IV2 | The interactivity is not misleading. | ✓ | | |
| IV3 | The info functions provided may be useful. | ✓ | | |



Name: Danny Tan

Date: 31/04/2020

Stamp: Leo Technology Sdn Bhd
Co. No. 1398272-M / 202001041951
Suite 33.01, Level 33,
JB City Square Office Tower,
106-106, Jalan Wong Ah Fook,
80000 Johor Bahru, Johor.

# Appendix F

## Perceived Augmentation and Enjoyment

I hereby certify that the Virtual Hijab Try-On app has been produced by Nur Syuhada' Binti Mohd Pozi from the School of Multimedia Technology and Communication, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the Perceived Augmentation and Enjoyment and the general comments are as follows:

| Heuristic and Sub heuristics | | | | |
|---|---|---|---|---|
| **Perceived Augmentation (PE)** | | Pick one | | Comment |
| | | Yes | No | |
| PE1 | The apps match to my face. | | | |
| PE2 | The way the hijab is matched to my face look real. | | | |
| PE3 | The matching hijab is like a part of my face. | | | |
| PE4 | The matching hijab looks like it exists in real time. | | | |
| **Enjoyment (E)** | | Pick one | | Comment |
| | | Yes | No | |
| E1 | I love using the application. | | | |
| E2 | The application gives me an entertaining experience. | | | |
| E3 | I enjoyed using the application. | | | |
| E4 | I don't feel like time has passed when using the application. | | | |

Name: Date:

Stamp:

# Appendix G

## Result I: Perceived Augmentation and Enjoyment

**PERCEIVED AUGMENTATION AND ENJOYMENT**

I hereby certify that the Virtual Hijab Try-On app has been produced by Nur Syuhada' Binti Mohd Pozi from the School of Multimedia Technology and Communication, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the Perceived Augmentation and Enjoyment and the general comments are as follows:

| Heuristic and Sub heuristics | | | | |
|---|---|---|---|---|
| **Perceived Augmentation (PE)** | | Pick one | | Comment |
| | | Yes | No | |
| PE1 | The apps match to my face. | ✓ | | |
| PE2 | The way the hijab is matched to my face look real. | ✓ | | |
| PE3 | The matching hijab is like a part of my face. | ✓ | | |
| PE4 | The matching hijab looks like it exists in real time. | | ✓ | |
| **Enjoyment (E)** | | Pick one | | Comment |
| | | Yes | No | |
| E1 | I love using the application. | ✓ | | |
| E2 | The application gives me an entertaining experience. | ✓ | | |
| E3 | I enjoyed using the application. | ✓ | | |
| E4 | I don't feel like time has passed when using the application. | ✓ | | |

Name: Nurul Liyana

Date: 03/03/23

Stamp:

METROPOINT COLLEGE
J4PI003
JOHOR BAHRU

# Result II: Perceived Augmentation and Enjoyment

**PERCEIVED AUGMENTATION AND ENJOYMENT**

I hereby certify that the Virtual Hijab Try-On app has been produced by Nur Syuhada' Binti Mohd Pozi from the School of Multimedia Technology and Communication, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the Perceived Augmentation and Enjoyment and the general comments are as follows:

| Heuristic and Sub heuristics | | | | |
|---|---|---|---|---|
| **Perceived Augmentation (PE)** | | Pick one | | Comment |
| | | Yes | No | |
| PE1 | The apps match to my face. | ✓ | | |
| PE2 | The way the hijab is matched to my face look real. | | ✓ | improves the hijab design |
| PE3 | The matching hijab is like a part of my face. | ✓ | | |
| PE4 | The matching hijab looks like it exists in real time. | | ✓ | |
| **Enjoyment (E)** | | Pick one | | Comment |
| | | Yes | No | |
| E1 | I love using the application. | ✓ | | |
| E2 | The application gives me an entertaining experience. | ✓ | | |
| E3 | I enjoyed using the application. | ✓ | | |
| E4 | I don't feel like time has passed when using the application. | ✓ | | |

Name: Atiqah Rizal Date: 03/03/23

Stamp:

METROPOINT COLLEGE JHP0003 JOHOR BAHRU

# Appendix H

## ACCEPTANCE OF VIRTUAL HIJAB TRY-ON APP (VHT) QUESTIONNAIRE

UNIVERSITI UTARA MALAYSIA
KOLEJ SASTERA DAN SAINS
06010 UUM SINTOK KEDAH DARUL AMAN

PENYELIDIKAN

VIRTUAL HIJAB TRY-ON (VHT) APP

Tuan/Puan yang dihormati,

Saya pelajar Universiti Utara Malaysia dan kini sedang mengikuti pengajian Sarjana Sains (Pengajian Multimedia) secara Penyelidikan. Saya menjalankan kajian mengenai penerimaan pengguna terhadap aplikasi Virtual Hijab Try-On yang berasaskan kepada teknologi Realiti Luasan. Soal selidik ini terdiri daripada dua bahagian iaitu Bahagian A: Maklumat peribadi dan Bahagian B: Persepsi pengguna. Semua maklumat yang diperolehi daripada kajian ini akan hanya digunakan untuk tujuan akademik semata-mata. Kerjasama anda dalam menjawab soal-selidik ini sangat dihargai.

Sekian, terima kasih.

Yang benar,

Nur Syuhada' Binti Mohd Pozi (822124)
MSc. MM Studies (by Research)

**Bahagian A**

**MAKLUMAT PERIBADI**

Sila jawab soalan berikut dengan menandakan (√) di dalam kotak dan menulis di ruang yang disediakan.

1. Jantina:

   ☐ Lelaki ☐ Perempuan

2. Umur: ____ tahun

3. Bangsa:

   ☐ Melayu ☐ Cina
   ☐ India ☐ Lain-lain

4. Adakah anda mempunyai telefon mudahalih?

   ☐ Ya ☐ Tidak

5. Berapa lamakah anda sudah menggunakan telefon mudahalih? ____ Tahun

6. Adakah anda mengetahui tentang teknologi Realiti Luasan?

   ☐ Ya ☐ Tidak

7. Pernahkan anda menggunakan sebarang aplikasi mencuba Hijab?

   ☐ Ya ☐ Tidak

8. Sekiranya anda menjawab Ya bagi soalan diatas, berapa lamakah anda sudah menggunakan aplikasi mencuba Hijab tersebut? ____ tahun

**Bahagian B**

## PERSEPSI PENGGUNA

Sila jawab soalan berikut dengan membulatkan diruang yang disediakan mengikut skala seperti dalam jadual di bawah .

| Sangat tidak setuju | Tidak setuju | Neutral | Setuju | Sangat setuju |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| BIL | KENYATAAN | SKALA | | | | |
|---|---|---|---|---|---|---|
| **DIRASAI KEMUDAHGUNAAN / PERCEIVED EASE OF USE** | | | | | | |
| 1 | Aplikasi HTO mudah digunakan. | 1 | 2 | 3 | 4 | 5 |
| 2 | Belajar menggunakan aplikasi HTO adalah mudah bagi saya. | 1 | 2 | 3 | 4 | 5 |
| 3 | Interaksi saya dengan aplikasi HTO adalah jelas dan difahami. | 1 | 2 | 3 | 4 | 5 |
| 4 | Adalah mudah bagi saya mencuba Hijab menggunakan aplikasi HTO. | 1 | 2 | 3 | 4 | 5 |
| **DIRASAI BERGUNA / PERCEIVED USEFULNESS** | | | | | | |
| 1 | Aplikasi HTO berguna kepada saya. | 1 | 2 | 3 | 4 | 5 |
| 2 | Aplikasi HTO membolehkan saya mencuba hijab dengan lebih cepat. | 1 | 2 | 3 | 4 | 5 |
| 3 | Aplikasi HTO menjimatkan masa saya dalam mencuba hijab. | 1 | 2 | 3 | 4 | 5 |
| **SIKAP / ATTITUDE** | | | | | | |
| 1 | Saya suka dengan idea menggunakan aplikasi HTO | 1 | 2 | 3 | 4 | 5 |
| 2 | Saya lebih cenderung untuk menggunakan aplikasi HTO | 1 | 2 | 3 | 4 | 5 |
| 3 | Lebih mudah dan lebih baik bagi saya untuk menggunakan aplikasi HTO berbanding dengan menggunakan bilik persalinan. | 1 | 2 | 3 | 4 | 5 |
| **NIAT UNTUK MENGGUNAKAN / INTENTION TO USE** | | | | | | |
| 1 | Saya akan selalu menggunakan aplikasi HTO | 1 | 2 | 3 | 4 | 5 |
| 2 | Saya akan terus menggunakan aplikasi HTO pada masa hadapan. | 1 | 2 | 3 | 4 | 5 |
| 3 | Saya akan memperkenalkan aplikasi HTO kepada rakan-rakan saya. | 1 | 2 | 3 | 4 | 5 |
| **KENIKMATAN / ENJOYMENT** | | | | | | |
| 1 | Saya suka menggunakan aplikasi HTO | 1 | 2 | 3 | 4 | 5 |
| 2 | Aplikasi HTO memberikan saya pengalaman yang menghiburkan | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Saya seronok menggunakan aplikasi HTO | 1 | 2 | 3 | 4 | 5 |
| 4 | Saya tidak merasakan masa telah berlalu bila menggunakan aplikasi HTO | 1 | 2 | 3 | 4 | 5 |
| **DIRASAI LUASAN / PERCEIVED AUGMENTATION** | | | | | | |
| 1 | Aplikasi HTO memadankan hijab ke wajah saya | 1 | 2 | 3 | 4 | 5 |
| 2 | Cara hijab dipadankan ke wajah saya nampak nyata | 1 | 2 | 3 | 4 | 5 |
| 3 | Hijab yang dipadankan seperti sebahagian dari wajah saya | 1 | 2 | 3 | 4 | 5 |
| 4 | Hijab yang dipadankan seperti wujud dalam waktu nyata. | 1 | 2 | 3 | 4 | 5 |

***Terima kasih diatas kerjasama anda.***