MOBILE AUGMENTED REALITY ADVERTISING (MARA) FOR PRINTED MEDIA MICROENTERPRISE

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Abstrak

Kajian ini memberi tumpuan kepada reka bentuk dan pembangunan aplikasi Pengiklanan Realiti Luasan Mudahalih (MARA) untuk perusahaan mikro media cetak. Kebanyakan perusahaan mikro media cetak di Malaysia menggunakan alat pengiklanan yang khas seperti sepanduk dan pita untuk menyebarkan maklumat mengenai produk dan perkhidmatan mereka. Walau bagaimanapun, pendekatan ini mempunyai beberapa batasan kerana maklumatnya terdiri daripada teks dan imej sahaja, tidak interaktif dan hanya menarik perhatian orang yang melewati sahaja. Dari kajian awal, ia jelas menunjukkan bahawa mereka mempunyai masalah yang berkaitan dengan promosi produk tetapi pada masa yang sama mereka juga yakin bahawa perniagaan mereka akan berkembang melalui promosi. Oleh itu, pendekatan pengiklanan alternatif yang berpatutan, berkesan dan bergaya diperlukan untuk perusahaan mikro. Kajian ini mencadangkan aplikasi Pengiklanan Realiti Luasan Mudahalih (MARA) untuk perusahaan mikro media cetak yang menggabungkan teknologi Realiti Luasan (AR) dan Multimedia (MM) untuk mengkaji niat pengguna untuk menggunakan berdasarkan kegunaan yang dirasakan, kemudahgunaan yang dirasakan, bermaklumat dan nilai pengiklanan. Metodologi kajian ini terdiri daripada lima fasa iaitu; kesedaran masalah, reka bentuk, pembangunan, penilaian dan dokumentasi yang disesuaikan daripada Kuechler dan Vaishnavi. Untuk fasa pembangunan, kaedah air terjun telah digunakan. Kajian ini menggabungkan Model Penerimaan Teknologi, Teori Perancangan Tingkah laku dan Model Nilai Pengiklanan. Analisis statistik deskriptif, Kolerasi Pearson dan Regresi digunakan untuk menentukan kesan kegunaan yang dirasakan, kemudahgunaan yang dirasakan, bermaklumat dan nilai pengiklanan terhadap niat pengguna untuk menggunakan aplikasi MARA. Keputusan menunjukkan sokongan empirik untuk hubungan yang signifikan secara statistik antara bermaklumat dan nilai pengiklanan dan niat pengguna untuk menggunakan. Bagaimanapun kegunaan yang dirasakan dan kemudahgunaan yang dirasakan tidak mempunyai hubungan yang signifikan dengan niat pengguna untuk menggunakan. Sebagai kesimpulan, kajian ini telah meninjau kemungkinan memperkenalkan pendekatan pengiklanan baru untuk perusahaan mikro media cetak melalui penggunaan Realiti Luasan Mudahalih. Adalah diharapkan penemuan kajian ini akan menggalakkan perusahaan mikro media cetak di Malaysia untuk menggunakan aplikasi MARA dalam mempromosikan dan memasarkan produk dan perkhidmatan mereka.

Kata kunci : Aplikasi MARA, Realiti luasan mudahalih, Pengiklanan, Media cetak, Perusahaan mikro

Abstract

This study focuses on the design and development of the Mobile Augmented Reality Advertising (MARA) application for the printed media microenterprises. Most of the printed media microenterprises in Malaysia use typical advertising tools such as banners and streamers to disseminate information about their products and services. However, these approaches have some limitations since the information consists of only texts and images, non-interactive and only attract attention of the passers-by only. From the preliminary study, it clearly shows that they have problems related to product promotion but at the same time they are also confident that their business will grow through promotion.Therefore, an alternative approach of advertising which is affordable, effective and trendy is required for the microenterprises. This study proposes Mobile Augmented Reality Advertising (MARA) application for the printed media microenterprises which incorporates Augmented Reality (AR) and Multimedia (MM) technologies to study users' intention to use based on perceived usefulness, perceived ease of use, informativeness, and advertising value. The research methodology of this study consists of five phases namely; problem awareness, design, development, evaluation and documentation which was adopted from Kuehler and Vaishnavi. For the development phase, the waterfall method was utilised. This study incorporates the Technology Acceptance Model, Theory of Planned Behaviour and Advertising Value Model. Descriptive statistics, Pearson Correlation and Regression analyses were used to determine the effects of perceived ease of use, perceived usefulness, informativeness and advertising value toward users' intention to use the MARA application. The results provided empirical support for the statistically significant relationships between informativeness and advertising value and intention to use. However, perceived ease of use and perceived usefulness have no significant relationships with intention to use. As for the conclusion, this study has looked into the possibility of introducing a new approach of advertising for the printed media microenterprises through the use of Mobile Augmented Reality. It is hoped that the findings of this study will encourage the printed media microenterprises in Malaysia to utilize the MARA application in promoting and marketing of their products and services.

Keywords: MARA application, Mobile Augmented Reality, advertising, printed media, microenterprise

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Table of Contents

List of Tables

List of Figures

List of Appendices

List of Abbreviations

2D	2 Dimensional
3D	3 Dimensional
A	Attitude
AR	Augmented Reality
ARM	Advanced RISC Machines
BI	Behaviour Intention
GPS	global positioning system
HD	High Definition
HDD	Hard Disk Drive
ICT	Information and Communication Technology
MAR	Mobile Augmented Reality
MARA	Mobile Augmented Reality Advertising
MB	Megabytes
OS	Operating System
PC	Personal Computer
PEU	Perceived Ease of Use
PU	Perceived Usefulness
r	The Pearson Correlation Coefficient
RAM	Random Access Memory
SDK	Software Development Kit
SN	Subjective Norm

SME	Small and Medium Enterprise
TAM	Technology Acceptance Model
TB	Terabytes
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
VR	Virtual Reality

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The aim of this research is to design, develop and investigate the impacts of an approach to advertising through the use of the Mobile Augmented Reality (MAR). This chapter introduces the background of the research focus. It also includes the problem statement, research questions, research objectives, research scope, research hypotheses, research significance and finally the conclusion.

1.2 Research Background

In Malaysia, microenterprise is a major component in small and medium enterprise (SME) which is divided into three categories namely; micro, small and medium. Microenterprises refer to organization that employs between 1 to 5 workers; have small amount of capital and provides goods and services in their local areas (Adeya, 2003). Meanwhile in Malaysia, the microenterprise is a company with annual sales turnover of less than RM250,000 or less than 5 full-time employees in the manufacturing/agriculture industry or annual sales turnover of less than RM200,000 or less than 5 full-time workers for others (National SME Development Council, 2010). Table 1.1 shows some definitions of SME based on size in Malaysia.

Table 1.1
Definition of SME based on size in Malaysia

Classification	Category	Annual Sales	Full time Workers
Manufacturing and	Micro	< RM250,000	< 5
Manufacturing related	Small	RM250,000 -	5 - 50
services and		RM10,000,000	

agriculture based industries	Medium	RM10,000,000 - RM25,000,000	51 - 150
Services, primary agriculture and information and communication technology	Micro	< RM200,000	< 5
	Small	RM200,000 - RM1,000,000	15 - 19
	Medium	RM1,000,000 - RM5,000,000	20 - 50

Source: National SME Development Council (2010)

In fact, the Malaysia's economic development is largely assisted by the activities of microenterprise. The efforts made by the microenterprises have a positive impact especially for a developing country like Malaysia. They create job opportunities for the community by providing opportunities and places for them. For example, Euro Zone microenterprise creates jobs for 88.8 million people in 2013 (Muller et al., 2014). Beside, in the United States, there are 31 million people being employed by 25.5 million microenterprise (Gomez at al., 2015). This can indirectly reduce the poverty rate of a country (Rogerson, 2004; Servon, 1999). In addition, microenterprise also provides more affordable goods and services to the community as the prices are usually lower and affordable (Kirkpatrick & Hulme, 2001). Therefore, it is important for the microenterprises to expand their products to the public and at the same time help in developing the country's economy. However, most microenterprises do not carry out activities like marketing and advertising as important and challenging aspects of their operations (Roberts & Wood, 2002). These problems occur because microenterprise have financial limitations and constraints (Grosh & Somolekae, 1996; Mansell & When, 1998; Hazan, 2002) and also lack of skills and their efforts of promotion did not reach the required goal (Jakic, 2011; Pharr & Weinrauch, 2007).

Usually, traditional advertising is expensive. The cost of using advertising media such as television and magazine is high. This issue has become a problem to microenterprises which are already facing financial constraints to allocate a sum of money for marketing and promotion activities of their products. Printed media like magazines and newspapers provide advertising space equivalent to the price. Most microenterprises could not afford to put their product advertisements on that space. Besides that, the use of banners and streamers for advertising their products is also less effective since they only attract the attention of those passers-by only. Therefore, an alternative approch of advertising which is affordable, effective, trendy and wider audience coverage is required for the microenterprises.

Nowadays, the use of Information and Communication Technology (ICT) has becoming more important in our daily lives. In the context of Malaysia, the ICT provides plethora of benefits to so many areas and that also include advertising. Nowadays, the utilization of digital gadgets is becoming more popular across the globe and among the most widely advertising medium is the smartphones. The smartphones have been used by people extensively in their lifestyle. This is because it is a vital source for communication and knowledge. The mobile advertising is expanding while the paper advertising market is declining. The global mobile advertising income has increased from US$9.8 billion in 2012 and reaching US$41.9 billion in 2017 (Lee et al., 2012; Gartner, 2014), while printed paper advertising income has dropped more than 66% for over 10 years (Kim & Han, 2014).

1.3 Problem Statement

Nowadays, the use of Information and Communication Technology (ICT) has becoming more important in our daily lives. In the context of our country, the ICT give us many advantages and disadvantages in many areas, particularly in advertising. Recently, the applicability of daily digital gadgets are becoming more popular across the globe, among the most broadly advertised examples are the smartphones. The smartphones have been used by people extensively in their lifestyle. This is because it is a vital source for communication and knowledge. However, these changes also have an implication to the microenterprises in relation to advertising of their products.

Actually,microenterprises are the backbone of the developing countries. This is because they contribute significantly to the national economy especially in providing the employment opportunities to the community, economic development, income generation and poverty alleviation (Rogerson, 2004; Servon, 2011). In addition, microenterprises also provide more affordable goods and services to the community as their prices are usually lower and affordable (Kirkpatrick & Hulme, 2001). In Malaysia, according to Bank Negara Malaysia (2011), microenterprise is a business entity with annual sales turnover of less than RM250,000 or less than 5 full-time employees in the manufacturing or agricultural-based industry or annual turnover of less than RM200,000 or less than 5 full-time workers for others. The main obstacle for microenterprises to start and grow their product business is in terms of financing and budget (Krasiqi, 2007; Hairuddin et al., 2012; Grosh, & Somolekae, 1996; Mansell, & Wehn, 1998). They also face other problems that include lack of skill and their efforts of promotion did not reach the required goal (Jakic, 2011; Pharr, & Weinrauch, 2007).

The digital technology has evolved alongside with the advancement of various fields and the most noteworthy are in the communication's style, purchase behavior, business interaction and so on. Therefore, this opportunity serves as a platform for the microenterprise to enhance the productivity through the advertising factor, along with the digital world of the Internet without allocating funds run out. Laudon and Laudon (2011) state that every organization must carefully planned their strategies and organize their infrastructure's information technology in order to achieve success with information system. On the other hand, there are various types of busineses in microenterprise and one of them that researcher focus to propose in this study is to develop a new approach to advertising which is Mobile Augmented Reality Advertising (MARA) for Printed Media. MARA uses mobile devices to provide customers with perceived usefulness, perceived ease of use, informativeness, and advertising values and also reduce cost for the promotion of products and services by the microenterprises. MARA is able to deliver product information to customers by using Augmented Reality and Multimedia technologies through the smartphone platform.

Augmented Reality is a platform which combines virtual with real environments as virtual imagery attached to real locations and objects that augments the scenes with additional multimedia elements based on the real world perception (Yuen, Yaoyuneyong, & Johnson, 2011). AR is defined as a view of a physical, real-world environment whose elements are integrated with computer-generated sensory input (Jennett et al., 2008). According to Azuma (1997), AR has three main features, firstly, it combines both the real and the virtual worlds, secondly, it interacts in real time and lastly, it registers in three dimensions. AR allows computer generated virtual imagery to exactly overlay physical objects in real time (Diegmann et al.,

2015; Zhou et al., 2008). The augmented environment is the direct superimposition of physical objects and computer-reproduced objects. AR technology has been used as an alternative to achieve the objective of advertising. AR has already been implemented for advertising in business, for example Pepsi, Coca-Cola, Benetton, Calvin Klein, Ikea, and others (Siltanen et al., 2017).

Furthermore, there is a lack of empirical study on the use of AR among printed media microenterprises both globally and specifically in Malaysia. The study of the use of AR often involves large companies and limited studies on small companies such as the microenterprises. Besides, there is also limited research on intention to use and microenterprise. Therefore, in this study, the researcher examines the relationships between perceived ease of use, perceived usefulness, informativeness and advertising value and intention to use the MARA application.

1.4 Preliminary Study

A preliminary study has been carried out to support the research problem. According to Shiratuddin and Hassan (2010), preliminary study is an initial searching of issues to be studied in order to suggest a better solution. In this study the researcher used a set of questionnaires (refer to Appendix A) for the purpose of gathering information from the respondents. The survey was conducted in Kubang Pasu, Kedah. The preliminary study involved 50 respondents consisting of micro entrepreneurs, who have small businesses around Kubang Pasu. They carry out various types of businesses such as selling foods, clothes, printing services, homestays and others. The micro entrepreneurs were asked questions which focused on the issues related to the promotion and advertising of their products and services. Table 1.2 shows the items and results of the preliminary study.

Table 1.2

Preliminary Study Items and Results

Item	Result	
	Yes (%)	**No (%)**
I am trying to promote my business	100	0
I need to promote my business to be known by the community	100	0
I need to promote my business to succeed	100	0
I am confident that my business will grow through promotion.	100	0
I have provided some expenses for promoting my business	82	18
I am promoting my business through :		
i. Radio	0	
ii. Newspapers	4	
iii. Television	0	
iv. Internet	38	
v. Signboard/Billboard	0	
vi. Pamphlet/Brochure	0	
vii. Banner	58	
The promotion method provides information to customers.	46	54
The promotion method attracts the attention of customers.	48	52
The promotion method provides an overview of the products to the customers.	68	32
The effect of the implemented product promotion to the business.		
i. Nothing change	40	
ii. Change with small increase	50	
iii. Change with high increase	10	
I face some problems related to product promotion.	84	16
Problems that I faced related to product promotion.		
i. High cost	62	
ii. The effort of the promotion did not reach the goal	14	
iii. Do not know how to do promotion	18	
iv. Difficult to get advise on how to do promotion	0	
v. The time of doing promotion is to long	0	

vi. The effort do not get high profit	0
vii. No government agencies can help to do promotion	3
viii. Others	0

Preliminary study results show that all (100%) of the micro entrepreneurs wanted to promote their business and they wanted their business to be known by the community. They also felt that they need to promote their business in order to be successful and they were confident that their business will grow through promotion. In actual case, 82% of the micro entrepreneurs have already invested some money for the purpose of promoting their products, while 18% indicted the opposite. The results indicated that they were promoting their business through banners (58%), Internet (38%), and newspapers (4%). None of micro entrepreneurs promote their products through radio, TV, billboard and brochure/pamphlet.

Next, for the effect of the implemented product promotion to their business, the results show that 40% has no changes, 50% has small increase and 10% has high increase. 84% of the respondents indicated that they faced problems related to product promotion and the problem include; high cost (62%), did not know how to do promotion (18%), promotion did not reach the goal (14%) and finally no government agencies helped to do promotion (3%). The findings of the preliminary study were in line with previous researches findings which indicated that most microenterprises face some problems which include; financial limitation and constraints and also lack of skills and efforts of promotion did not reach the required goal (Jakic, 2011; Pharr & Weinrauch, 2007). The problems arise whenever the microenterprises refuse to do marketing and advertising activities (Robert & Wood, 2002). So, similar to the findings of this preliminary study, the microenterprises face

some barrier in expanding their business. Hence, related to this issue, a new approach of advertising through the use of the Mobile Augmented Reality (MAR) technology needs to be introduced. The application is known as Mobile Augmented Reality Advertising (MARA) and can be installed on any android smartphone.

1.5 Research Questions

The problems discussed above lead to the following research questions.

1. How the MAR technology be used in the advertising application for the printed media microenterprise?
2. What are the perceptions of users towards the use of the Mobile AR Advertising (MARA) application?
3. What are the relationships between the independent variables which include; perceived ease of use, perceived usefulness, informativeness and advertising value and the dependent variable intention to use?

1.6 Research Objectives

This research aims to propose a Mobile Augmented Reality Advertising (MARA) for the printed media microenterprise. Three sub-objectives are introduced in order to achieve the main objective. The sub-objectives serve as a guide for this study and are as follows:

1. To design and develop the Mobile Augmented Reality Advertising (MARA) for the printed media microenterprise.
2. To investigate the users' perceptions towards the use of the Mobile AR Advertising (MARA) application.

3. To determine the relationships between the independent variables (perceived ease of use, perceived usefulness, informativeness and advertising value) and the dependent variable (intention to use).

1.7 Research Hypothesis

The hypotheses for this study are discussed in the following section. Altogether four hypotheses have been constructed and the probability level of 0.05 was used to test for the inferential statistics significance. Meanwhile, the hypotheses are also discussed in chapter five under the descriptive statistics (Data Analysis and Result).

Hypothesis$_{01}$: There is no significant relationship between perceived ease of use and intention to use the MARA application.

Hypothesis$_{02}$: There is no significant relationship between perceived usefulness and intention to use the MARA application.

Hypothesis$_{03}$: There is no significant relationship between informativeness and intention to use the MARA application.

Hypothesis$_{04}$: There is no significant relationship between advertising value and intention to use the MARA application.

1.8 Research Scope

The focus of this study is to develop the MARA application. The design and development of the MARA application was based on the Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM) and Advertising Value Model. In developing a comprehensive and effective application, three design components that include; design for interaction, design for information and design

for presentation were incorporated into this study. The software that has been used for the development of the MARA application include; Unity 3D, Vuforia, and Adobe Illustrator and the developed application is intended for the Android smartphone users only.

The MARA application incorporates several multimedia elements. The multimedia elements interactively provide information about the products and services that are provided by Haza Media, a microenterprise that has been specially selected for this study. This application comprises of two components namely; the AR Marker (Haza Media brochure) and the MARA application. The Haza Media brochure consists of four markers which are assigned for Wedding Cards, Stickers, Tags and Banners on the front page, while on the opposite page shows the service and contact information of Haza Media. Once anyone of the marker is scanned, the information related to the marker will be displayed in the form of multimedia elements that include images, text and video interactively.

The MARA application runs on any Android devices and in order to access the information, the Haza Media brochure is required. The MARA application was evaluated among a sample of micro entrepreneurs who have been using Android smartphones in order to determine their perceptions towards the use of the application. Descriptive statistics, correlation and regression analyses were conducted to determine the users' perceptions, the relationships between the independent variables and the dependent variable and also to test the hypotheses.

1.9 Research Significance

This study provides three contributions. Firstly, the main contribution of this study is the MARA application based on the utilisation of the MAR technology for

promoting and advertising of microenterprises' products and services. Secondly, are the users' perceptions in terms of perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use the MARA application. Finally, the relationships between perceived ease of use, perceived usefulness, informativeness and advertising value (independent variables) and intention to use (dependent variable).

This study contributes to the microenterprises, researchers and smartphone users. The biggest contribution is to the microenterprise for carry out advertising and promotional activities in order to expand and improve their businesses. Microenterprises face various constraints in carrying out their business activities especially pertaining to finance. This issue has been a major obstacle that challenges them to engage in advertising activities in order to promote their products and services. Thus, with the proposed MARA application, which is low cost and trendy, it is suitable to be used by the microenterprises in carrying out their promotional and advertising activities anytime and anywhere. In addition, the MAR enables microenterprises to reach wider audiences and thereby enhances the potential for market development. The outcome of this study is not just intended for the microenterprises alone, but instead it could also assists the policy makers, entrepreneurial educators and researchers in making important decisions. These include introducing the MAR technology to the microenterprises and incorporating the technology as a new approach in the promotional and advertising of products and services by the microenterprises.

1.10 Conclusion

In conclusion, this chapter has discussed the problem statement, the research questions, the research objectives, the research scope and the research significance. All the topics which have been discussed in this chapter are important guidelines for this study.

1.11 Summary of All Chapters

This thesis consists of six chapters. The following sections are the summaries for every chapter.

Chapter one: Introduction

This chapter provides the introduction to the overall thesis. This chapter consists of several subsections which include; research background, problem statement, preliminary study, research questions, research objectives, research hypotheses, research scope, research significance and conclusion.

Chapter two: Literature Review

This chapter discusses about the previous studies and the implemented elements and theories in this study. Furthermore, it discusses about technology used in this research namely; Mobile Augmented Reality (MAR), Augmented Reality (AR) and Multimedia (MM) together with related theories and how they are linked to this study.

Chapter Three: Research Methodology

This chapter discusses the use of research methodology and the method implemented in this study. This study has five main phases namely; Problem Awareness, Design,

Development, Evaluation and Documentation. Furthermore, it also discusses about methodology that has been used in development phase which is waterfall methodology.

Chapter Four: Design and Development of Mobile Augmented Reality Advertising (MARA) for Printed Media Microenterprise

This chapter elaborates on the design and development of the MARA application. This chapter also discusses all the steps in the development of the MARA application.

Chapter Five: Data Analysis and Result

Chapter five discusses the data collected from the evaluation. In this study, the Descriptive Statistics, the Pearson Correlation and Regression analyses were conducted.

Chapter Six: Conclusion

This is the final chapter of this thesis. It concludes all the findings and mentions the limitation and recommendations of the study. Further it also discusses the contribution to the body of knowledge and suggestions for future study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

They are several approaches towards marketing and promotion that have been used by printed media microenterprises in disseminating information about their products and services to their customers. A study of previous literatures related to the subjects is important to observe the idea of the selected study. The following review of literatures provides the background knowledge of the study pertaining to the concept of AR and MAR. This chapter discusses on some prominent theories which are related to AR and MAR that have implemented in this study.

2.2 Microenterprise

There are several definitions for the microenterprise that have been used throughout the world. A microenterprise is small business with a self-employed owner, and up to five workers (Mead & Liedholm, 1998; Jurik, 2005; Green, Kirkpatrick, & Murinde, 2006; Midgley, 2008). Meanwhile, according to the European Commission (2003), a microenterprise is an enterprise employing less than 10 workers and the annual turnover is less than EUR 2 million. In Malaysia, microenterprise has been defined as a company with annual turnover of not more than RM250,000 or less than 5 full-time workers in the manufacturing or agricultural-based industry or annual turnover of not more than RM200,000 or less than 5 full-time workers for other industries (National SME development council, 2005; Bank Negara Malaysia, 2011).Microenterprises are considered as the engine for generating employment, enhancing growth and economic development. Microenterprises have a positive

impact on the developing countries, although the support of some organizations is quite limited (De Soto, 1989; The Futurist, 2003; Abor et al., 2010). In addition, microenterprises also help to create job opportunities by providing job opportunities to those who are still unemployed and looking for jobs and this can help reduce poverty rate and bring benefits to a country (Rogerson, 2004; Servon, 1999; Garikai, 2011). Other than that, microenterprises also offer and supply cheaper goods and services from other major corporations to the community (Kirkpatrick & Hulme, 2001).

Simultaneously, like other companies, microenterprises also have no exception in facing some of the challenges and constraints in this business world. Among the barriers faced by the microenterprises are the difficulty in capital, distribution channels, business support and markets (Prasad & Tata, 2008; Sivak, Caplanova, & Hudson, 2013). Furthermore, they are also weak in terms of funding, planning, control and training of information systems due to lack of resources (Wood, 2002; Budak & Rajh, 2013).

2.3 Advertising

Previous studies have proven that there exist various definitions of advertising since the definition often changes with time and also with the advancement of the technologies pertaining to advertising. The medium and formats of advertising have changed dramatically during the past two decades. Despite these changes, the definition of advertising has not been much discussed during this time (Kerr & Schultz, 2010; Nan & Faber, 2004). The first definition of advertising by Daniel Starch (1923) who suggested that advertising should be defined as advertising is selling in print. At that time, printing was the main method used for advertising. It

took three decades before radio proceeded sufficiently far to be practicable and another decade for the TV to earn enough influence (Dahlen & Rosengren, 2016). Thus, Daniel Starch's definition is no longer relevant because of the fast technology development nowadays.

In general, advertising is about attracting people's attention to a business or product by making announcements in the mass media or digital media. Advertising is any paid form of non-personal presentations and promotion ideas, goods or services by an identified sponsor (Kotler, 2009). While Copley (2014) defines advertising as any paid-for communication designed to inform and/or persuade. However, the definition of advertising may change from time to time due to the rapidly increasingly attainment and technological advancement of today for example advertising through the mobile phones and text messages. Meanwhile, mobile advertising is the use of interactive wireless media to transmit advertising messages with the overall goal of promoting goods and services (Kumar, 2013).

2.3.1 Traditional and Conventional Advertising

There are several examples of the medium used in the traditional advertising, namely; television, radio, newspapers, magazines, billboards, and others. Traditional advertising is what most people might have in mind whenever the word advertising appears during the conversation. Prior to the existence of the Internet, focused was given to television, radio and printed media for the advertising of the products and services. These methods of advertising were popular and widely used throughout the world. They have their own advantages in advertising and promoting of products and services. Television is widely used in advertising since almost all homes have it and its ability to reach all audiences regardless of age (Edell & Keller, 1989). Meanwhile,

the advantages of radio advertising are low production costs and ability in choosing the target audience based on demographics or lifestyle (McDonald, 1998; Roberts & Berger, 1989). Newspapers allow the users to determine the size and content of the advertisement, newspaper advertising reaches greater audiences and the advertisement can be viewed many times (Khatri, 2016). While magazine advertising advantages among others include; providing opportunity for colour reproduction, ability to target best prospects, advertisements are expected by readers, and potentially high readership (Thomas, 2008). According to Mueller and Rogers (1980) radio and television advertising are combined to form electronic media advertising, while newspapers and magazines are combined to form printed media advertising.

2.3.2 Online Advertising

Today, there are several new ways of reaching the customers through advertising, as many of the customers are new online or digital (Kitchen & Proactor, 2015). This is because, many people today own a mobile phone, tablet or computer or at least have access to them or the ability to access the internet. Therefore, along with this development has also made online advertising widely available. According to Technopedia (2016), online advertising is a marketing approach that involves the use of the internet in delivering the message to the right customers and achieving the target. This approach is a unique and helpful strategy that advertiser can use for marketing and promoting their product, so that many advertisers involved in online advertising. Jianqing and Stallaert (2014) estimated that in 2011, more than $1.3 billion was spent in advertising by online advertisers, while in 2014, the spending increased to more than $2.6 billion. From that revenue generated based on online advertising in the United States, total spending was $22.7 billion in 2016 (Shimp,

2016). This development makes a good sign to online advertising and makes people more interested to be involved in it.

2.4 Background information about Augmented Reality (AR) and Mobile Augmented Reality (MAR)

The development of Augmented Reality technology is becoming increasingly popular. Additionally, the usage of mobile devices is rampant which made MAR increasingly popular among mobile users. This section discusses about AR and MAR.

2.4.1 Augmented Reality (AR)

The first pioneer in the field of AR was Ivan Sutherland (1968). He and his student at the University of Harvard and the University of Utah have produced the first AR prototype in the 1960s as shown in Figure 2.1. This prototype enables user to view 3D graphics through a device known as Head Mounted Display (HMD).

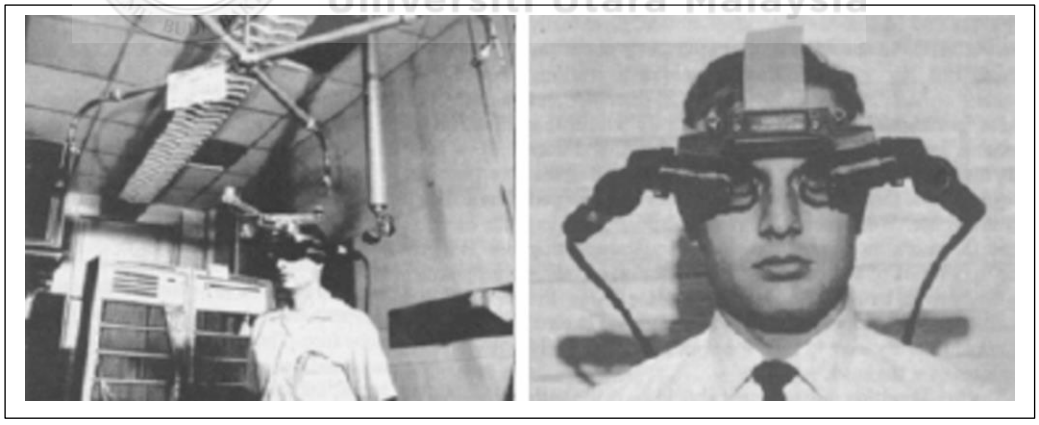


Figure 2.1. The world's first HMD known as the "Sword of Damocles"

Then, Caudell and Mizelle (1992) were the first to use the AR term in describing a digital graphics displaying virtual physical reality on aircrafts. A few years later, the AR technology which was developed in research labs started to evolve and require a level of technical expertise and high knowledge to manage. At that time AR only

runs using stationary desktop computer which was cumbersome and requires users to wear HMD (Caudell & Mizelle, 1992). Then, AR has been utilized in the outdoor game (Thomas & Piekarska, 2002) and it continues to expand with the introduction of mobile devices equipped with screen, camera, image recognition, GPS and has been a popular tool for AR experiences (Juniper Research, 2012).

2.4.2 Definition of Augmented Reality (AR)

AR is a combination of real world and digital data (Siltanen, 2012). Normally, AR mixes new information into an existing picture that has already been taken (Definition Database, 2014). However, the most popular definition for AR has been introduced by Milgram and Kishino (1994), whereby AR exists between a real environment and virtual environment as shown in Figure 2.2.

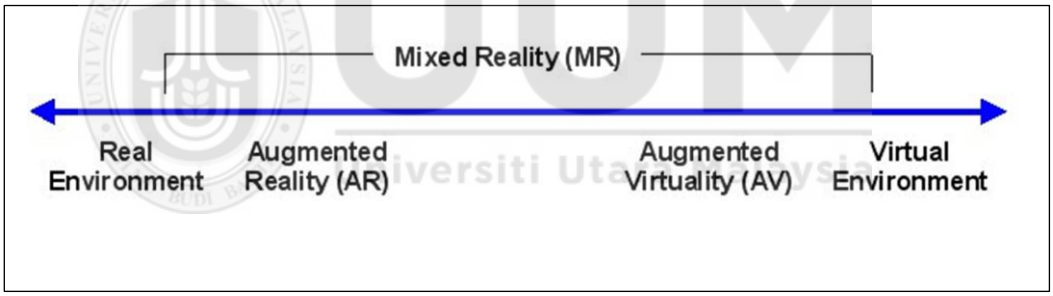


Figure 2.2. Virtual continuum (Milgram & Kishino,1994)

A more concrete and commonly used definition of AR is refined by Azuma (1997) asserting the three characteristics of AR. The first characteristic involves the combination of both the real and virtual worlds. The second characteristic deals with the real-time interaction and the final characteristic on the other hand register the real and the virtual objects. AR assists in procedural tasks by enhancing essential physical world features with virtual constructs to help in understanding and following a procedure and it can unite and combine the virtual with user's view of the task itself. Actually, AR perpetuates the natural context, realism and multi-sensory interaction

of a task, while adding virtual enables. For examples like overlaid instructions, feedback, and cuing as well as representations of additional physical objects that may be hidden or missing.

2.4.3 Type of Augmented Reality (AR)

Generally, the AR system is classified into marker-based or markerless-based (Craig, 2013). Normally, QR codes are used as markers to deliver two forms of information in marker-based AR system. The first form of information is to send a report to a computer about what kind digital content to display and the second form of information is regarding the angle of view to present the virtual content within a physical environment (Craig, 2013). The overlaid digital data will appear when a marker comes into view, unlike the markerless AR system which uses the natural features taken from images of the cameras. This is very different from the marker-based AR because it requires access of Global Positioning System (GPS) and using the position of the devices to search nearby points of interest. Then, when the information is located, the user gets additional information or direction in real-time (Craig, 2013).

2.4.4 Mobile Augmented Reality (MAR)

Nowadays, the MAR applications become important in many areas such as sport, computer games, cultural heritage, medicine, education, marketing and advertising (Adhani & Rambli, 2012). Recently, a research survey by Juniper showed that the user of MAR apps will be 200 million by 2018 (Juniper Research, 2012). MAR is often referred to as digital information or products that represent the camera's view (Juniper, 2012). Previous researchers view MAR specifically as an interface on handheld devices that combine real and virtual worlds by allowing original non-

visible information to be viewed via digital content (Papagiannakis, Singh, & Magnenat Thalmann, 2008; Specht, Ternier, & Greller, 2011).

The existing MAR application can be classified into two namely; the AR browser and the image recognition-based AR application (Olsson & Salo, 2011). With the rapid development of technologies related to the MAR technology, many commercial and open source AR browsers are available which include Junaio, Layar, Wikitude, ARViewer and Sekai Camera (Grubert, Langlotz, & Grasset, 2011). The AR based image recognition applies visual recognition technology to connect nearby objects with digital information. For instance, Good Guide provides a set of third-party ratings of companies and products using scanned barcodes, while Google Groggles provides relevant results pertaining to the area near the objects (Olsson & Salo, 2011).

2.4.5 Advantages of Mobile Augmented Reality (MAR)

Although there are various ways for users to experience AR, mobile device is the most appropriate platform and was selected for this study. They are several reasons for this selection. Firstly, by comparing the price of mobile and some special-purpose devices such as Google Glass solid hardware, mobile devices offer a lower cost to be used with AR. The fully-developed hardware such as mobile devices have been equipped with components that include camera, touch screen display, GPS, accelerometer and 3D graphics which fulfil the requirements for MAR implementation.

Secondly, MAR provides ubiquitous experience to the user (Henrysson & Ollila, 2004). Users can carry it everywhere with ease as it fits into a pocket. This makes it easier for them to use it anywhere at any time. Thirdly, MAR has a broad market and

its applications include; education, training, advertising, games, entertainment, medical, culture, heritage and marketing (Adhani & Rambli, 2012). Based on a new study by Juniper Research (2018), by 2022 the total AR and Mixed Reality applications are expected to reach 9 billion, up from 3 billion in 2018 with an expected growth rate of 212%.

2.5 AR in Advertising

The following sub-sections discuss on the potential of MAR in printed media advertising, previous study on the effectiveness of AR in advertising, the AR application and development platform in advertising and marketing, and MAR in advertising and promotion.

2.5.1 The potential of MAR in Printed Media Advertising

Richard and Curran (2002) define advertising as "paid, non-personal communication from an identified sponsor using mass media to persuade or influence people" where the mass media includes television, radio, outdoor and print media billboards. In this study, the researcher focuses on the use of MAR with printed media microenterprise. Until now, most printed media, including books, newspapers, magazines and posters cannot be replaced with other advertising method. In consequence, they have to suffer from some intrinsic constraints (Jurca, 2010). Firstly, the constraint is in term of one-way communication interaction, for example a marketer just leaves a message directly to the consumer without getting feedback from the customer. Secondly, it is mono-media; whereby audio and video cannot be transmitted by printed advertisement (Ingloba Technologies Srl, 2011) and finally, the cost for the use of printed media. Alternatively, the AR approach can be the solution to these constraints by changing the one-way to two-way communication between the

marketer and the consumer. In contrast to the social media, the AR approach provides interactive, personal, transparent, and engaging conversation to the user. This is because, the user can chat, share and give commentaries through the social media network. Thus, social media supply an appropriate platform for marketer and viral advertising (Golan & Zaidner, 2008; Utz, 2009) and also provide access to huge audiences at a very low cost (Kang & Park, 2018).

2.5.2 Previous study on the use of Augmented Reality in Advertising and Marketing

Nowadays, AR is universally applied in the world of advertising. Large companies have been using AR as a marketing tool for example Coca-Cola, McDonald, Kellogg, and Nike. They are using the AR technologies as an alternative to achieve their advertising objectives. Kolb (2011) reviewed an advertising effectiveness study conducted by Acentric involving an AR advertisement in the CAR magazine (May 2011 issue) of the new Mercedes Benz model. 79 respondents were involved in this study and they were taught on how to use the AR advertisement. Stupendously, the results indicated that sixty-three percent of the respondents reviewed the advertisement by the company.

Besides that, Connolly et al. (2010) also carried out a study on AR advertising effectiveness and their study was about the information through the observer's retention and recall from standard paper based and AR based advertisements. The results showed that AR advertising is effective in presenting the visual component of the product and generating product interests. The study also revealed that the 2D printed media can convey the information much more effectively. They concluded

that the possible explanation for this result is that the video recording for the AR advertisement has been viewed by the participants.

A study by a consulting firm on children toy advertisements compared between printed and AR advertisements (Hidden Creative Ltd, 2011). 100 parents were involved and the result indicated that 45% would consider buying the toy after viewing the AR advertisement. Moreover, in term of engagement, parents spend 12 seconds for the printed media advertisement. This study indicates that the AR advertisement has a better potential in attracting customers' attention to purchase the advertised products.

In a study, Yee et al. (2014) utilize the AR advertisement from a different perspective. They introduced a mobile app that is able to show a more comprehensive condition of consumers' car. By using this app, users can view different colours of Perodua Myvi car through their android smartphones. The users can rotate the car up to 360 degree using this application. Apart from that, the users can utilize this application by scanning the marker that is provided in the advertisement through the camera of the smartphones. In this study, the researcher has gathered some information from previous research on the use of Augmented Reality in advertising and marketing like as shown in Table 2.1 below.

Table 2.1

Previous research on the use of Augmented Reality in Advertising and Marketing.

Paper	**References**	**Purpose of Study**	**Technology and Area application**	**Result and Finding**
Mobile Augmented Reality Advertisement	Chua, & Nussing (2012)	To evaluated the developed prototype of a drink	The technology used is Augmented Reality	The findings of this project it was found that there are

for Android Platform		advertisement.		indeed a lot of room for improvements and growth in the advertising industry. This project could be further developed to incorporate video streaming which is currently in the early stages of development.
Human Friendly Interface Design for Virtual Fitting Room Applications on Android Based Mobile Devices	Martin & Oruklu (2012)	To develop a virtual fitting room app for mobile devices.	This application used Augmented Reality and Virtual Reality technology.	VFR app was implemented successfully and a real time app has been achieved.
A Framework for enhancing customer experience through Mobile AR Advertising	Zainuddin, Rambli, & Sulaiman (2012)	Improve customer experience through mobile AR advertising	The technology used is Augmented Reality	This prototype shows that the use of AR in advertising has the potential to enhance customers' experience

				especially the inclusion of exciting AR games that stand out as strong motivators for customers.
Car Advertisement for Android Application in Augmented Reality	Yee, Arshad, & Obeidy (2014)	To develop an application that can show a more comprehensive condition of the car to the consumers.	This application used Mobile Augmented Reality technology	This application allows users to access this type of application anytime, anywhere.
Augmented Reality Mobile Application of Balinese Hindu Temples: DewataAR	Waruwu, Bayupati, & Putra (2015)	To present DewataAR an AR mobile app for tourism objects especially for temples in Bali.	This application used Augmented Reality Technology.	This study provides new innovation and experience for tourists especially about temples.
Furniture Layout Application Based on Marker Detection and Using Augmented Reality	Khairnar, Khairnar, Mane, & Chaudhari (2015)	To develop a windows application for trying different furniture virtually.	This application has used Human Computer Interaction, Augmented Reality and Marker Detection	This application helps customers in buying and setting up furniture by viewing the virtual furniture in real environment.

Perancangan Brosur Interaktif Berbasis Augmented Reality	Rumajar, Lumenta, & Sugiarso (2015)	To promote car using AR.	This application used Augmented Reality Technology, Unity3D and Vuforia.	The interactive brochure based on Augmented Reality can work properly suitable with the objective.
Development and Evaluation of i-Brochure: A Mobile Augmented Reality Application	Zulkifli, Alnagrat, & Mat (2016)	To promote higher learning institutions through the use of interactive brochure.	This application used Mobile Augmented Reality technology	This application provides students with information about the institution through interactive brochure.
Applikasi pemasaran perumahan berbasis teknologi Augmented Reality	Rizal & Sandiana (2016)	Designing a brochure media as marketing tools Augmented Reality-based real estate business and Examine the feasibility of brochures as a marketing tool Augmented Reality-based real estate business	An implementation of Augmented Reality technology for a brochure media as marketing tools Augmented Reality-based real estate business.	This application has been developed and the result to testing is this app feasible to use
Interaktif	Husniah, Saputro, &	Production of	Used system of	AR

Augmented Reality untuk Katalog Penjualan Rumah Berbasis Android	Cahyono (2016)	home sales catalog using AR	Augmented Reality with katalog and method of marker.	interactive application for catalog of home sales can run according to the design that has been done.
Interaktif Augmented Reality Media sebagai promosi penjualan perumahan.	Beny (2016)	To produce 3D objects in line with the Real Estate and Real Estate brochures and promote real estate using interactive brochures.	Augmented Reality technology	Test results on the android system went smoothly, and the test results at Surabaya district sapphire housing marketing office showed that more than 70% of those choosing to be interested in using the tested app for the selection.
Augmented Reality Media pendukung pengenalan kampus university As Wahi Hasyim Semarang.	Yudhistira, Riyantomo, & Mustagfirin (2017)	Designing and making media application supporting the introduction of the University of Wahid Hasyim	This application used Augmented Reality Technology, Unity3D and Vuforia.	This research produces an Augmented Reality application that can be used as a supporting media for the

		campus Semarang with utilize Augmented Reality technology.		introduction of University of Wahid Hasyim Semarang campus and is applied to android devices well.
Aplikasi Brosur Penjualan Rumah Menggunakan Augmented Reality dan Virtual Reality Berbasis Android Pada CV.	Aini, & Aisa (2018)	This research aims to build a program application that generates 3D housing.	Used system of Augmented Reality with brosure. For content, used virtual reality. This application used mobile android platform and method of markerless.	This application has been successfully developed to produce 3D housing model for selling or marketing the housing of CV Aden Perumahan Fadiah Asri.
Augmented Reality Technology Implementation in Local Automobile Advertising	Yi, Wahid, Hamid, Murli, & Othman (2018)	Presents the implementation of AR for advertising Perodua Myvi using a mobile application. This application enables fast response to user requests.	Implementation of AR technology for local car advertising on Android platform as an alternative to advertising new cars.	This project has been successfully developed to provide alternative advertising methods to car users.

2.5.3 MAR application and development platform in advertising and marketing

Today, more businesses are using the AR advertisements as a strategy in promoting and marketing their products. Using this technology, the users can control a virtual image of the products and even packaging of a product by manually using a smartphone or tablet ubiquitously. Furthermore, it is a more innovative way to imprint product-related experiences in the minds of the consumers compared to static images in a printed advertisement. The following are some examples of the applications of MAR in advertising.

Beyond reality has produced a twelve-page markerless magazine advertisement that can be displayed and animated by software program downloaded from the publisher's website (Beyond Reality, 2010). Following this approach, which is the starting point for users to enjoy the AR experience and attracted more users to pay for advanced content and functionalities such as full access to movies. This AR advertisement through magazine may replace a movie ticket.

Next, IBM Corporation introduced the MAR application to help customers shop every day. This application provides the users with coupons as well as ranking of commodities according to customer's specific preferences (Stampler, 2012). This AR advertisement is more beneficial to customers compared to the conventional method. Based on the same advertisement approach, Starbuck uses AR to make the image come to life on a coffee cup decorated with holiday's seasons images. A free downloadable application enable customers to view their own set of different animation attached to different cups. This approach helps to promote the company in a novel way that inspires the customers (Justin, 2012).

Furthermore, the introduction of several AR platforms for non-programmers helps to popularize the utilization of AR among more advertising companies and organizations. For example, Aurasma is a platform for creating the AR experience for users who do not have the programming skill (Aurasma, 2011). The process to create the AR experience using Aurasma is easy and fun. The users only need to create and place the markers that activate the viewing of Auras, which can be a video, image or audio. Aurasma is created by taking images of the environment through devices or by selecting the maker in the Aurasma pre-set list. The required media is then associated with the marker (Aurasma, 2011).

Another example of an AR platform is BlippAR, the first image-recognition phone application aimed at adding experience and immediate content to newspapers, products, posters and magazines (BlippAR, 2011). Both have similar platform in creating advertisements by using two types of free open platform where the users can build their own personal AR advertisements. The users need to attach to their existing printed advertisement some virtual contents before publishing them. The users only need to download the Aurasma or the BlippAR viewers and then use the printed advertisements to view and experience the virtual contents anywhere and anytime.

In this study, the researcher has used Unity3D and Vuforia in order to develop the MARA application. Unity3D has the technology that can offer a platform for creating beautiful and engaging 2D, 3D, VR, AR games and apps (Hackathorn & Margolis, 2016). It has a powerful graphic engines and full featured editor that can enable the developer to realize their creative vision. It enables users to produce and deliver content fast to virtually any media or device. The reason to choose Unity3D to develop MARA application over other software was the simplicity and

extendibility of the software. Besides, the use of Vuforia plugin is easy, and it is easy to debug at runtime the development of the application. The latest version of Unity3D comes with Vuforia plugin. So, the developer does not need to download separate compatible file.

Vuforia is a platform for AR Software Development Kit (SDK) for mobile device to create AR application (Chapagain, 2018). This SDK is offered by Qualcomm which has boosted its market share in the industry of AR (Vuforia, 2017). MARA application has used Unity 3D and Vuforia in order to complete the development and this application was built for android devices.

2.6 Relevant Theories and model

In this studies, the researcher discusses the theories which are related to this study and they include; Theory of Reasoned Action (TRA), Theory of Planned Behaviour by Fishbein and Ajzen (1975, 1980), Technology Acceptance Model (TAM) and The Advertising Value Model.

2.6.1 Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)

The Theory of Reasoned Action (TRA) was initially proposed by Ajzen (1975) and it was completed by Ajzen and Fishbein (1980). TRA is used to predict the behavioural intention, spanning predictions of attitude and predictions of behaviour. The TRA have three general construct components namely; attitude (A), Subjective Norm (SN), and Behaviour Intention (BI). This theory suggests that a person's behavioural intention depends on the person's attitude related to the behaviour and the subjective norm (BI=A+SN). Referring to Figure 2.3, the Behavioural Intention (BI) measures

an intention of a person's relative strength to make behaviour. The attitude consists of the belief about the consequences of performing the behaviour multiplied by the person's valuation of these consequences. Subjective Norm (SN) is a combination of perceived expectations from relevant individuals or a group along with intentions to comply with these expectations (Ajzen, 1975).

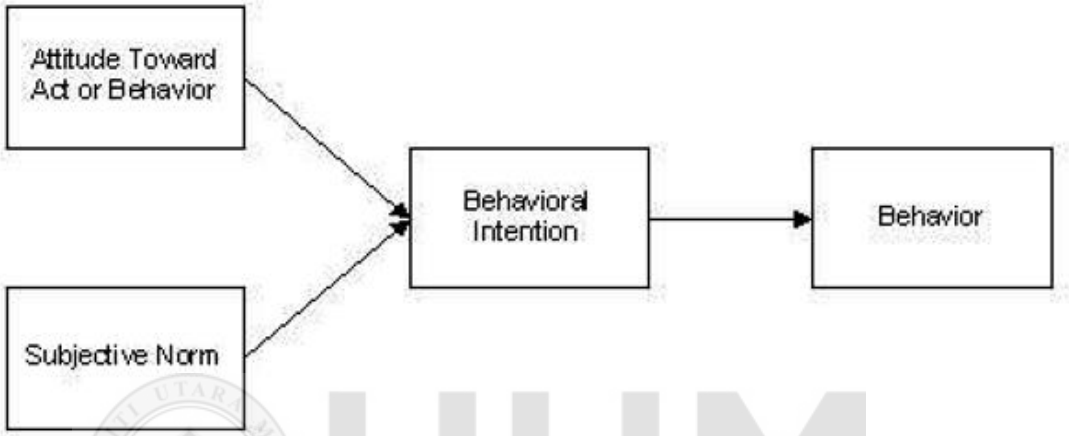


Figure 2.3. Theory of Reasoned Action (Ajzen, 1975).

In 1991, Ajzen introduced an extension of the TRA by combining the concept of perceived control over behaviour achievement as a determinant of behaviour intention or behaviour as shown in Figure 2.4. Following that, the TRA became the Theory of Planned Behaviour (TPB). Both theories (TRA and TPB) stress on the theoretical constructs concerned with individual motivational factors as determinants of performing a specific behaviour. From the aspect of TRA and TPB, the best predictor of behaviour is behavioural intention, which in turn is defined by attitude toward the behaviour and social normative perception regarding this. Furthermore, the TRA and TPB focus on the attributes of attitudes, the subjective norms and perceived controls.

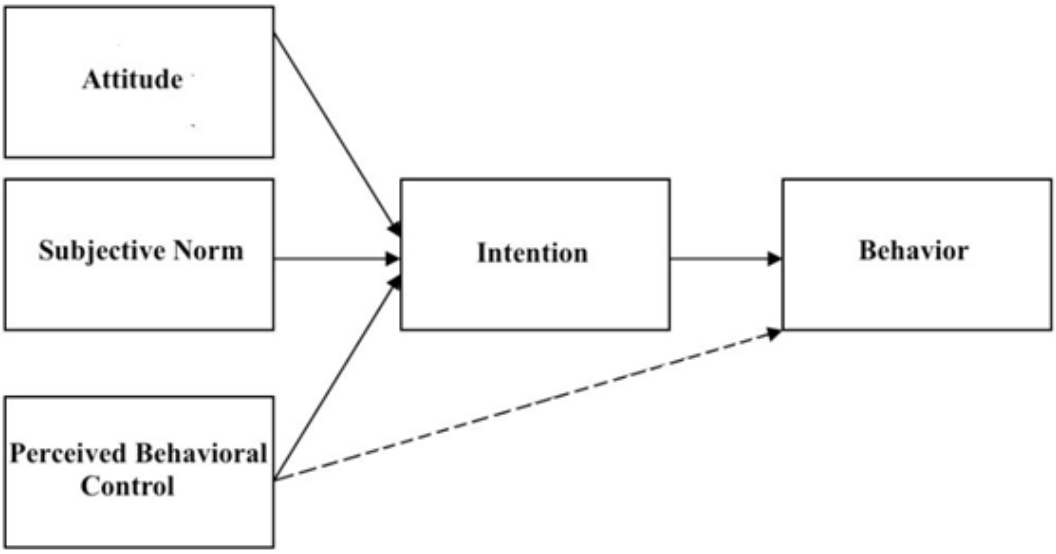


Figure 2.4. Theory of Planned Behavior (Ajzen, 1991)

2.6.2 Implications of the TRA and TPB Theories to this study

The Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) was formulated by Social Psychologist (Azjen and Fishbein, 1980). Social Psychologist attempts among other things to show how and why attitude affect behaviour. This is very important to the intention of using an application. This is because, the theory states that a person's intention to perform or not to perform behaviour is determining the action taken by that person. In this study, intention to use has been used as the dependent variable and it is applied in developing the MARA application. Furthermore, the need of this theory is seen when it involves attitudes and perceptions. Attitude and perception are also important determinants of people's intention to act in action such as adopting and using new technology when this has significant effect, it will also affect the use of such technology. So, MARA was built by using technology of MAR and it's related to this theory.

2.6.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model was originally developed by Davis (1989). It is adapted from the Theory of Reasoned Action (TRA). This model is about the person's acceptance of intention to use a particular technology. Intention is determined by the person's attitude towards the use of that technology and the perception regarding its usefulness. Attitudes are generated from the beliefs a person holds about the use of the technology. Figure 2.5 shows the Technology Acceptance Model.

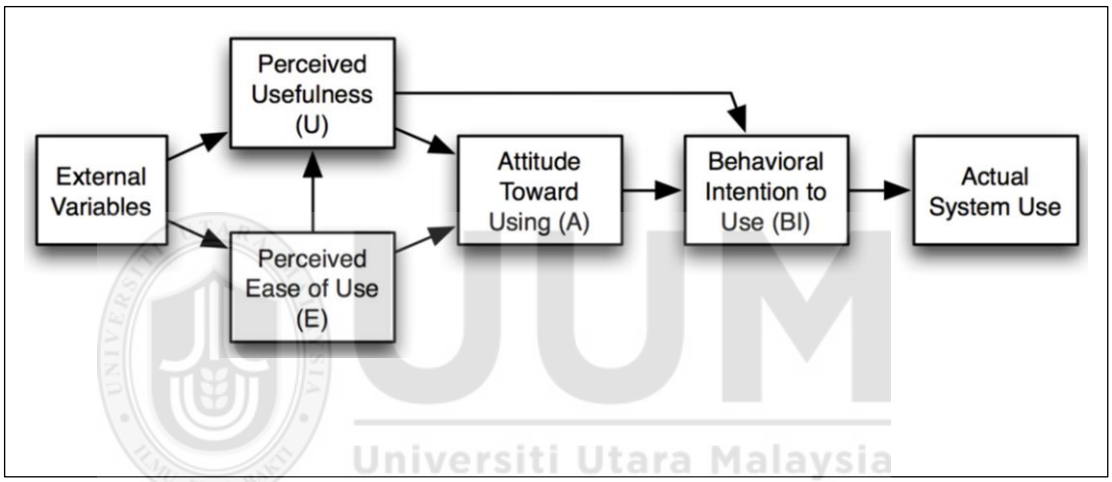


Figure 2.5. Technology Acceptance Model (Davis, 1989).

Perceived Usefulness (PU) is defined as the subjective probabilities of prospective users using a particular application system will improve their job performance (Davis et al., 1989). Perceived ease of use (PEU) is defined as the level at which users expect the target system to be independent of effort (Davis et al., 1989). As the case for the Theory of Reasoned Action, the strength of the belief-attitude-intention-behaviour relationship in expecting behaviour largely depends on the degree of specificity achieved (Ajzen & Fishbein, 1989). Therefore to apply this notion to the context of technology acceptance, it is necessary to measure beliefs about the use of technology, rather than the technology itself, in which individuals may have a

positive view of a technology without being positively dispensing it with its use. Table 2.2 lists all the dimensions and their definitions for TAM.

Table 2.2

Lists all the dimensions and their definitions for TAM.

Dimension	Definition
Perceived Ease of Use (E)	Perceived Ese of Use is defined as the extent to person believe that he/she will be free of mental effort after using the system (Davis,1989)
Perceived Usefulness (U)	Perceived Usefulness is defined as the extent to person believe that using a system can improve his/her job performance (Davis,1989)
Attitude toward Use (A)	Attitude toward use is defined as the positive or negative feelings of individual about performing the target behavior in using system (Fishbein & Azjen,1975)
Behavioral Intention to Use (BI)	Behavioral Intention or Purpose of the behavioural is the individual's intention to do their target behavior (Morris & Dillion,1997).

2.6.4 Implication of the TAM Theory to this study

TAM is about the person's acceptance of intention to use a particular technology. All the measurements in TAM which include; perceived ease of use, perceived usefulness, attitude toward use, and intention to use were used in this study. Furthermore, TAM is a popular way to predict the use of emerging technology. So, the use of the TAM theory is appropriate to this study.

2.6.5 The Advertising Value Model

The Advertising Value Model was developed by Ducoffe (1995, 1996). According to Ducoffe (1995, 1996) the advertising value can be explained as consumers' subjective assessment about the significance or usefulness of the advertisement, entertainment, informativeness and irritation. Figure 2.6 shows the advertising value model.

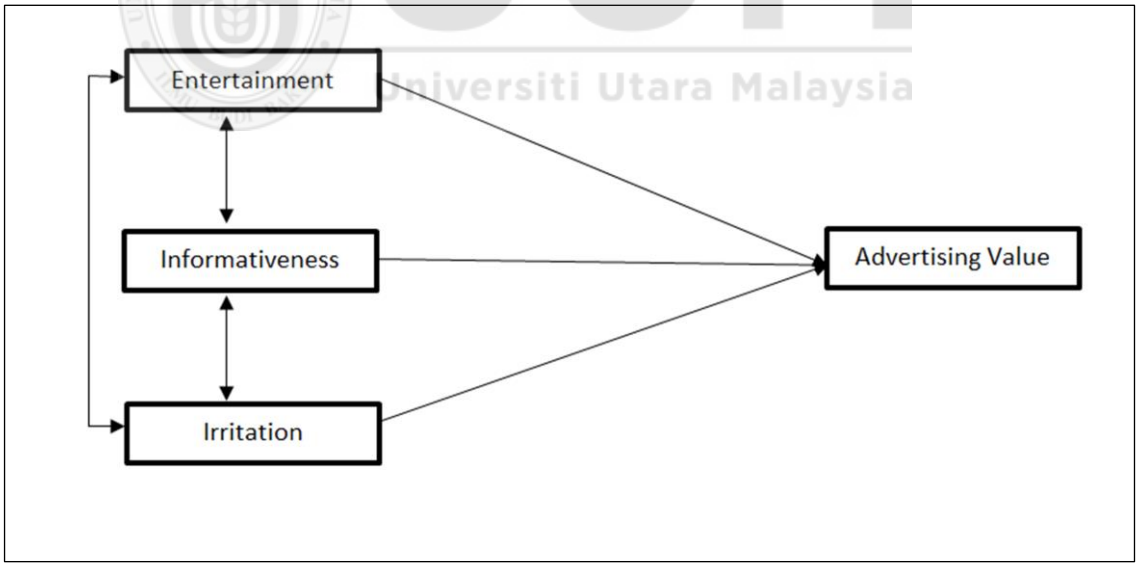


Figure 2.6. The Advertising Value Model (Source: Ducoffe, 1995, 1996)

Ducoffe (1995) proposed this model to measure the perception of consumer about the relative worth or utility of advertising. Importantly, these priorities belong to the

consumers experience with the advertising rather than traditional advertising effectiveness and purchase intent. This model demonstrated that the advertising value construct is an antecedent of the attitude towards advertising construct. Besides, this model was also developed because there was a need to comprehend how advertising can be used to meet its objective as a tool of communication with the consumer. Entertainment is a satisfaction of a user's desire for distraction, virtual and affective pleasure (Ducoffe, 1996; Waldt et al., 2009; Gao & Wu, 2010; Karthik, 2014). Entertainment is important as a platform for advertising. Zabadi et al. (2012) found that the most significant element that effect consumer attitude is entertainment. Informativeness is defined as the satisfaction of the consumers when they get information about goods and services from marketers via advertising (Gao & Kaufaris, 2006). Besides, informativeness is also an ability to effectively present appropriate information. Lastly, irritation can be described as perceived offensive and not informative (Alwitt & Prabhaker, 1992; Alwitt & Prabhaker, 1994; Ducoffe, 1995) annoying (Ducoffe, 1995; Ducoffe,1996; Hasan et al., 2013) or evasive (Taylor et al., 2011). Irritation also can make consumer reduced the value of that advertisement (Ducoffe, 1996; Lieu et al., 2012). Thus, it is considered an important reason for consumer in developing a negative attitude towards advertisements (Schlosser, Sharitt, & Karfer,1999).

2.6.6 Implication of the Advertising Value Model to this study

The Advertising Value Model explains the features of the advertisement together with advertising value and attitudes toward advertising (Ducoffe, 1996). There are three measurements that are included in this model namely; entertainment, informativeness and irritation. The implication of this model to this study is when the

measurement of informativeness and advertising value were utilised in this study as independence variables**.**

2.6.7 Waterfall Model

Waterfall model is an approach from Software Development Life Cycle (SDLC). This model is one of the most widely used models for software development. Besides, this old model is easy to learn (Kute et al., 2014). This model was first introduced in 1970 by Winston W. Royce. There are five stages in this model which include; Requirement Analysis, Design, Implementation, Verification Testing and Maintenance. In this study, the waterfall model has been used in development process of the MARA prototype as depicted in Figure 2.7.

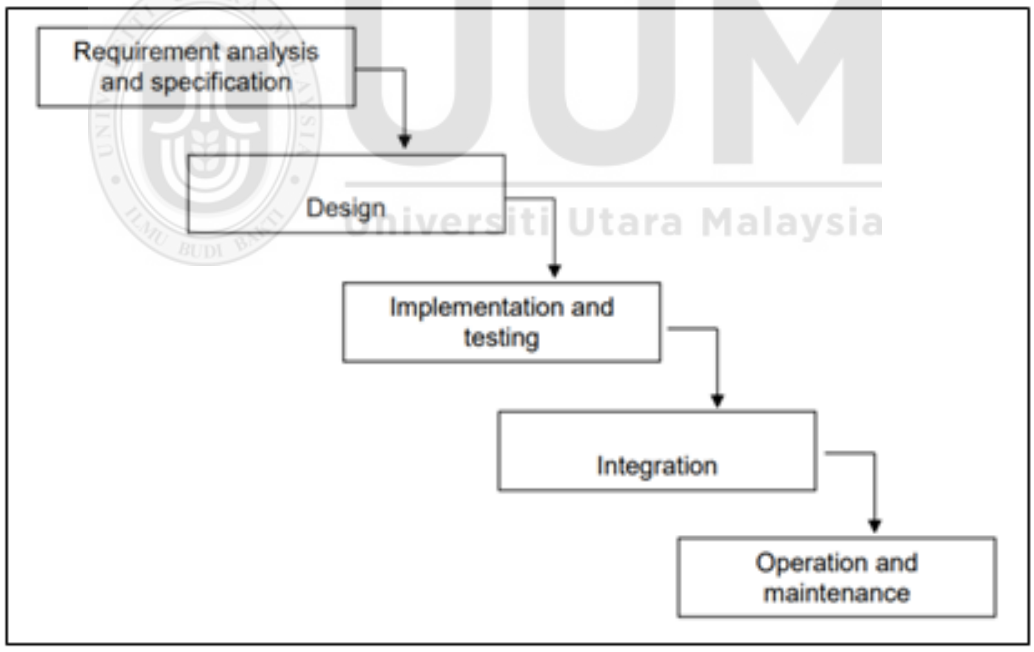


Figure 2.7. Waterfall Model (Source : Aqqarwal & Singh, 2008)

2.6.7.1 Requirement Analysis

The aim of this stage is to understand the exact requirements of customer and to document them properly in a natural language containing a description of what the system will do without describing how it will be done.

2.6.7.2 Design

The aim of this stage is to transform the requirements specification into a structure that is suitable for implementation in some programming language. In this phase also, design work is performed.

2.6.7.3 Implementation

In this stage, design is implemented. If the entire design description document is complete, the implementation phase will proceed smoothly.

2.6.7.4 Verification Testing

The goal of this stage is to determine that each module is correctly done. This gives the chance to determine that interface between modules is also correct and for this reason integration is performed. This stage is to develop confidence in the developers before the prototype is delivered to the customer or release in the market.

2.6.7.5 Maintenance

Maintenance is the stage that every development group has to face, when the prototype is delivered to the customer's site, installed and operational. Prototype maintenance is a wide activity consisting of errors correction, enhancement of capabilities and deletion of obsolete.

2.7 Evaluation

An evaluation is a process that is important to officially decide about evidence or fact from the useful feedback of target users to the proposed solution. There are several tests in evaluation such as perception evaluation, the Pearson correlation analysis and the regression analysis. Thus, this is the most important part of this study because the results obtained through the evaluation of the MARA application are the dependencies of this study. The following sub-sections discuss on the heuristic evaluation and user evaluation.

2.7.1 Heuristic Evaluation

Heuristic evaluation is a method to identify usability problems in the tested application (Bertini et al., 2009; Paz et al., 2013). It requires the assistance of two or three examiners who are experts about the particular field to evaluate that system against the reference guideline and heuristic principle. Heuristic evaluation can give

some quick and relatively inexpensive feedback to designers. Furthermore, assigning the correct heuristic can help suggest the best corrective measure to designers.

The main purpose of heuristic evaluation is to identify the problems in the interface design and content of the application. The evaluation involves experts from a chosen field of study (Davids, Chikte, Grimmer-somer, & Halperin, 2014). This evaluation is known as a cost-effective and simple to conduct method and it is very useful for multimedia application or system development (Albion, 1990).

For the heuristic or expert evaluation, two categories of experts were involved namely; content and interface. The content experts were responsible in ensuring the consistency of the information in the MARA application by evaluating it thoroughly and making suggestions for any inconsistencies detected. In this study, the owner of Hazamedia himself was involved. Besides that, the content expert ensures that the MARA application is useful to the users. Correction will be made if faults and errors are found in the content of the application. Meanwhile, for the user interface evaluation, two lecturers from UUM were involved. Their knowledge and experience in AR-related teaching and research of more than five years were considered as the basis for the selection. The interface experts were responsible in ensuring the functionality of all the interfaces of the MARA application.

2.7.2 User Evaluation

The main aim of user evaluation in this study is to determine the perceptions of users in using the MARA application as a marketing and promotional tool for the printed media microenterprises. In the perception study, the perceptions of users in using the MARA application were determined through a set of questionnaires. The study was extended to determine the correlation and regression between the independent

variables and the dependent variable in order to determine the relationships between each independent variable and the dependent variable and also to test the hypotheses of this study. A set of questionnaires can be used as a tool to determine the users' reaction towards the prototype based on the conceptual model (Dick & Johnson, 2007). The questionnaires that have been used for this study to evaluate the users' perceptions are listed in Appendix B.

2.7.2.1 Measurements Used In User Evaluation

There are several measurements that have been used in this study which include; perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use. The following sub-sections discuss the measurements.

2.7.2.1.1 Perceived Ease of Use

This study used Perceived ease of use as one of the independent variables. Perceived ease of use is one's ability in handling a system without guidance (Davis, 1989). This should be taken into account when developing the MARA application so that it is suitable for users to use it anytime and anywhere. By transforming the traditional advertising to the online advertising is one of the purposes of the AR advertising. Thus, the application should not be complicated and easy to navigate by user without any guidance.

2.7.2.1.2 Perceived Usefulness

Perceived Usefulness is the second independent variable in this study. Perceived usefulness refers to users improving their performance with the help of the ability of the system (Davis, 1989; Efferson, Lalive, Richerson, Mcelreath, & Lubell, 2006). Users have the potential to use the system if they feel that the system can help

improve their performance. In this case, MARA has been developed for the purpose of enhancing the users' performance whereby by using MARA, it will make users' job easier, it is useful and also can save time.

2.7.2.1.3 Informativeness

The third independent variable in this study is informativeness which is related to delivering the content value and enjoyment of the style and form of value (Tsang, Ho, & Liang, 2004). Through content's informativeness, advertising delivers information about the product and services of the organization's offer (Alwitt & Prabhaker, 1992; Hassan et al., 2013). The informativeness in advertising can keep consumer up to date about the information needed. Informativeness also has been used in the model to understand the consumers' attitude and adoption of mobile advertisement and online advertisement by some researcher for example Tsang, Ho and Liang (2004). In this case, MARA has been developed with variable informativeness such as providing information of products, services and also about the microenterprise. This enables users to obtain detailed information about the organization directly when using MARA.

2.7.2.1.4 Advertising Value

The fourth independent variable in this study is advertising value. According to Ducoffe (1995), advertising value is a subjective evaluation of the relative worth or utility of advertising to user. Economist sees this definition through a view as long as the value of the advertising is understood to be subjective measure of the user or satisfaction from the commodities. In this study, advertising value is also applied in developing the MARA application. MARA is developed to give user the ability to feel valuable, useful and important.

2.7.2.1.5 Intention to Use

The last variable in this study is intention to use which is also the dependent variable of this study. Intention to use can be defined as the degree to which the user would like to use technology in the future. Researchers such as Chow et al. (2012), Lee and Lehto (2013) and Teo (2011) propose that intention to use is a form of technology acceptance behaviour related to perceived ease of use and perceived usefulness. In this case users have greater intention to use the MARA application in the future whenever they perceive it as easy to use and useful. Thus, the researcher chooses intention to use as the final dependent variable in order to support previous studies.

2.7.3 Correlation Analysis

The Pearson Correlation Coefficient (r) was carried out to determine the relationships between the independent variables and the dependent variable. According to Pallant (2013), the correlation coefficient value is +1 and -1. The value that depicts the positive correlation between the variable which is the impact of independent variable and dependent variable in the same direction is +1 while the value that depict the negative correlation between the variables where the variables are in two different directions is -1 (Pallant, 2013). When there is no relationship between the independent variable and the dependent variable, it means the coefficient is zero

2.7.4 Regression Analysis

In order to accept or reject the null hypotheses of this study, the regression analysis has been carried out. It also determines the relationships between the independent variables and the dependent variable. In this study, the researcher used multiple regression because there are more than one independent variables and one dependent variable applied.

2.8 Implication of evaluation to this study

This section discusses the evaluation process that has been conducted in this study. The evaluation includes perception study, correlation analysis, and regression analysis. The perception study was carried out to determine the users' perceptions toward the MARA application. The correlation analysis is to determine the relationships between the independent variables and the dependent variable. The regression analysis is for hypotheses testing. The significant or not significant and positive or negative outcomes of the evaluation depict the effectiveness and usefulness of the MARA application.

2.9 Summary

This chapter focuses on the understanding of related topics in this study. The microenterprise, advertising, AR technologies and theories have been examined prior to the development of the MARA application. This application is aimed at rendering interactive information exceeding that of conventional advertising approaches. The MARA application has been developed based on these two technologies; AR and MM for the Android mobile platform. The methodology for this research was adapted from Kuechler and Vaishnavi and the development process for the MARA application was based on the waterfall method. Finally, the explanation about the conducted evaluation in this study was discussed.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is specifically operating as a toll which helps to clarify the research, providing a set of more accurate measurements and to obtain facts and evidences related to the studies (Denscomber, 2007). Therefore, the methodology's stage is like the strategy of planning, on how to do or achieve, approach and design intertwine with and become very closely connected (Saunders, 2009). Hence, the following chapter on methodology initially discusses the research design and its processes. Then, the processes are further explained in detail in order to achieve the research objectives.

3.2 Research Methodology

Research methodology is the research process which proposes a number of systematic steps in finding the solutions for all the questions and problems. Research methodology is a mixture of a series of actions that the researchers carry out with the particular purpose, the use of method and tools is to discover the solutions in a precise way (Nunamaker et al., 1991). This study uses the research methodology that was adapted from Kuechler and Vaishnavi (2011). It comprises of five phases namely; problem awareness, design, development, evaluation and documentation as shown in Figure 3.1. Meanwhile Table 3.1 provides the detail descriptions of the research methodology and Figure 3.2 depicts the process of this research study.

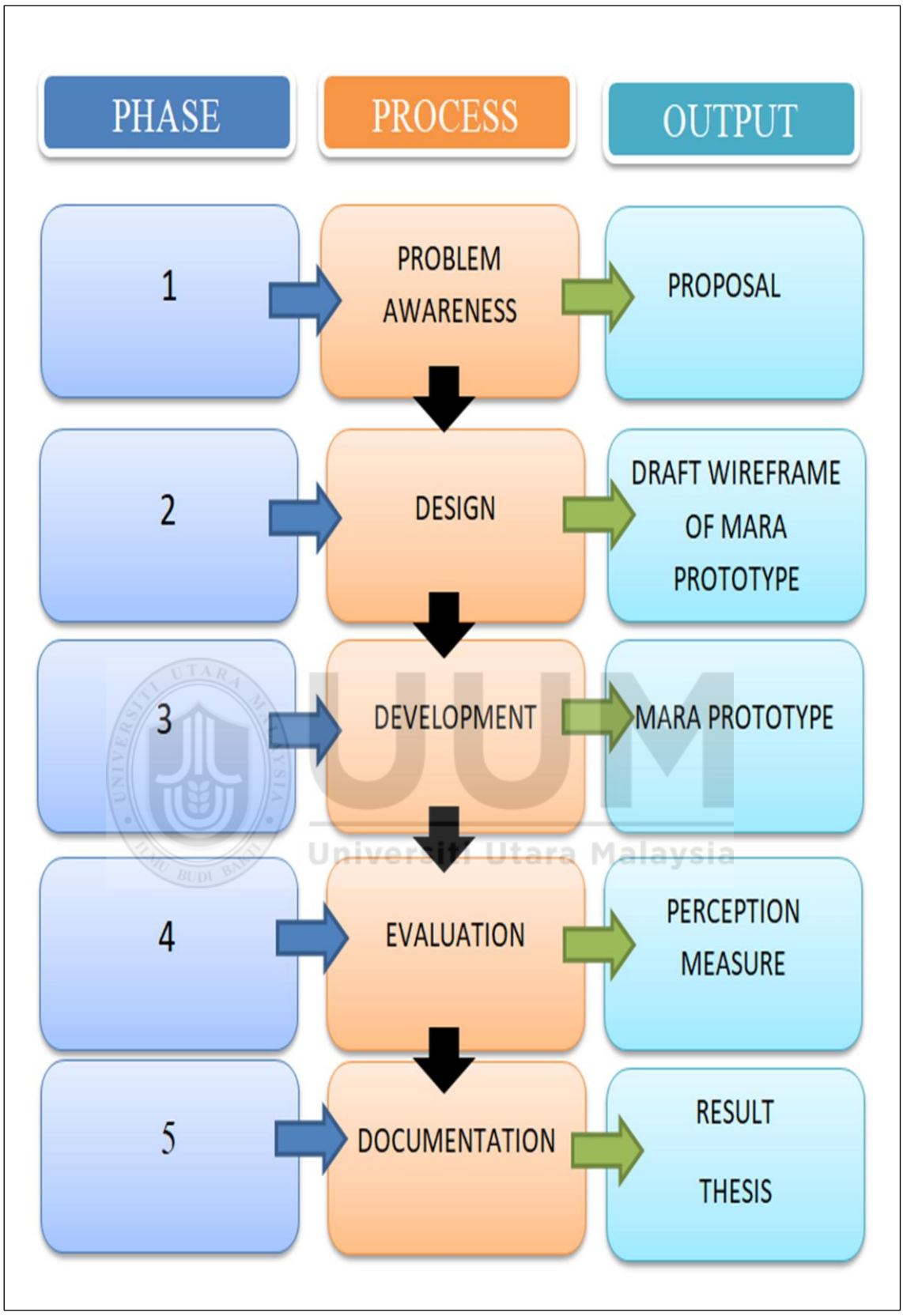


Figure 3.1. Research Methodology of this study (Adapted from Kuechler & Vaishnavi, 2011)

Table 3.1

Detail Descriptions of the Research Methodology

Item	Description
Phase	Phase is a step and process in this study
Process	There are five steps in this process phase; problem awareness, design, development, evaluation and documentation.
Output	Each output is from each process phase in this design research process
1, 2, 3, 4,5	Number of phase that included in research methodology
	The arrow that show the phase to their process
	This arrow directs to the next process in the design research methodology
	The arrow that shows the output from the process.

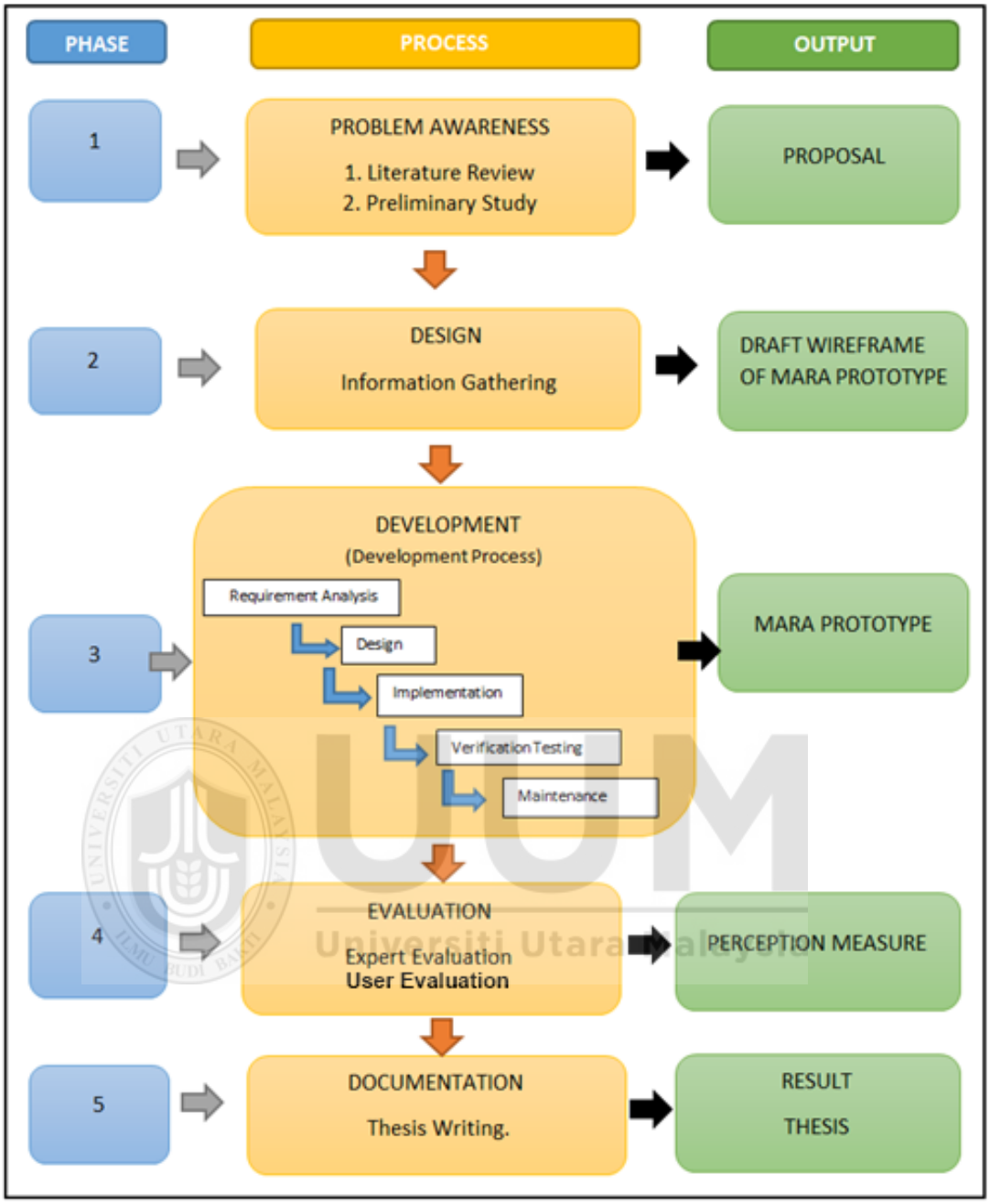


Figure 3.2. Process of research

Figure 3.2 shows the process of research for this study. It shows the phases, process and output. There are five phases which is phase 1, phase 2, phase 3, phase 4 and phase 5. The process begins with Problem Awareness that includes literature review and preliminary study. Next is the Design which includes information gathering. The Development includes; requirement analysis, design, implementation, verification testing and maintenance. Evaluation has expert and user evaluations and lastly

Documentation has thesis writing. The outputs in this process of research study consist of proposal, draft wireframe of MARA prototype, MARA prototype, perception measure, result and thesis.

3.2.1 Problem Awareness

According to Shiratuddin and Hassan (2010), researchers have to continue or repeat something that has already been started with recent issues in order to stay relevant in the research areas. Sometimes, some current issues that happened in the society can also be a problem in the research area that will later come out with a solution. In this phase, literature reviews and preliminary study were conducted to determine the problem or issue of the study.

The rapid development of today's technology has made advertising and promotion as promising areas for applying new technologies. Nevertheless, some businesses from microenterprises do not carry out significant advertising and promotion activities for their businesses (Robert & wood, 2002). This problem occurs because microenterprises have financial limitations and constrains and also lack of skills and their efforts of promotion did not reach the required goals (Jakic, 2011; Pharr & Weinrauch, 2007). Therefore, microenterprises require advertising method and product promotion that can overcome their constraints and give them easy to use, interactive, trendy and easily available anywhere and anytime approach. This is in line with today's ICT development where the use of smartphone is the latest trend and is widely used not only in the big cities but also in rural areas.

Normally, literature review is important in order to determine the critical points and current knowledge; it is also related to the theories in providing explanation to this study. Besides that, literature review also contributes to the current literatures and

findings on selected topics. Apart from that, this study ensures the researcher to be updated with information that is related to mobile technology, AR, advertising and promotion from previous researchers.

On top of that, the preliminary study that the researcher conducted is to understand and identify the real issue that is happening in the society. The detail explanation and results of the preliminary study were described in Chapter one.

In problem awareness, the activities that were involved include collecting information about the topic and determining related virtual contents. The researcher needs to identify and select the microenterprise in order to retrieve more information about the products and services offered. The information about the microenterprise's products is important in order to produce the virtual content for the MARA application. The researcher met and discussed with the owner of the microenterprise which is Haza Media. Haza Media provides products and services related to Wedding Card, Sticker, Tag and Banners. Besides, Haza Media also consults their customers in selecting the right design of the products.

In this study, Haza Media has been chosen by the researcher because it is the only printed media microenterprise in Jitra, Kedah who was willing to cooperate and participate in this study. Since the researcher is interested to develop an MAR application which can be used for advertising and promotion of microenterprises' products and services, Haza Media is suitable since most of its products and services can be transformed into digital formats which can be applied in the MAR application. Nowadays, Augmented Reality Advertising app has become trendy and within reach of most consumers. AR in advertising and promotion has been widely used abroad and the researcher feels that AR needs to be explored to provide opportunities in marketing of microenterprises' products and services. This is one

way to help the entrepreneurs to expand their business by using the new approach which is the trend of technology today.

3.2.2 Design

The design phase is executed once the first phase is completed. The objective of this phase is to creatively propose a new functionality of the artefact or application to be developed. Literature review is important to formulate the design phase for accomplishing the objective stated in chapter one. Referring to the problem statement and the preliminary study from Chapter one, this study aims to propose a new approach to advertising through the use of the Mobile Augmented Reality (MAR) technology. The application that has been developed is known as the Mobile Augmented Reality Advertising (MARA) application and it can be installed to any android smartphones.

In this phase, the important task that has been carried out is information gathering. The researcher needs to get all the information in detail about the products from the selected microenterprise. Here the owner of the microenterprise (Haza Media) will be referred as the expert since he is well versed with his own company's products and services. The researcher needs to know all the descriptions about the products and services involved and the way they are to be promoted. The information about the products and services is presented in the form of hard copy using Haza Media AR Brochure and also virtual content by using MAR technology.

After all the information regarding the required products and services has been gathered from the Haza Media, the researcher created a draft wireframe of the MARA application. The wireframe acts like storyboard for multimedia application whereby it displays the functional elements of the application. The first draft of the

wireframe has been shown to the content expert and he was briefed about the overview of this application. When it is agreed, the wireframe proceeded to the development phase. Figure 3.3 shows the MARA application wireframe.

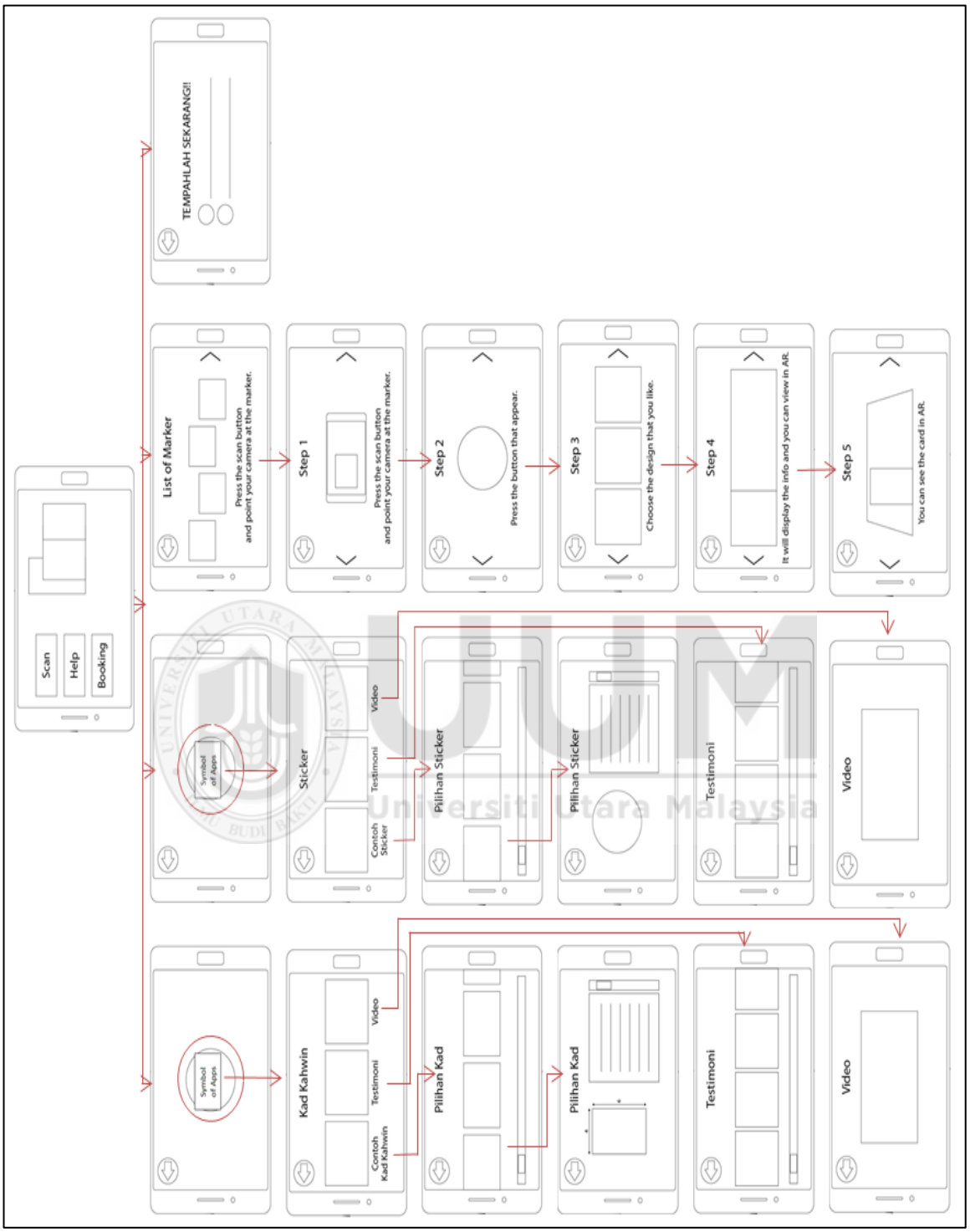


Figure 3.3. MARA application wireframe.

there are three main buttons on the main interface of this apps which include Scan, Help and Booking. This apps is used with the Haza Media AR brochure. The user can see the interface of the Kad Kahwin and Sticker when he scan the Kad Kahwin and Sticker image at the Haza Media AR brochure. Then, the option Help will go to how to use this app and then, Booking option will go to Tempahlah Sekarang.

3.2.3 Development

The development phase comes after the design phase. The design phase is the creative part and a lot of knowledge regarding the research issue is needed. Software Development Life Cycle (SDLC) is a process used by the software industry to design, develop and test software (Balaji & Murugaiyan, 2012). SDLC aims to produce software that meets or exceeds customer expectations, achieves completion within the time and cost that has already been planned. This study uses SDLC approach which is the waterfall model, a sequential software development process where each stage must be completed first before entering the next stage which is seen as the flow of water that keeps flowing down (like waterfall) through the existing stage. The waterfall model comprises of requirement analysis, design, implementation, testing and maintenance (Bassil, 2012) as shown in Figure 3.4. Moreover, the waterfall model is a generic model that has a systematic approach and provides with a framework to ensure an effective material is generated.

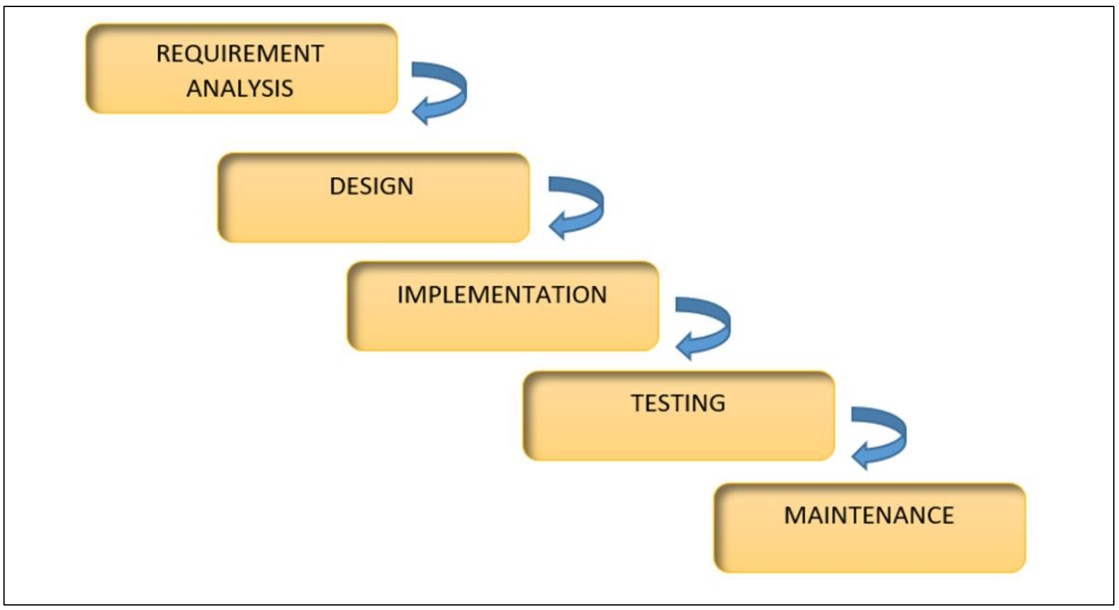


Figure 3.4. Waterfall model

MARA application is an application to be used as a marketing and promotional tool for the printed media microenterprise in Malaysia. This application provides interactive information beyond that of conventional advertising approaches. By using MARA, the user will be able to access a more comprehensive marketing and promotional tool. An overview of the MARA application is shown in Figure 3.5.

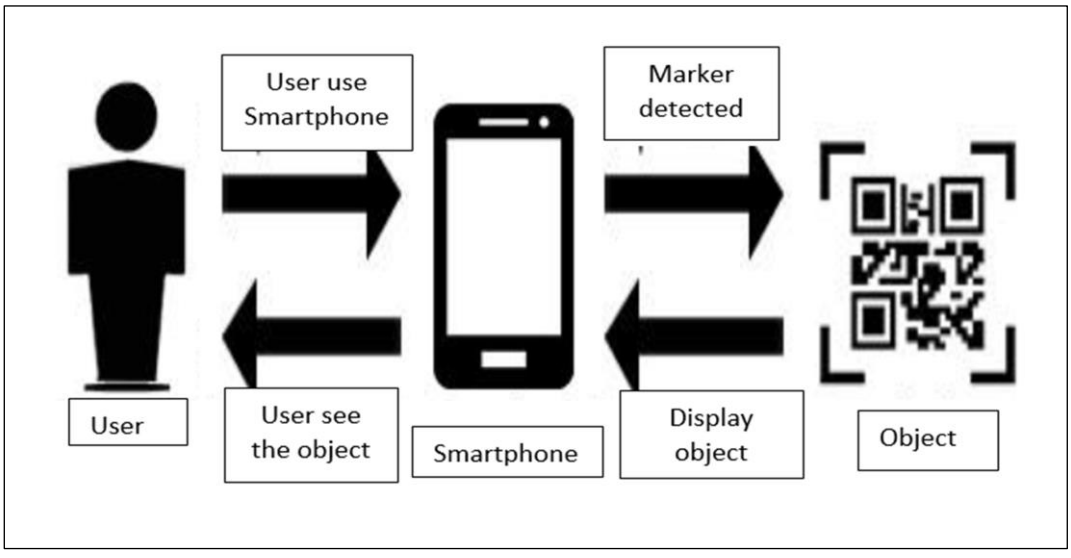


Figure 3.5. Overview of the MARA Application

The following sub-sections describe briefly the stages in the waterfall model.

3.2.3.1 Requirement Analysis

In this phase, all the requirements and specifications of the input and output of the proposed application are identified and documented.

3.2.3.2 Design

The specifications from the previous phase are studied in this phase in order to specify the hardware and system requirements and also system architecture.

3.2.3.3 Implementation

Inputs from the system design in the previous stage are used to develop small programs called units which are then tested for their functionality.

3.2.3.4 Testing (Verification Testing)

All the developed units in the implementation phase are assembled into after testing each of the unit. The entire assembled system is tested once again for any faults and failures.

3.2.3.5 Maintenance

This stage occurs whenever there are modifications to an individual component or system in order to improve the performance. Normally the request for modifications is due to defects in the system and initiated by the clients. As such the client is provided with regular maintenance and support for the developed software.

3.2.4 Evaluation

In this study, there are basically two types of evaluation namely; expert evaluation and user evaluation. Each types of the evaluation will be discussed in the following sub-sections.

3.2.4.1 Heuristic Evaluation

The goal of the heuristic or expert evaluation is to find and track the advantages and disadvantages of the existing or future applications. It evaluates the content and functionality and interface of an application. For the content, the expert was from Haza Media. The owner of the microenterprise has been selected since he is the one who know in depth about the products and services offered by Haza Media. The expert was required to verify that the content of the MARA application is accurate and in accordance with Haza Media's requirements. Next, for the functionality and interface, the experts were lecturers who have been teaching and developing mobile applications. They were required to identify issues related to the functionality and interface of the MARA application.

3.2.4.2 Evaluation by Users

Once the heuristic evaluation has been completed, the MARA application was evaluated by the target users. In this study, the target users were micro entrepreneurs from the district of Kubang Pasu, Kedah. The evaluation by users involves a perception study, correlation analysis, and regression analysis. A set of questionnaires was used as a tool to determine the users' reaction towards the MARA application. The purpose of the perception study is to determine the users' opinion after using the MARA application for advertising and promoting micro entrepreneurs' products and services. Meanwhile, the correlation analysis is to

determine the relationships between each of the independent variables and the dependent variable. Finally, the regression analysis is to explain the effect of the independent variables on the dependent variable.

3.2.5 Documentation

The final stage is the documentation where all the results were reported. The analysed data with all the findings gathered in the study went through thesis writing and publication. The study has documented notable findings in thesis and journals that explain in detail about the topic of study. This last phase is important to disseminate the information and the research topic to the public.

3.3 Summary

This chapter discusses on the overall method and process to be implemented in this study. Besides AR and MM technologies that are applied in the development process, the waterfall model was also adapted as a guideline during the development of the MARA application. Figure 3.6 shows the relationship between the research methodology and waterfall model that was utilized in this study.

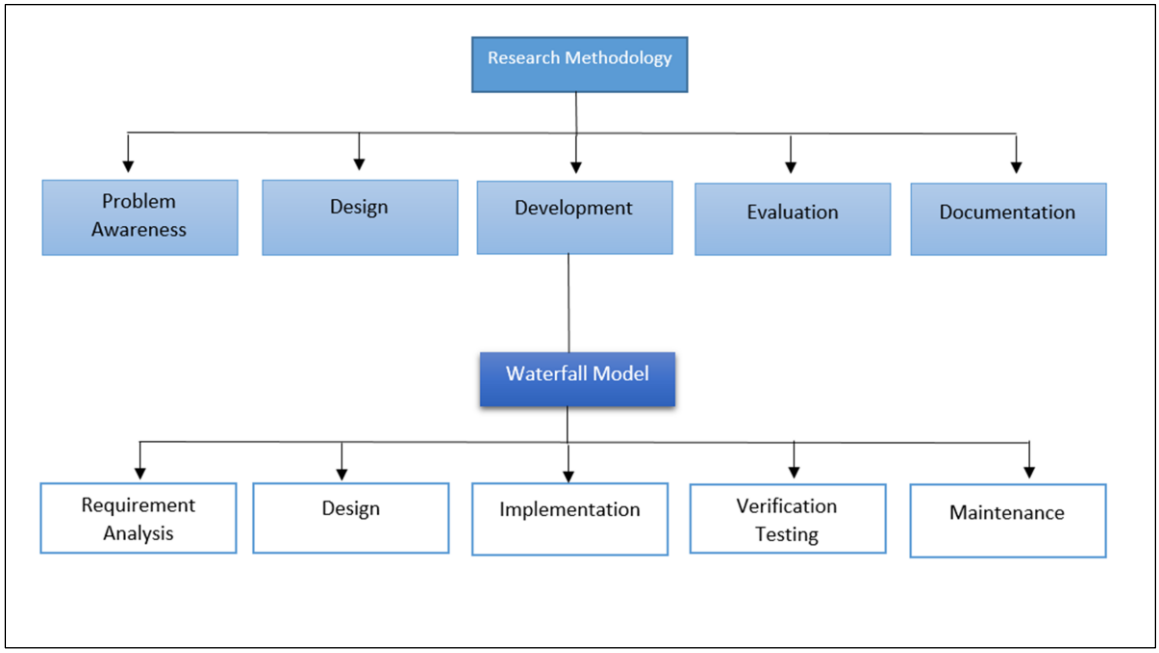


Figure 3.6. Relationship between Research Methodology and Waterfall Model

CHAPTER FOUR

DEVELOPMENT OF THE MARA APPLICATION

4.1 Overview

This chapter discusses on the development of the MARA application. This chapter mainly reports on the activities that were carried out in the development of the MARA application as mentioned in the methodology of this study. The development of the MARA application was based on the waterfall model which provides the template for all stages of the process including the requirement analysis, design, implementation, testing and maintenance. The following sections discuss in detail the development stages of the MARA application based on the waterfall model.

4.2 Requirement Analysis

The first stage in the waterfall model is the requirement analysis whereby the functional requirement analysis is conducted to ensure that the application is doing what it should be done based on the functional requirements. The analysis is done by giving input to the application in order to detect various possibilities such as bugs (Rosa & Shalahudin, 2011). The use case diagram is used to describe the functional requirements of this application and how the application interacts with the user as shown in Figure 4.1. Meanwhile Table 4.1 shows the functional requirement analysis for the MARA application. The functional requirements analysis table describes the application specifications and the various things the user does.

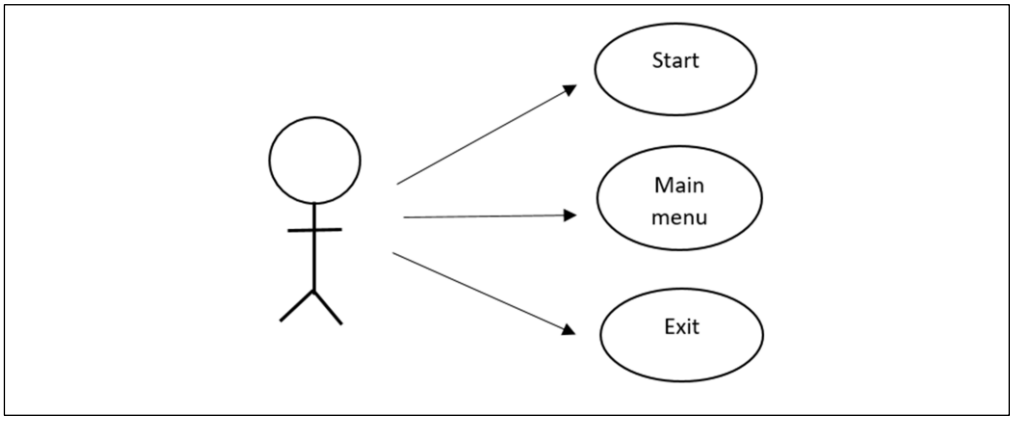


Figure 4.1. Use Case Diagram for Functional Requirement Analysis

Table 4.1

Functional Requirement Analysis

Requirement	Use case
The system must provide a start-up function so that the user can start the application	Start
The system should provide a main menu function so that the user can choose the option and see the information contained in the application	Main menu
The system must provide the exit function so that the user can exit the application	Exit

Table 4.2 shows the requirements for software and hardware in the development of the MARA application.

Table 4.2 *Software and Hardware Requirement Analysis*

Parameter	Description
Software	1. Unity 3D 2. Vuforia as android SDK 3. Windows 8.1 operating system - 64 bit
Hardware	1. Laptop or PC 2. Intel Core i3-6006U processor 3. 4GB RAM 4. 1TB HDD 5. Intel HD Graphics 520 6. Screen 14 inch

Table 4.3 shows the requirements for compatibility in the development of the MARA application.

Table 4.3

Compatibility Requirement Analysis

Parameter	Description
Mobile device	1. Android OS smartphone or tablet 2. Android OS at least 4.2.1 3. ARM V7 processor 4. 512 MB RAM 5. 100 MB system storage.

4.3 Design

Design is the second stage in the waterfall model which involves the process of planning and problem-solving for the solution-level application such as determining a plan for a solution that includes algorithm design, architectural design and planning stage of the application user interface.

4.3.1 Algorithm Design

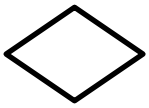
The MARA application is designed so that it can be accessed by only one user at a time on the same smartphone. The user can run this application using the printed media marker (Haza Media Brochure). For the algorithm design, flowcharts have been used. The flowchart explains the steps in a graphical way. The flowcharts are created for the main menu interface, content interface, help interface and booking interface. The flowcharts are created for the following steps:

a) The user opens the MARA application through an Android smartphone.
b) The user must choose from options scan, help and booking in the main menu.
c) The user chooses scan and directs the smartphone camera towards the Haza Media Brochure whenever he/she wants the information to be displayed.
d) The user chooses help to see the MARA application user's guide.
e) The user chooses booking to book any product from Haza Media.

Table 4.4 shows the symbols used in developing the flowchart. The flowchart for the Main Menu interface is shown in Figure 4.2. Figure 4.3 shows the flowchart for content interface. Figure 4.4 shows the flowchart for Help Interface. Lastly, Figure 4.5 shows the flowchart for Booking Interface.

Table 4.4

Symbols Used in Flowchart

Symbol	Description
	Start or end
	Process
	Manual Input
	Manual Operation
	Display
	Decision
	Data

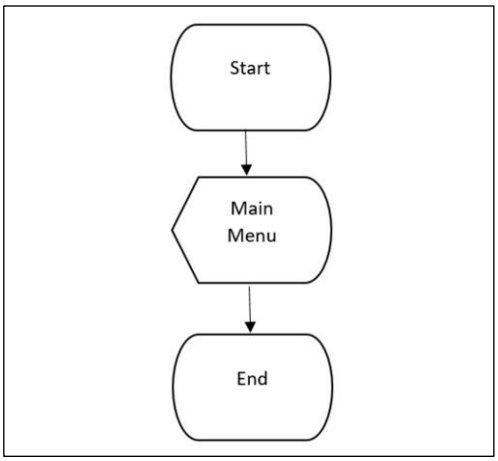


Figure 4.2. Flowchart of Main Menu interface

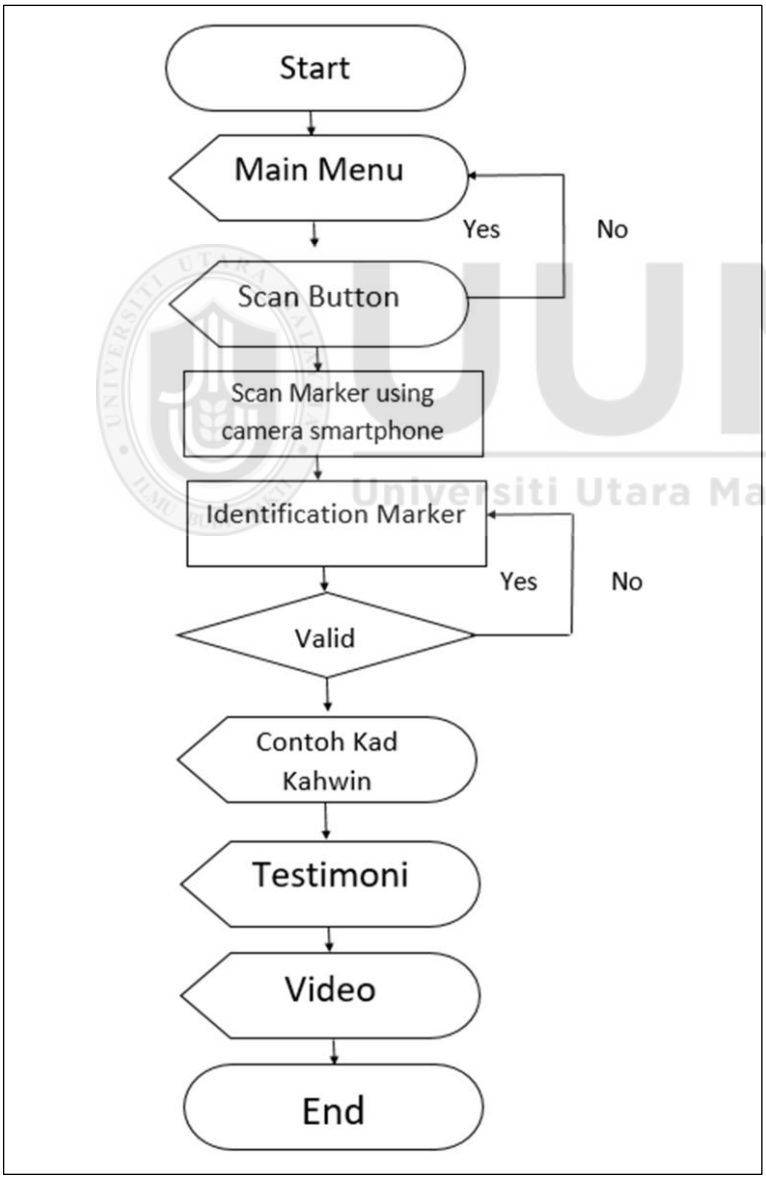


Figure 4.3. Flowchart of Content Interface

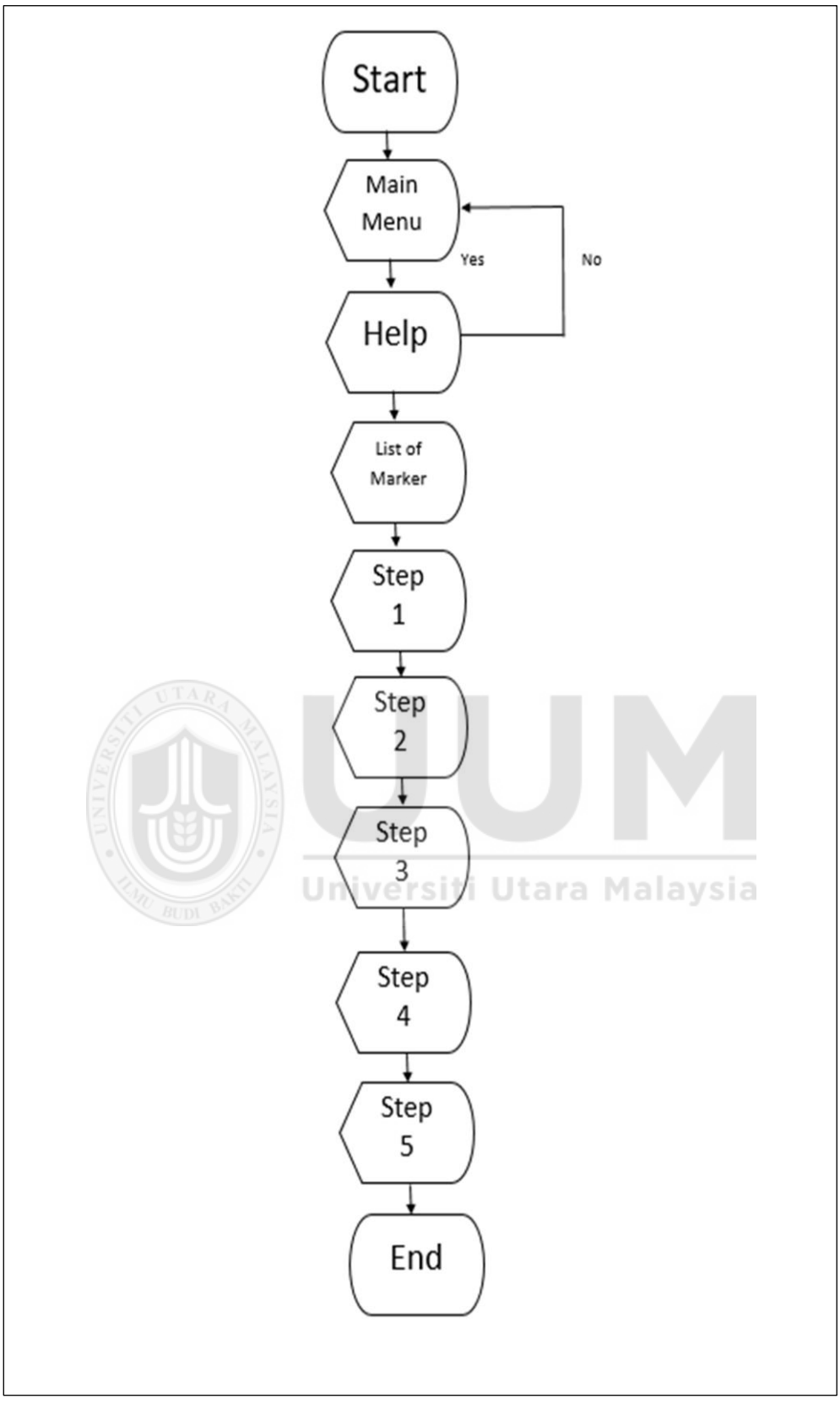


Figure 4.4. Flowchart of Help Interface

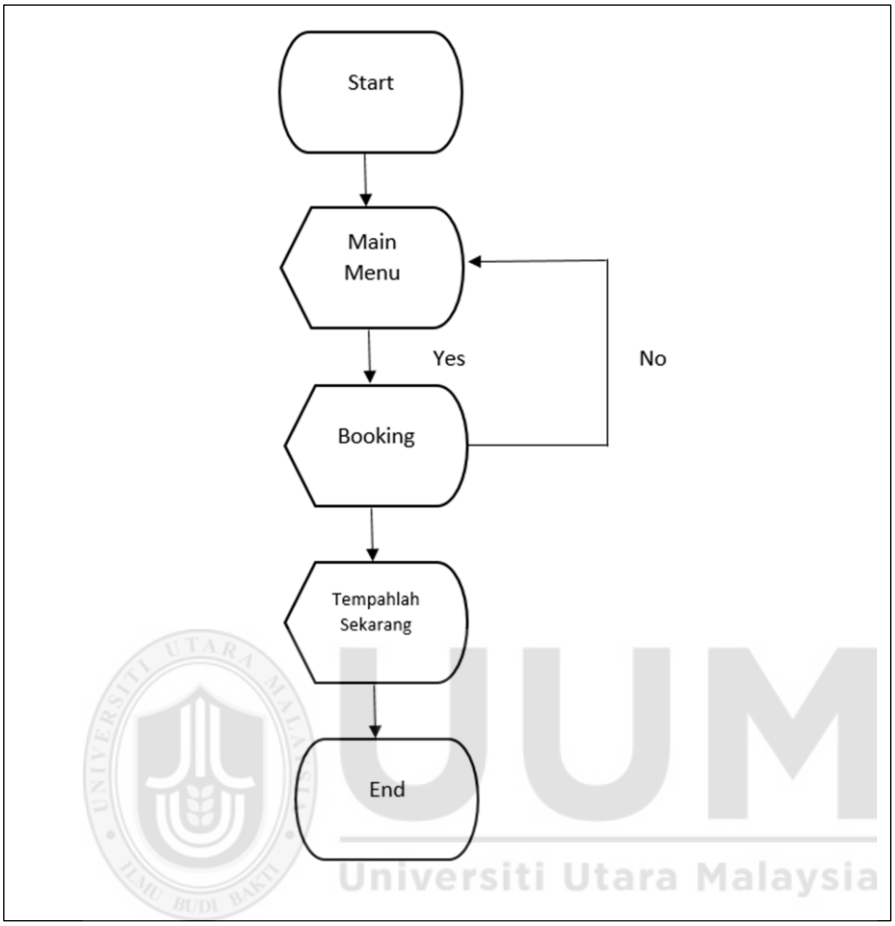


Figure 4.5. Flowchart of Booking Interface

4.3.2 Menu Navigation Structure Design

The menu navigation structure is used as a planning stage on the menu to be used. The menu navigation structure is an important design element with the objective of allowing users to acquire more of the information they seek and making the information easier to find. For more details, the design of the menu navigation structure of MARA application is shown in Figure 4.6. Meanwhile Figure 4.7 shows the final wireframes based on the menu navigation structure of the MARA application.

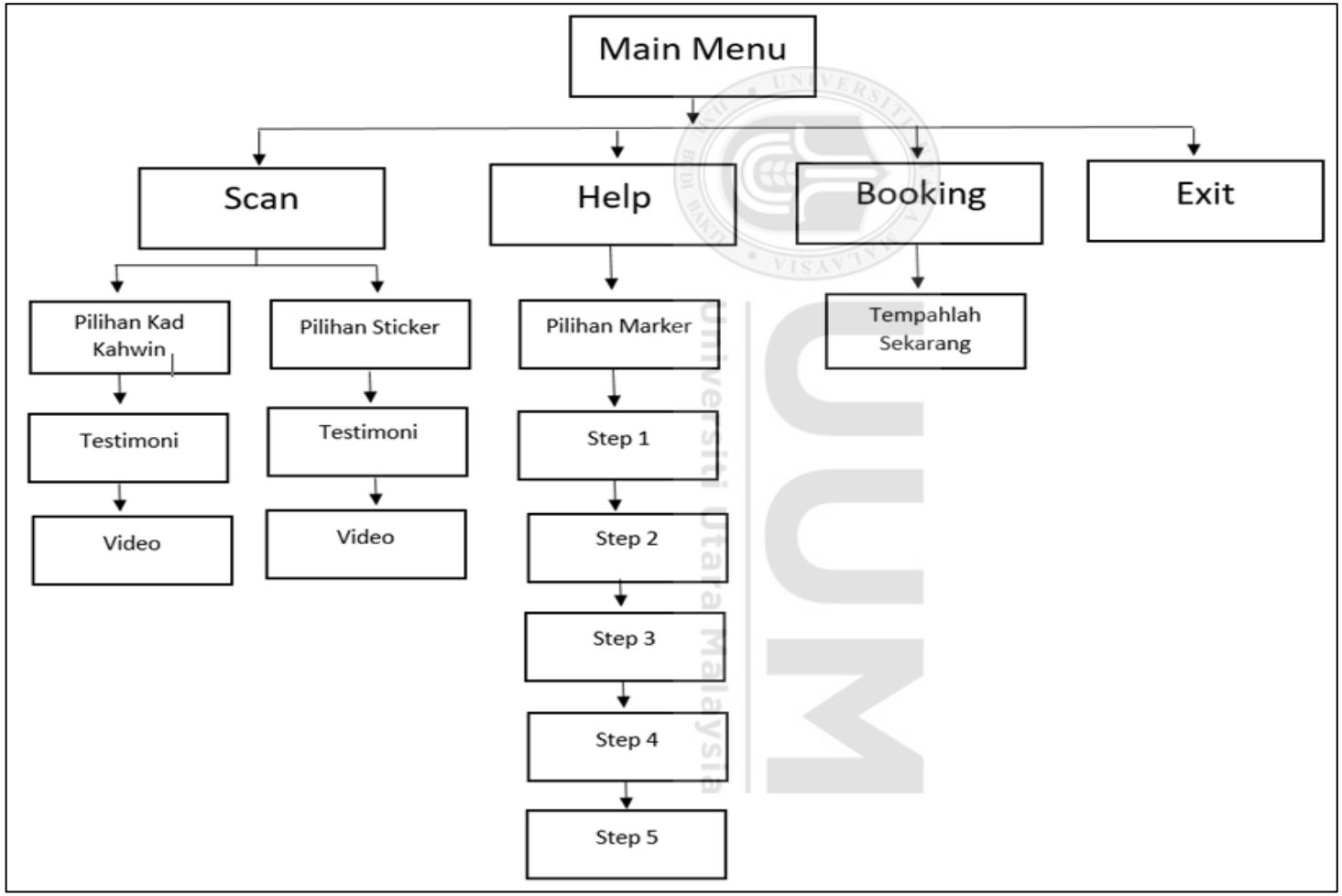


Figure 4.6. MARA Application Menu Navigation Structure.

Figure 4.7. Final Wireframes of MARA Application.

4.4 Implementation

The inputs from the design phase are then used in developing the image target and the MARA application and they are further discussed in detail in the following sub-sections.

4.4.1 Image Target

In order to implement an image target in an AR environment, the way to do is to specify the target image, measure its size, determine the quality and quality of its features and create configuration files and datasets from the target image. The process of researching quality and feature quality, configuration and creation of datasets can be done online. Image target is created as marker for this application.

All the pictures and information that were gathered from Haza Media were properly designed as a brochure in Adobe Illustrator. It has been designed as a two-sided A4-sized brochure since this format is more convenient, practical and cheaper. In the design phase, care has to be taken whenever to include the image for the marker so that the MARA app is able to detect the marker easily. The markers consist of colored images instead of black and white images. The advantage of colored images is that the user is able to view the original image and quickly associate it to the virtual content to be displayed. The front page of the brochure consists of four markers which are assigned for Wedding card, Sticker, Tag and Banner as shown in Figure 4.8. While on the opposite page as shown in Figure 4.9 shows the services and contact information of Haza Media.

Figure 4.8. Haza Media Brochure front page

Figure 4.9. Haza Media Brochure back page

4.4.2 Application Development

The MARA application has been specifically developed for the printed media microenterprise. It was developed using Unity 3D and Vuforia and can be installed to any Android smartphones. This application also used C language during the development phase. MARA consists of two main components namely; the AR marker (Haza Media brochure) and the MARA application. The user must have the two components in order for MARA to function properly. Figure 4.10 shows the two main components of MARA.

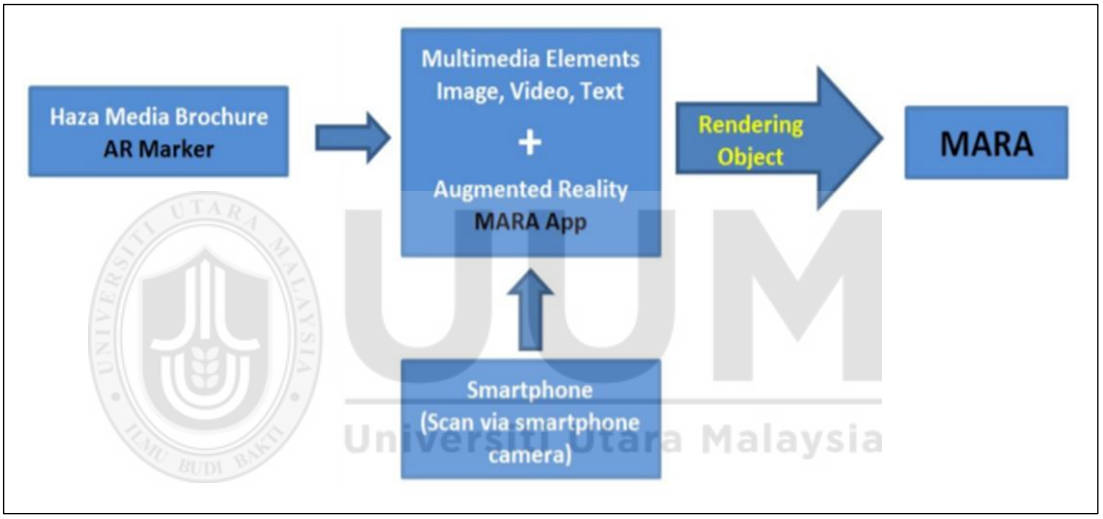


Figure 4.10. Components of MARA Application

There are 3 main buttons on the main interface of this app which include; Scan, Help and Booking. The following sub-sections elaborate each of the buttons.

4.4.2.1 Scan

In the Unity workspace, a raw image was inserted and saved as Scan as shown in Figure 4.11. The raw image functions as the background of the application. This application requires a scene exchange; as such an object named Manager was created and the Scan script was later attached to the object. In order to change from one scene to the other, the number of scene display was inserted. In order to scan; a script

written in Microsoft Visual Studio was created. Figure 4.12 shows the Scan Button. When a marker is scanned, the virtual content that is attached to the marker appears on the mobile screen. For the wedding card, the virtual content consists of a collection of images of various wedding cards, price list, sample of testimonies and videos of the wedding cards. The user can browse all of these by swiping and scrolling the screen of the mobile device. Meanwhile the Tag button activates the collection of tag images, price list, sample of testimonies and the tag videos.

Figure 4.11. Raw image as a background

Figure 4.12. The Scan image button

4.4.2.2 Help

The Help button is to guide first-time users on the operation of the MARA application. It is important since MAR is considered a new concept and the user needs to be guided on the use of this application. The process of creating the Help button as shown in Figure 4.13 is similar to the Scan button which involves inserting the Help raw image into the Unity workspace, attaching the button script to the Manager object and setting the “Change to Scene“ on the click event. Figure 4.14 shows a sample screen capture of the Help interface.

Figure 4.13. The Help image button

Figure 4.14. The interface of the Help Scene

4.4.2.3 Booking

The Booking button provides the user with contact information of Haza Media. The process of creating the Booking button as shown in Figure 4.15 is similar to the two previously discussed buttons. Figure 4.16 shows the finalized main interface of the MARA application.

Figure 4.15. The Booking image button

Figure 4.16. The Main Interface of the MARA Application

4.5 Testing (Verification Testing)

The testing phase of the waterfall method is to ensure that the MARA application should experience a thorough quality assurance and application testing in order to discover any defects in the application. The types of testing that have been conducted

include; black box, effect of light on the marker, camera distance to the marker and camera capture angle to the marker.

4.5.1 Black Box

The purpose of the black box is to examine the functionality of the MARA application without peering into its internal structures or workings. Table 4.5 lists some of the black box tests that have been conducted on the MARA application. Based on the outcomes of the black box tests, all the functionalities of the MARA applications are running well.

Table 4.5

Application Testing Results

No	Type Of Testing	Action	Expected Result	Testing Result	Conclusion
1	Installing the APK		Installation process runs well on Android smartphone.	As expected	Valid
2	Run application that is installed		Application can run well	As expected	Valid
3	Detection of wedding card's marker on Haza Media Brochure	Point the camera to the marker	Marker used can be detected until symbol of application appears	As expected	Valid
4	Detection of	Point the	Marker used can be	As	Valid

	Sticker’s marker on Haza Media Brochure	camera to the marker	detected until symbol of application appears	expected	
5	Touch the application symbol during the scanning of wedding card’s marker	Touch	Display the wedding card information interface	As expected	Valid
6	Touch the application symbol during the scanning of Sticker's marker	Touch	Display the sticker information interface	As expected	Valid
7	Button Back touched	Touch	Back to previous interface	As expected	Valid
8	Button Help touched	Touch	Display choice marker’s interface	As expected	Valid
9	Button Booking touched	Touch	Display Book now interface	As expected	Valid
10	Testing scroll view on sample of wedding card’s interface	Touch and Scroll	Image can scroll to left and right	As expected	Valid
11	Testing scroll	Touch and	Image can scroll to	As	Valid

	view on testimonies of wedding card's interface	Scroll	left and right	expected	
12	Button play video wedding card touched	Touch	video can be played	As expected	Valid
13	Testing scroll view on sample of sticker's interface	Touch and Scroll	Image can scroll to left and right	As expected	Valid
14	Testing scroll view on Testimonies of Sticker's interface	Touch and Scroll	Image can scroll to left and right	As expected	Valid
15	Button play video Sticker touched	Touch	video can be played	As expected	Valid
19	Button Exit touched	Touch	Exit from the apps	As expected	Valid

4.5.2 Testing the Effect of Light on the Marker

Light testing for the MARA application was carried out in areas of outdoor lighting and indoor lighting. The results indicated that this application was able to detect the

markers in both outdoor and indoor lightings. However, the detection took a longer time in areas with low light.

4.5.3 Testing the Camera Distance to the Marker

This test was conducted by measuring the distance between the camera and the marker in order to get the most suitable distance for best marker detection. The researcher placed the camera at a distance of 20 cm, 30 cm, 40 cm, 50 cm and 200 cm in front of the marker. Table 4.6 shows the test results by varying the distance of the camera to the marker. The results indicated that the marker could be detected whenever the camera was located 20 to 50 cm in front of the marker. However, when it was at a distance of 200 cm, the marker could not be detected.

Table 4.6

Testing the Camera Distance to the Marker

Distance	Result Wedding Card Marker	Result Sticker Marker
20 cm	Application symbol of wedding card information appears	Application symbol of Sticker information appears
30 cm	Application symbol of wedding card information appears	Application symbol of Sticker information appears
40 cm	Application symbol of wedding card information appears	Application symbol of Sticker information appears
50 cm	Application symbol of wedding card information did not appear	Application symbol of Sticker information did not appear
200 cm	Application symbol of wedding card information did not appear	Application symbol of Sticker information did not appear

4.5.4 Testing Camera Capture Angle on Marker

This test was conducted by changing the camera angle to the marker. The camera was placed at 45°, 90° and 180° from the marker. Table 4.7 shows the results of the test. The results indicated that the marker could be detected whenever the camera was at 45° and 90° from the marker. However, when it was at 180°, the marker could not be detected.

Table 4.7

Testing Camera Capture Angle on Marker

Angle	Distance	Result Wedding Card Marker	Result Sticker Marker
45°	30cm	Application symbol of wedding card information appears	Application symbol of sticker information appears
90°	30cm	Application symbol of wedding card information appears	Application symbol of sticker information appears
180°	30cm	Application symbol of wedding card information did not appear	Application symbol of sticker information did not appear

4.6 Maintenance

In the previous stage, the MARA application has been tested to ensure that the application has no error or deficiencies. As such the application is ready to be made available to the users. However, if the application still has errors or new functions need to be added then the researcher can repeat the implementation and testing stages in order to improve and add the new functions.

4.7 Summary

This chapter discussed about the development of the MARA application based on the waterfall model. The development of the application begins with an emphasis on the requirement analysis which is necessary to ensure the smooth running of the application. These requirements were the guide for developing the application using Unity 3D and Vuforia software. Next the design stage involved determining the algorithm design, architectural design and planning stage of the application user interface. The implementation stages involved the development of the image target and the MARA application. The application has also undergone several testing that include; black box, effect of light on the marker, camera distance to the marker and camera capture angle to the marker. Once all these stages have been completed, the application is ready to be made available to the users. Unless if the application still has errors or new functions need to be added, then the implementation and testing stages can be repeated.

CHAPTER FIVE

DATA ANALYSIS AND RESULTS

5.1 Overview

This chapter presents the data analysis and results of expert and user evaluations for this study. The expert evaluation comprises of and functionality and interface evaluation. The expert for content evaluation consists of the owner of Haza Media while the expert for the functionality and interface evaluation consists of two lecturers in the field of MAR and MM. Meanwhile for the user evaluation, the participants are youngsters between the ages of 19 to 39 years old based on Erikson's Stages of Psychological Development. Altogether, 60 participants were involved in the user evaluation.

The data collected from the expert evaluation was used to fix any problems related to the MARA application's content, functionality and interface prior to the user evaluation. The data from the user evaluation was used to determine the participants' perceptions in using the MARA application, the correlation between the independent variable (perceived usefulness, perceived ease of use, informativeness and advertising value) and the dependent variable (intention to use). In this study, several hypotheses were formulated and they are tested through regression analysis.

The data analysis starts with the reliability analysis where the Cronbach Alpha (α) values were calculated to determine the reliability of the variables used in this study. Next is the descriptive statistics where its purpose is to describe the data usually using

standard measures and in this study in the form of mean and standard deviation.

Then, the correlation analysis was conducted to determine the relationships between each independent variables and the dependent variable.Lastly, the regression analysis was conducted for the purpose of testing the hypotheses. All these analyses were conducted using statistical package for social sciences (SPSS) version 22. Finally, the summary of the findings is presented at the end of the chapter. Figure 5.1 show the evaluation process for this study.

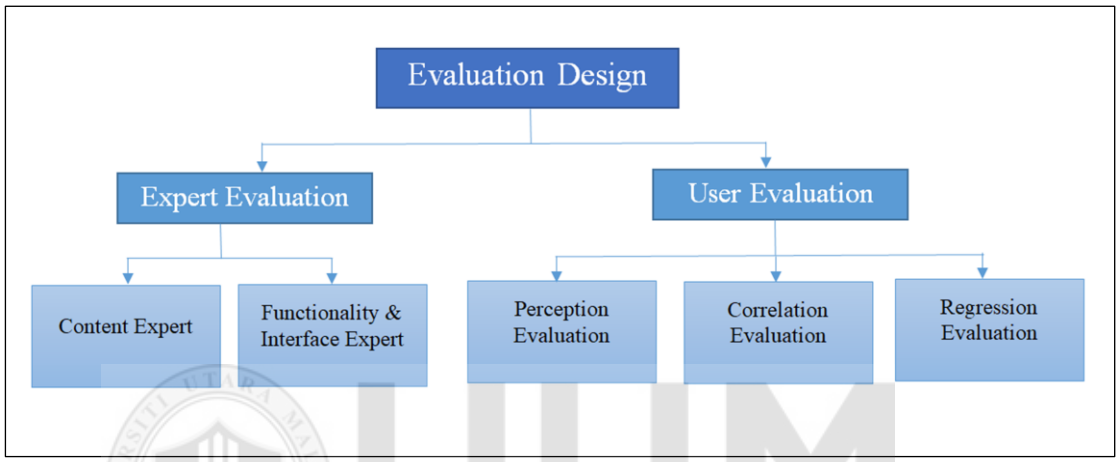


Figure 5.1 Evaluation Design in this study

5.2 Expert Evaluation

Expert evaluation is the first evaluation that has been conducted in this study. Altogether three experts were involved in this evaluation, one for the content expert while the other two for the functionality and interface experts. The content experts is the owner of Haza Media and the other two are lecturers who have experience in teaching and conducting research related to AR and MM and they also have more than five years of experience in their respective fields.

The role of the content expert is to check the validity and suitability of the content to be presented to the participants who were youngsters' mobile phone users. The content expert was given ample time to go through the application and he was asked to provide feedback to the researcher in terms of the content. Meanwhile, the

functionality and interface experts evaluated the functionality and interface of the MARA application. They were provided with the functionality and interface evaluation form as shown in Appendix C to fill. The feedbacks from the two experts were required to correct the errors and mistakes prior to the user evaluation.

5.2.1 Content Evaluation

Based on the use of the MARA application, the expert has decided that the content of the application fulfilled the requirements of Haza Media. The expert agreed that the content was appropriate to be used for promoting and marketing of Haza Media's products and services.

5.2.2 Functionality and Interface Evaluation

Appendix C and D show the feedbacks provided by the two experts. The suggestions by the experts have been taken into account and the MARA application has been modified prior to the user evaluation.

5.3 User Evaluation

The next phase of the evaluation process is the user evaluation. The user evaluation was based on the modified and improved MARA application. In this study, the user evaluation was conducted by using the Technology Acceptance Model (TAM) Questionnaires. The user evaluation includes users' perceptions study, correlation study and regression study.

5.3.1 Sample

The participants for this evaluation were mobile users who were categorized as youngsters between the ages 19 to 39 years old based on Erikson's stages of

psychosocial development (Rosenthal, Gurney, & Moore, 1981). The sampling technique used was convenience sampling whereby the participants were selected from the population based on ease of selection and accessibility (Smith, Fry, Shannon, & Groebner, 2005). Altogether 60 participants were selected and this satisfies the minimum number for sample size as suggested by Coakes and Steed (2003).

The evaluation was conducted among micro entrepreneurs within the district of Kubang Pasu, Kedah. The reasons for choosing the printed micro entrepreneurs from Kubang Pasu who were categorised as youngsters include convenience in data collection and the participants from this category are normally mobile savvy and furthermore, all of them were mobile users. Before the evaluation was conducted, the participants were asked about their age. Only those within the age category were selected for the evaluation. A brief explanation on the use of the MARA application was given to the selected participants especially on the functions and interfaces. They were asked to install the MARA application to their mobile devices and then ample time (approximately 15 minutes) was given for them to familiarize with the application. Next, a set of questionnaires was handed to each of the participants for them to evaluate the application. Table 5.1 shows the demographic data of the participants.

Based on the demographic data, the breakdown of participants based on gender is 30 male and 30 female and all of the participants have smartphones. 37 (61.7%) of them have internet facility at home. In terms of frequency of internet usage, the results indicated that 32 (53.3%) used daily, 23 (36.7%) used weekly, 6 (10.0%) used monthly and none never used the internet. In terms of knowledge of Augmented Reality (AR), the results indicated that 31(51.7%) of them have some knowledge

about AR and 29 (48.3%) do not have any knowledge about AR. Finally, in terms of the use of any mobile phone app based on AR in advertising, the results indicated that 23(38.3%) have used the AR mobile app while 37 (61.7%) have never used the AR mobile app.

Table 5.1

Demographic Data of Participants

	Respondent Profile	Frequency	Percentage (%)
	Gender		
1	Male	30	50
2	Female	30	50
	Availability of smartphone		
1	Yes	60	100
	Internet facility at home		
1	Yes	37	61.7
2	No	23	38.3
	Frequency of internet usage		
1	Daily	32	53.3
2	Weekly	22	36.7
3	Monthly	6	10.0
4	Never	0	0
	Knowledge about AR		
1	Yes	31	51.7
2	No	29	48.3

The use of any mobile app based on Augmented Reality in advertising.

1	Yes	23	38.3
2	No	37	61.7

5.3.2: Validity and Reliability of the Questionnaire

Validity refers to the accuracy of a measure or the extent to which a score truthfully represents a concept (Zikmund, Babin, Carr, & Griffin, 2013). Validity of questionnaires is the degree to which the questionnaires actually measure or collect data from researchers on what the researcher thinks about measurement and data collection (George & Malley, 2003). In this study, only content validity is considered. Content validity refers to the degree to which the content of the items represents the appropriate universe of all relevant items under study (Cooper, Schindler, & Sun, 2014). In this study, since all the items in the questionnaires were adapted from previous related studies, they were considered valid.

Meanwhile, the reliability of a questionnaire refers to its ability to be consistent, stable and reproducible. Reliability is defined as the extent to which measurements can be replicated (Daly & Bourke, 2000). A 5-point Likert scale anchored with 1-strongly disagree, 2-disagree, 3-somewhat agree, 4-agree and 5-strongly agree was used. Cronbach alpha (α) was used to examine the reliability of all the measurements that include; perceived usefulness, perceived ease of use, informativeness, advertising value and intention to use.

The SPSS version 22 was used to calculate the α values. Table 5.2 shows the measurements' α values. The results indicated that α for Perceived Usefulness is 0.713, α for Perceived Ease of Use is 0.716, α for Informativeness is 0.714, α for Advertising value is 0.711 and α for Intention to Use is 0.789. All the measurements

have $\alpha > 0.7$ which indicates that they are reliable (Van Raaij & Schepers, 2008). Meanwhile, according to Li (2015), based on the rule of Cronbach alpha scale, the internal consistency of $\alpha > 0.9$ indicates excellent, $0.9 > \alpha > 0.8$ indicates good, $0.8 > \alpha > 0.7$ indicates acceptable, $0.7 > \alpha > 0.6$ indicates questionable, $0.6 > \alpha > 0.5$ indicates poor, and $\alpha < 0.5$ indicates unacceptable. Thus based on this rule, the α for all the measurements are acceptable as shown in Figure 5.2.

Table 5.2

Cronbach Alpha Values for All Measurements

Measurement	**Number of Items**	**Cronbach Aplha (α)**
Perceived usefulness	3	0.713
Perceived ease of use	4	0.716
Informativeness	5	0.714
Advertising value	3	0.711
Intention to use	4	0.789

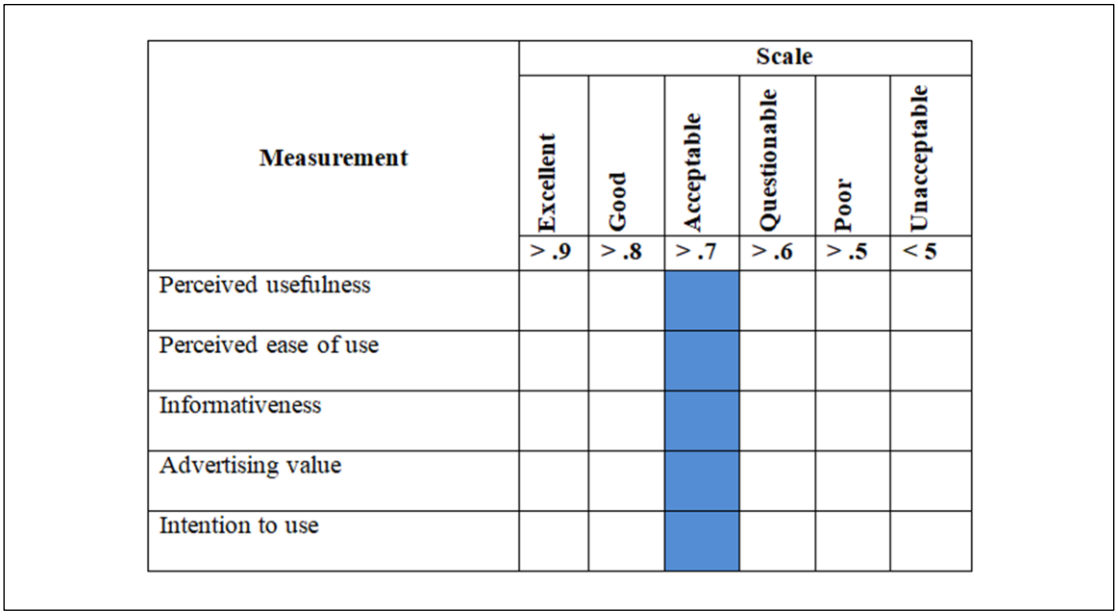


Figure 5.2 Cronbach Alpha Scale for Each Measurement

5.3.3 Descriptive Statistics Analysis

User evaluation is important in obtaining the users' perceptions towards the use of the MARA application. Descriptive statistics was conducted to determine the mean score and the standard deviation for each item of the measurements which include; perceived usefulness, perceived ease of use, informativeness, advertising value and intention to use. The descriptive statistics for all the measurements and items are presented in Table 5.3.

Table 5.3

Descriptive Statistics

Measurements and Items	Mean	SD
Intention to use	**4.62**	
I intend to use MARA when it is implemented.	4.72	0.454
I intend to use MARA on a regular basis.	4.52	0.567
Given the circumstances, I will use MARA.	4.60	0.527
I would strongly recommend my friend to use MARA.	4.65	0.515

Perceived ease of use	**4.71**	
MARA is easy to use.	4.67	0.510
MARA is suitable to use in advertising.	4.68	0.537
MARA is easy to use even when you are alone.	4.72	0.490
Steps in using MARA are easy to remember.	4.77	0.500
Perceived usefulness	**4.83**	
Using MARA can save my time.	4.83	0.376
Overall, I find MARA is useful in searching for product.	4.80	0.480
Using MARA makes it easier to search for product.	4.87	0.343
Informativeness	**4.71**	
MARA provides useful information on product.	4.67	0.510
MARA provides timely information on product.	4.72	0.454
MARA supplies information and service.	4.68	0.469
MARA supplies relevant information on product.	4.73	0.446
MARA provides complete information on product.	4.75	0.474
Advertising value	**4.70**	
MARA is valuable.	4.68	0.504
MARA is useful.	4.70	0.530
MARA is important.	4.73	0.482

The mean scores for all the measurements and items were based on a five-point Likert scale which is an ordinal scale. However, in order to determine the participant's level of agree or disagree with the statement presented, numerical scale is frequently utilised. Numerical scale is the range between positions or numbers. Sugiyono (2010) suggested that the measured position in numerical scale has to be

categorised into two directions with no neutral position. Thus, in calculating the interval of Likert scales, the following equation was applied:

RS= (m-n) / b = (5−1) / 4=1

Table 5.4 illustrates the criteria of analysis for each category by the numerical scales.

Table 5.4

Criteria of Analysis for Each Category by Numerical Scales

Category	**Numerical scale**
Strongly Disagree	1 – 1.99
Disagree	2.0 – 2.99
Agree	3.0 – 3.99
Strongly Agree	4.0 – 5.00

The results of the descriptive statistics analysis indicated that the mean scores for intention to use is 4.62 (strongly agree), perceived ease of use is 4.71 (strongly agree), perceived usefulness is 4.83 (strongly agree), informativeness is 4.71 (strongly agree) and lastly advertising value is 4.70 (strongly agree). The results indicated that the users strongly agreed on all the measurements. Perceived usefulness has the highest mean score of 4.83 while intention to use has the lowest mean score of 4.62. The results of the descriptive statistics analysis help to answer the second research question which is related to the perceptions of the users towards the use of the MARA application.

5.3.4 Correlation Analysis

The Correlation analysis is used to measure and determine the relationship between the independent variables and the dependent variable. The Pearson Correlation Coefficient (*r*) is used to determine the strength and linear relationship between variables and the *r* value is between +1 and -1 (Pallant, 2013). Table 5.5 shows the strength of linear relationship to the correlation coefficient (Davis, 1971). When the value of *r* is 0.70 and above, the correlation among the variables is very strong. When the value of *r* is between 0.50 and 0.69, the correlation is strong. When the value of *r* is between 0.30 and 0.49, the correlation is medium. When the value of *r* is between 0.10 and 0.29, the correlation is weak. Otherwise, when the value of *r* is between 0.01 and 0.09, then the correlation does not exist between the variables.

Table 5.5

Strength of Linear Relationship to the Correlation Coefficient

Correlation Coefficient	Strength of Linear Relationship
0.70 and above	Very strong
0.50-0.69	Strong
0.30-049	Medium
0.10-0.29	Weak
0.01-0.09	Not exist

Table 5.6 shows the *r* values between all the independent variables (Perceived Usefulness (USE), Perceived Ease of Use (EOU), Informativeness (INFO), and Advertising Value (AV)) and the dependent variable (Intention to Use (ITU)). The

results show that all the *r* values for the independent variable; (perceived usefulness, perceived ease of use, informativeness, and advertising value) are positively and significantly correlated to the dependent variable (intention to use). The *r* value for perceived usefulness is .352, perceived ease of use is .662, informativeness is .416, and advertising value is .689. The *r* values for perceived ease of use and advertising value indicated that the linear relationship is strong. While the *r* values for perceived usefulness and informativeness indicated that the linear relationship is medium.

Table 5.6

Pearson Correlation Coefficient Analysis

Variables	**ITU**	**EOU**	**USE**	**INFO**	**AV**
ITU	1				
EOU	.662**	1			
USE	.352**	.633**	1		
INFO	.416**	.207	.093	1	
AV	.689**	.872**	.414**	.149	1

**Correlation is significant at the 0.01 level (1-tailed).

5.3.5 Regression Analysis

Regression is a statistical process in determining the relations between variables and for hypothesis testing. Table 5.7 shows the regression analysis results for this study. The R^2 value is 0.581 which describes the change in the users' intention to use the MARA application. Perceived ease of use, perceived usefulness, informativeness and advertising value are the predictors in this analysis. One-tailed test was utilized in order to verify the hypotheses. As suggested by Cohen (2008), the p-value should be less than 0.05 and the t-value should be greater than 1.645. The regression model is fit for the data since the independent variables significantly predict the dependent

variable F (4, 55) = 19.071. Figure 5.3 shows the snapshots from SPSS regarding the regression analysis.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.762[a]	.581	.551	.27163	.581	19.071	4	55	.000	1.623

a. Predictors: (Constant), ADVValue, Inform, Use, Ease

b. Dependent Variable: Intention

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.628	4	1.407	19.071	.000[b]
	Residual	4.058	55	.074		
	Total	9.686	59			

a. Dependent Variable: Intention

b. Predictors: (Constant), ADVValue, Inform, Use, Ease

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.494	.746		-.662	.511
	Ease	.134	.248	.124	.541	.591
	Use	.036	.153	.029	.235	.815
	Inform	.390	.113	.310	3.452	.001
	ADVValue	.526	.194	.523	2.714	.009

a. Dependent Variable: Intention

Figure 5.3 Snapshot of Regression Analysis From SPSS

Table 5.7

Regression Analysis

Variable	**Beta**	**Std. Error**	**t-value**	**Sig (p-value)**
Ease of use	0.12	0.25	0.541	0.60
Usefulness	0.30	0.15	0.235	0.82
Infomativeness	0.31	0.11	3.452	0.00**
Advertising value	0.52	0.19	2.714	0.00**

**Significance level; p < 0.01

* Significance level; p < 0.05

Dependent Variable: Intention to use

N=60; R Square, 0.581; Adjusted R Square, 0.551; F = (4, 55) 19.071

5.3.6 Hypotheses Testing

Null hypotheses have been prepared in determining the relationships between perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use.

Hypothesis o_1: there is no significant relationship between perceived ease of use and intention to use the MARA application.

Hypothesis o_2: there is no significant relationship between perceived usefulness and intention to use the MARA application.

Hypothesis o_3: there is no significant relationship between informativeness and intention to use the MARA application.

Hypothesis $_{04}$: there is no significant relationship between advertising value and intention to use the MARA application.

Table 5.7 shows the results of the regression analysis which indicates that two of the independent variables namely perceived ease of use and perceived usefulness have no significant relationships with intention to use. While the other two namely informativeness and advertising value have significant relationships with intention to use. Since the significant value for perceived ease of use is 0.60, thus, H_{01} is supported. Perceived ease of use has no significant relationship with intention to use with Beta = 0.12, t = 0.541 and p = 0.60. Since the significant value for perceived usefulness is 0.82, thus H_{02} is also supported. Perceived usefulness has no significant

relationship with intention to use with Beta = 0.30, p = 0.82 and t = 0.235. Since informativeness has significant value of 0.00, thus H_{03} is also not supported. Informativeness has significant relationship with intention to use with Beta = 0.31, p = 0.00 and t = 3.452. Since advertising value has significant value of 0.00, thus H_{04} is also not supported. Advertising value has statistically significant and positive relationship with intention to use with Beta = 0.52, t = 2.714 and p = 0.00. Table 5.8 shows the results of the hypotheses testing. The results of the hypotheses testing answer the third research question which is related to the relationships between the independent variables and the dependent variable.

Table 5.8

Summary of Results of the Hypotheses Testing

Hypotheses	Variable	Results
H_{01}	There is no significant relationship between Perceived ease of use and Intention to use the MARA application.	Null hypothesis is supported
H_{02}	There is no significant relationship between Perceived usefulness and Intention to use the MARA application.	Null hypothesis is supported
H_{03}	There is no significant relationship between Informativeness and Intention to use the MARA application.	Null hypothesis is not supported
H_{04}	There is no significant relationship between Advertising value and Intention to use the MARA application.	Null hypothesis is not supported

5.3.7 Comparison between Previous Findings and Findings of This Study

In this study, the relationships between the independent variables and the dependent variable in using the MARA application were determined. Based on the results, it may be concluded that; perceived ease of use and perceived usefulness are not significantly related to intention to use, while informativeness and advertising value are significantly related to intention to use.

The results from Table 5.8 have shown that there are no significant relationships between perceived ease of use and perceived usefulness with users' intention to use the MARA application for promotion and advertising of the products and services. The results are consistent with studies by Lee, Chung and Jung (2015); Jung, Lee, Chung, and tom Dieck (2018) which indicated that perceived ease of use and perceived usefulness have no positive and significant relationships with intention to use. Meanwhile a study by Wojciechowski and Cellary (2013) also showed that perceived usefulness has no positive and significant relationship with intention to use.

The results from Table 5.8 have also proved that there are significant relationships between informativeness and advertising value with users' intention to use the MARA application for promotion and advertising of the products and services. This is similar with the studies by Richard and Meuli (2013); Madden et al. (1992); Oh and Xu (2003) which indicated that informativeness has positive and significant relationships with intention to use. Meanwhile, studies by Ha, Park, and Lee (2014) showed that advertising value has positive and significant relationships with intention to use. Besides that studies by Kim and Han (2014); Lee, Tsai, and Jih (2006); Tsang, Ho, and Liang (2004); Yang (2007) supported the positive and significant relationship between advertising value and intention to use.

5.4 Summary

The user evaluation is aimed in determining the perceptions of users in using the MARA application as a marketing and promotional tool for the printed media microenterprises. For user evaluation, descriptive statistics analysis was applied whereby the results showed that users highly agreed on all the measurements comprising of perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use. Other statistical analyses were also performed in this study which include; Pearson correlation and regression. The results obtained from the Pearson correlation analysis statistically confirmed that all the *r* values for the independent variable; (perceived usefulness, perceived ease of use, informativeness, and advertising value) are positively and significantly correlated to the dependent variable (intention to use). The results of the regression analysis statistically confirmed that two of the independent variables namely perceived ease of use and perceived usefulness have no significant relationships with intention to use. While the other two namely informativeness and advertising value have significant relationships with intention to use.

CHAPTER SIX
CONCLUSION

6.1 Overview of the Chapter

This chapter concludes the overall findings of this study. It elaborates on the accomplished objectives; the contribution to the body of knowledge, acknowledged limitations and recommendations for future study. The following subsections discuss in detail about the whole study.

6.2 Research Discussion

The goal of this study is to design, develop and examine the impact of MAR to advertising. Then, the MARA application was developed for the printed media microenterprise followed by the process of conducting perception study, Pearson Correlation and regression analyses to evaluate the users' intention to use MARA application for promoting and advertising of products and services as started in Chapter 1 (Introduction). The results from the evaluation can be viewed in chapter 5 (Data Analysis & Result). This study was conducted in order to achieve three objectives as follows:

i) To design and develop the Mobile Augmented Reality Advertising (MARA) for the printed media microenterprise.

ii) To investigate the users' perceptions in terms of perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use of MARA.

iii) To determine the relationships between the independent variables (perceived ease of use, perceived usefulness, informativeness and advertising value) and the dependent variable (intention to use).

In achieving the stated research objectives, three research questions were developed.

i) How the MAR technology be used in the advertising application for the printed media microenterprise?

ii) What are the micro entrepreneurs' perceptions in terms of perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use the Mobile Augmented Reality Advertising (MARA)?

iii) What are the relationships between the independent variables (perceived ease of use, perceived usefulness, informativeness and advertising value) and the dependent variable (intention to use)?

The perception study was carried out to determine the perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use of among users toward the use of MARA application. The results of the correlation analysis indicate the relationships between the independent variables and the dependent variable. Meanwhile, the results of the regression analysis were used for testing the hypotheses. The following subsections discuss more about this study.

6.2.1 Developing the MARA Application

The first objective of this study is to design and develop the Mobile Augmented Reality Advertising (MARA) application for the printed media microenterprise. The development phase of the MARA application was based on the waterfall model which comprises of requirement analysis, design, implementation, testing and maintenance as shown in Figure 6.1. Detail discussions on the design and development of the MARA application are available in subsection 3.3.3 of Chapter 3 and also Chapter 4. The development steps were adapted from previous study. In developing this application, all the steps have to be made one by one and the steps

have to be completed before proceeding to another step based on the Waterfall Model (Bassil, 2012). Designers and developers of MAR application can use this research as guidelines in the design and development of their MAR application.

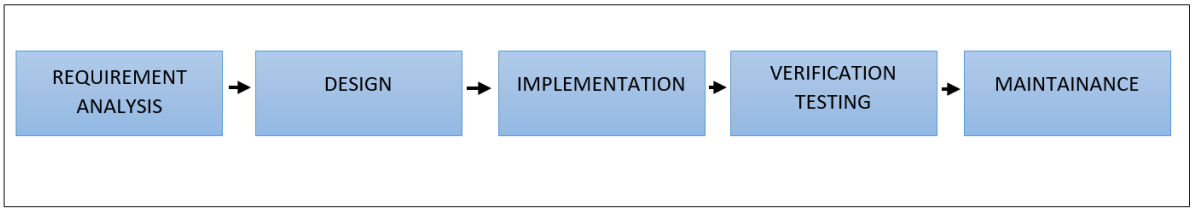


Figure 6.1. Development Phase of the MARA application

6.2.2 MARA Application Evaluation

The evaluation was conducted in order to fulfil the second and third objectives of this study. In this study, three analyses comprising of descriptive statistics, pearson correlation and regression were conducted. The descriptive statistics was used to determine users' perceptions in terms of perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use of MARA application. The results show that the mean scores for intention to use is 4.62 (strongly agree), perceived ease of use is 4.71 (strongly agree), perceived usefulness is 4.83 (strongly agree), informativeness is 4.71 (strongly agree) and lastly advertising value is 4.70 (strongly agree). The users strongly agreed on all the measurements. The measurement with the highest mean score of 4.83 is perceived usefulness and intention to use has the lowest mean score of 4.62.

Next, the pearson correlation was carried out to observe the relationships between the independent variables and the dependent variable. The results of the pearson correlation analysis suggest that all the independent variables (perceived ease of use, perceived usefulness, informativeness and advertising value) are positively correlated

to intention to use with significance level of ($p < 0.01$ and $p < 0.05$). Table 6.1 shows the results of the Pearson correlation analysis.

Table 6.1

The Pearson Correlation Coefficient Analysis

Num	Relationship between Variables	Results
1	Relationship between perceived ease of use and intention to use.	Variable are positively correlated.
2	Relationship between perceived usefulness and intention to use	Variable are positively correlated.
3	Relationship between informativeness and intention to use	Variable are positively correlated.
4	Relationship between advertising value and intention to use.	Variable are positively correlated.

Finally, the regression analysis was used in hypotheses testing whether to accept or reject the null hypotheses. Four null hypotheses were formulated for the hypotheses testing. Based on the results of the regression analysis, two of the null hypotheses were rejected and two were accepted. Meanwhile, the results from the regression analysis show that two variables (informativeness and advertising value) are positively and significantly correlated to intention to use with significance level ($p <$ 0.01 and 0.05). Meanwhile, the other two variables (ease of use and usefulness) are not positively and significantly correlated to intention to use. Table 6.2 shows the summary of results of the hypotheses testing.

Table 6.2

Summary of Results of the Hypotheses Testing

Hypotheses	Variable	Results
H_{01}	There is no significant relationship between perceived ease of use and intention to use in the MARA application.	Null hypothesis is supported
H_{02}	There is no significant relationship between perceived usefulness and intention to use in the MARA application.	Null hypothesis is supported
H_{03}	There is no significant relationship between informativeness and intention to use in the MARA application.	Null hypothesis is not supported
H_{04}	There is no significant relationship between Advertising value and Intention to use the MARA application.	Null hypothesis is not supported

6.3 Research Contributions

This study has provided several contributions to the body of knowledge and the contributions are elaborated as follows.

6.3.1 Contribution to Microenterprise

In most developing countries, microenterprises are important organizations and the backbone of the countries' economy in terms of employment and their contributions

to gross domestic product (Harvie, Narjoko, & Oum, 2009). This is because their performance is closely related to the performance of a country's economic growth (Chitititthaworn et al., 2011). Microenterprises help in creation of jobs, generate income, develop skills and sustaining communities livelihoods (Heeks, 2005; Qureshi, 2005; Kamal & Qureshi, 2009, Chew et al., 2010).

Microenterprises also face many challenges that include; lack of skills, limited resources and credit facilities, low awareness of the potential of the latest technologies, lack of support and their efforts of promotion did not reach the required goal (O'Neill & Viljoen, 2001; Wolcott et al., 2008; Rogerson, 2008; Jakic, 2011; Pharr, & Weinrauch, 2007). These challenges may result in the microenterprises to be unsustainable (Rogerson, 2005; Mitrovic & Bytheway, 2009).

Therefore the development needs to be given special attention especially in terms of advertising and promotion of the microenterprises' products and services. With the introduction of MARA application, microenterprises can use it as an advertising and promotion tool for their products and services since smartphone usage is so widespread nowadays. MARA has been developed for the Android platform by using MAR technology where information on microenterprises' products and services can be presented more comprehensively using text, images and videos interactively compared to the conventional advertising media such as brochures, pamphlets, bunting and banners.

6.3.2 Contribution to Researcher

The Mobile Augmented Reality Advertising (MARA) application for the printed media microenterprise also can be a contribution to the researcher. This application

was developed with reference to research theories and methodology that may be used by other researchers in the future. The underpinning theories and model that have been applied in this study include the Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM) and the Advertising Value Model. The design research methodology that was used in this study was adapted from Kuechler and Vaishnavi (2011) which comprises of five phases namely; problem awareness, design, development, evaluation and documentation. Meanwhile, for the development phase, the SDLC approach which is the waterfall model was applied. The waterfall model comprises of requirement analysis, design, implementation, testing and maintenance.

6.4 Research Limitations

The following section describes the limitations that need to be addressed in this research.

i. The speed of detection of the marker by the smartphone depends on the lighting as well as the quality of the smartphone's camera. Some marker detection will be faster when the environment is properly lighted. However, the marker detection will be slow and take a longer time for detection if the lighting condition is dull. Thus, proper lighting condition is required for effective marker detection
ii. Whenever scanning a marker, the distance between the camera and the marker must be between 20 cm to 30 cm. If the smartphone is positioned at a distance greater than 30 cm, the application symbol will not appear which means that the marker is not detected.
iii. The participants in this study were micro entrepreneurs from the area around Kubang Pasu, Kedah. Although they have mobile devices, only 51.7% have

knowledge of Augmented Reality and only 38.3% have used some form of mobile based Augmented Reality application for advertising. These mean that majority of the participants have no experience with any mobile Augmented Reality for advertising application.

iv. During the evaluation, the participants were given approximately 15 minutes for them to familiarize with the MARA application. Probably the participants should be given longer time (one week) to familiarize with the MARA application since majority of the participants have no experience with any MAR for advertising application. They need to be able to understand the function as well as all the interfaces of the MARA application in order to realize the benefits of this application to them.

v. During the evaluation also, the MARA application has been installed to the participants' mobile devices. Even though all the participants own smartphones, the researcher has no information on the capability of the participants' smartphones to run the MARA application. Since this application utilises MAR technology, it requires quite a powerful smartphone in order to run the application efficiently and smoothly.

6.5 Future Recommendations

The MARA application has been developed for the Android platform and it requires the AR marker (Haza Media brochure) in order for the application to function. There are four markers on the Haza Media brochure which represent Wedding Card, Sticker, Tag and Bunting/banner. In the future, if Haza Media requires further extension of the MARA application such as adding more products or services, the Haza Media brochure can be modified to incorporate the new items. In this study,

five variables namely; perceived usefulness, perceived ease of use, informativeness, advertising value and intention to use have been used to determine the users' perceptions towards the use of the MARA application. Perhaps in the future, other variables can be considered in determining the users' perceptions. In this study, the relationships between the independent variables and the dependent variable were in determined. In future study, different dependent and independent variables can be considered for the MARA application. In this study, descriptive statistics, Pearson correlation and regression were used for the analysis. In future study, a multivariate statistical analysis namely structural equation modelling can be used to analyse a more complex structural relationship.

6.6 Research Summary

The overall goal of this study is to achieve all the proposed objectives as discussed in Chapter 1. According to the main aim of the research, this study has successfully proposed the Mobile Augmented Reality Advertising (MARA) application for the printed media microenterprise. MARA was designed and developed based on selected theories and methodology. The contributions of this study include the utilisation of the MAR technology for promoting and advertising of the microenterprise's products and services and also the development of the MARA application. Furthermore, from the conducted evaluation, the results indicated that the users highly agreed on all the measurements which include perceived ease of use, perceived usefulness, informativeness, advertising value and intention to use. Lastly, it is hoped that the findings of this study will encourage all microenterprises specifically the printed media in Malaysia to be aware of the importance of utilising

the current technology such as the MAR in promoting and advertising of their products and services.

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APPENDIX A
PRELIMINARY STUDY QUESTIONNARES

Pusat Pengajian Teknologi Multimedia Dan Komunikasi
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

Tuan/Puan yang dihormati,

Kaji selidik ini dijalankan untuk mendapatkan maklumat berkaitan dengan promosi produk perniagaan dikalangan Pengusaha Kecil dan Sederhana (PKS). Saya amat berbesar hati sekiranya tuan/puan dapat menjawab **SEMUA** soalan atau mengisi pada ruangan yang disediakan. Segala maklumat yang diberikan hanyalah untuk tujuan akademik semata-mata. Kerjasama tuan/puan amatlah dihargai. Terima kasih

BAHAGIAN A: MAKLUMAT PERIBADI

Jawab soalan berikut dengan menandakan (√) didalam kotak dan juga menulis jawapan diruang yang disediakan.

1. Jantina: ☐ Lelaki ☐ Perempuan
2. Umur: _____ tahun
3. Bangsa: ☐ Melayu ☐ Cina
   ☐ India ☐ Lain-lain
4. Jenis Perniagaan yang dijalankan : _____
5. Tahun terlibat dalam perniagaan : _____ tahun

BAHAGIAN B: MAKLUMAT BERKAITAN PROMOSI PRODUK PERNIAGAAN

Jawab soalan berikut dengan menandakan (√) didalam kotak yang disediakan.

1. Saya berusaha untuk mempromosi produk perniaagan saya.	☐ Ya ☐ Tidak
2. Saya perlu mempromosi produk perniaagan saya supaya dikenali oleh masyarakat.	☐ Ya ☐ Tidak
3. Saya perlu mempromosi produk perniaagan saya untuk berjaya.	☐ Ya ☐ Tidak
4. Saya memperuntukkan sebahagain perbelanjaan untuk tujuan mempromosi produk perniaagan saya.	☐ Ya ☐ Tidak
5. Saya yakin dengan mempromosi produk perniaagan saya, perniaagaan saya akan berkembang maju.	☐ Ya ☐ Tidak

6. Sila tandakan (√) didalam kotak yang disediakan. Saya mempromosikan produk perniagaan saya melalui : ☐ *Radio* ☐ Surat khabar ☐ TV ☐ Internet ☐ Papan Iklan ☐ Pamplet/Brosur ☐ Lain-lain (Nyatakan _____)	
7. Kaedah promosi produk perniagaan yang dilaksanakan memberi maklumat yang lengkap kepada pelanggan.	☐ Ya ☐ Tidak
8. Kaedah promosi produk perniagaan yang dilaksanakan dapat menarik perhatian pelanggan.	☐ Ya ☐ Tidak
9. Kaedah promosi produk perniagaan yang dilaksanakan dapat memberikan gambaran tentang produk perniagaan saya kepada pelanggan.	☐ Ya ☐ Tidak
10. Kaedah promosi produk perniagaan yang dilaksanakan menarik perhatian pelanggan.	☐ Ya ☐ Tidak
11. Sila tandakan (√) didalam kotak yang disediakan. Apakah kesan promosi produk yang dilaksanakan keatas perniagaan anda? ☐ *Tiada perubahan* ☐ Berubah dan perniagaan meningkat sedikit. ☐ Berubah dan perniagaan meningkat banyak.	
12. Saya menghadapi masalah berkaitan promosi produk perniagaan saya. Jika anda menjawab **YA**, teruskan menjawab bahagian berikut.	☐ Ya ☐ Tidak
13. Sila tandakan (√) didalam kotak yang disediakan. Masalah yang anda hadapi berkaitan promosi produk perniagaan. ☐ Kos yang tinggi. ☐ Usaha promosi tidak mencapai matlamat. ☐ *Tidak tahu cara untuk mempromosi perniagaan.* ☐ Sukar untuk mendapat khidmat nasihat berkaitan mempromosi perniagaan. ☐ *Mengambil masa yang lama untuk mempromosi perniagaan.* ☐ Tidak mendapat faedah besar dari usaha mempromosi perniagaan. ☐ Tiada agensi kerajaan yang boleh membantu mempromosi perniagaan. ☐ Lain-lain (Nyatakan _____)	

Kerjasama anda amatlah dihargai
Terima kasih

APPENDIX B

AR EVALUATION QUESTIONIRE

UNIVERSITI UTARA MALAYSIA

KOLEJ SASTERA DAN SAINS

06010 SINTOK KEDAH DARUL AMAN

Tuan/Puan yang dihormati,

Mobile Augmented Reality Advertising For Printed Media

Saya pelajar Universiti Utara Malaysia dan kini sedang mengikuti pengajian Sarjana Sains (Pengajian Multimedia) secara Penyelidikan. Saya sedang menjalalankan satu kajian terhadap keupayaan teknologi Reality Luasan dalam menentukan kecenderungan tingkahlaku untuk menggunakan sesuatu teknologi tersebut (Behavioral Intention to Use) kepada para pengguna terhadap applikasi MARA.

Saya amat berbesar hati sekiranya Tuan/Puan dapat menjawab **SEMUA** soalan atau mengisi pada ruangan yang disediakan. Segala maklumat yang diberikan hanyalah untuk tujuan akademik.
Kerjasama anda dalam menjawab soal-selidik ini sangat dihargai.

Sekian,terima kasih.

Yang benar,
Harwati binti Idris (817092)
MSc. MM Studies (by Research)

BAHAGIAN A

MAKLUMAT PERIBADI

Sila jawab soalan-soalan berikut dengan menandakan **[√]** didalam kotak dan ruangan yang disediakan.

1. Jantina :

   ☐ Lelaki ☐ Perempuan

2. Umur: ☐ Tahun

3. Adakah anda mempunyai telefon pintar?

   ☐ Ya ☐ Tidak

4. Adakah anda mempunyai kemudahan internet dirumah?

   ☐ Ya ☐ Tidak

5. Berapa kerap anda menggunakan Internet?

   ☐ Harian

   ☐ Mingguan

   ☐ Bulanan

   ☐ Tidak Pernah

6. Pernahkah anda mengetahui tentang teknologi Reality Luasan?

   ☐ Ya ☐ Tidak

7. Pernahkah anda menggunakan sebarang aplikasi mudahalih berasaskan teknologi Realiti Luasan dalam pengiklanan?

   ☐ Ya ☐ Tidak

BAHAGIAN B

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

1. NIAT UNTUK MENGGUNAKAN *(Sumber: Chatzoglou, Sarigiannidis, Vraimaki & Diamantidis, 2009).*

Definisi: Sejauh mana seseorang telah merumuskan rancangan sedar untuk melaksanakan atau tidak melaksanakan beberapa tingkah laku masa hadapan yang ditentukan (Davis, 1989).

Sila tandakan pada angka yang sesuai. Contoh: 1 2 3 4 **5**	Sangat Tidak Bersetuju	Tidak Bersetuju	Tidak Pasti	Bersetuju	Sangat Bersetuju
1. Saya bercadang untuk menggunakan MARA apabila ia dilaksanakan.	1	2	3	4	5
2. Saya bercadang untuk menggunakan MARA secara tetap	1	2	3	4	5
3. Memandangkan keadaan ini, MARA akan digunakan.	1	2	3	4	5
4. Saya akan mengesyorkan kepada rakan-rakan saya untuk menggunakan MARA.	1	2	3	4	5

2.KEMUDAHGUNAAN *(Sumber: Venkatesh, Morris, Davis & Davis, 2003).*

Definisi: Sejauh mana seseorang itu percaya bahawa menggunakan sistem akan bebas daripada usaha (Davis, 1989)

Sila tandakan pada angka yang sesuai. Contoh: 1 2 3 4 **5**	Sangat Tidak Bersetuju	Tidak Bersetuju	Tidak Pasti	Bersetuju	Sangat Bersetuju
1. MARA senang digunakan.	1	2	3	4	5
2. MARA sangat sesuai digunakan di dalam pengiklanan.	1	2	3	4	5
3. Teknologi Realiti Luasan senang digunakan secara sendirian.	1	2	3	4	5
4. Langkah-langkah menggunakan MARA adalah mudah diingati.	1	2	3	4	5

3.KEBERGUNAAN *(Sumber: Blackledge & Barrett, 2012).*

Definisi: Sejauh mana seseorang itu percaya bahawa menggunakan sistem tertentu akan meningkatkan prestasi kerja beliau (Davis, 1993)					
Sila tandakan pada angka yang sesuai. Contoh: 1 2 3 **4** 5	Sangat Tidak Bersetuju	Tidak Bersetuju	Tidak Pasti	Bersetuju	Sangat Bersetuju
1. Menggunakan MARA dapat menjimatkan masa saya.	1	2	3	4	5
2. Keseluruhannya, MARA sangat berguna kepada saya.	1	2	3	4	5
3. Aplikasi MARA memudahkan kerja saya.	1	2	3	4	5
4.SIKAP TERHADAP PENGGUNAAN *(Sumber : Ajzen & Fishbein, 1975)* ***Definisi: Kecenderungan pengguna belajar untuk bertindak balas dengan cara baik ke arah pengiklanan mudah alih secara konsisten atau tidak (Ajzen, 1991; Ajzen & Fishbein, 2005; Altuna & Konuk, 2009; Davis, 1989).***					
Sila tandakan pada angka yang Sesuai. Contoh: 1 2 3 4 **5**	Sangat Tidak Bersetuju	Tidak Bersetuju	Tidak Pasti	Bersetuju	Sangat Bersetuju
1. Saya suka idea menggunakan MARA	1	2	3	4	5
2. Saya lebih cenderung untuk menggunakan MARA.	1	2	3	4	5
3. Menggunakan MARA adalah suatu idea yang baik.	1	2	3	4	5
5.BERMAKLUMAT *(Sumber: Robert H. Ducoffe (1995).* ***Definisi: Bermaklumat dapat dijelaskan sebagai keupayaan perniagaan untuk memaklumkan kepada pengguna mengenai produk dan perkhidmatan untuk mencapai kepuasan terbesar pengguna (Gao & Koufaris, 2006; Wong & Tang, 2008).***					
Sila tandakan pada angka yang Sesuai. Contoh: 1 2 3 4 **5**	Sangat Tidak Bersetuju	Tidak Bersetuju	Tidak Pasti	Bersetuju	Sangat Bersetuju

1. MARA mengandungi maklumat yang beguna tentang produk.	1	2	3	4	5
2. MARA mengandungi maklumat yang tepat tentang produk.	1	2	3	4	5
3. MARA mengandungi maklumat berkaitan produk yang mencukupi.	1	2	3	4	5
4. MARA mengandungi maklumat semasa tentang produk.	1	2	3	4	5
5. MARA mengandungi maklumat yang lengkap tentang produk.	1	2	3	4	5
6.NILAI PENGIKLANAN *(Sumber : Ducoffe,1995)* ***Definisi : Pengguna menganggap pengiklanan bernilai (Ducoffe,1995)***					
Sila tandakan pada angka yang Sesuai. Contoh: 1 2 3 4 5	Sangat Tidak Bersetuju	Tidak Bersetuju	Tidak Pasti	Bersetuju	Sangat Bersetuju
1. MARA bernilai	1	2	3	4	5
2. MARA berguna	1	2	3	4	5
3. MARA penting	1	2	3	4	5

***** **Terima Kasih Di Atas Kerjasama Anda*****

APPENDIX C

EXPERT REVIEW 1

Functionality and Interface Evaluation

I hereby certify that the MARA application has been produced by Harwati Idris from the College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of 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.		✓	The background is not suitable for the app.
IN3	The MARA application is easy to use.	✓		
IN4	The color scheme used is appropriate.	✓		
IN5	The display of the screen design is attractive.		✓	The concept of design must be consistent
IN6	The interface is appropriate for this application.	✓		
IN7	The readability of the text suits the target.	✓		
Multimedia (image, video, and text) (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 support meaningfully the information provided.	✓		
MM5	The quality of multimedia elements used is good.			Some of the video/images are blurry (resolution issue) esp. logo
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.	✓		back button must be placed at the image view page.
IV3	The help functions provided is useful.	✓		

Name:

Position: DR. SITI SALMI BT JAMALI
Penyelaras
Pusat Pengajian Pengurusan Industri Kreatif
dan Seni Persembahan
Universiti Utara Malaysia

APPENDIX D

EXPERT REVIEW 2

Functionality and Interface Evaluation

I hereby certify that the MARA application has been produced by Harwati Idris from the College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of 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 MARA application is easy to use.	✓		
IN4	The color scheme used is appropriate.	✓		
IN5	The display of the screen design is attractive.		✓	
IN6	The interface is appropriate for this application.		✓	
IN7	The readability of the text suits the target.		✓	text on image not clear
Multimedia (image, video, and text) (MM)		Pick one		Comment
		Yes	No	
MM1	Each multimedia elements used serves a clear purpose.		✓	video not helping at all images should be able to zoom in zoom out
MM2	Usage of multimedia elements is suitable with the content.		✓	video not suitable
MM3	The presentation of multimedia elements is well managed.		✓	
MM4	The use of multimedia elements support 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 help functions provided is useful.		✓	not helping

Name: ASMIDAH BINTI ALWI

Position: Lecturer
School of Creative Industry Management and Performing Arts
UUM College of Arts and Sciences
Universiti Utara Malaysia

APPENDIX E

EXPERT REVIEW 3

EVALUATION BY CONTENT EXPERT

I, hereby certify that the **MARA Application** has been produced by **Harwati Binti Idris** from the College of Arts and Sciences, Universiti Utara Malaysia. It has been checked by me in terms of the validity of the contents and the general comments are as follows:

General Comments:

I am the owner of Haza Media, I tried The MARA Apps and was satisfied with the content. The information was good and suitable for advertise. This Apps help Haza Media customers to understand and interested with the product. The image, text and the video are interesting and valuable to customer because customer will clearly understand about the product. Lastly, I wish to apply this apps to improve my product marketing. Thank you.

Name: HAZA MEDIA (SA0323268-D)
Position:
Address: JALAN SOPHEA 4, TAMAN TUNKU SARINA 2, 08000 JITRA, KEDAH
Emel: hazamedia@gmail.com
Tel: 013-2826739