

# MARA: A Mobile Augmented Reality Approach to Advertising for Printed Media Microenterprise

Harwatibinti Idris, Abdul Nasir Zulkifli, Mohd Fitri Yusoff

**Abstract:** Most printed media microenterprises in Malaysia used several typical advertising tools such as banners and streamers to disseminate information about their products and services. However, these have some limitations since the information consisting only of text and images, non-interactive and only attract attention of those passersby only. This paper introduces Mobile Augmented Reality for advertising (MARA) application, an alternative advertising tool for the printed media microenterprise. An evaluation among a sample of 60 mobile users on the use of the MARA app has been conducted. The results of the evaluation indicated that the users strongly agreed on perceived ease of use, perceived usefulness, in formativeness, advertising value and intention to use of the application. These indicate that the MARA application has the potential to be an alternative advertising tool for the printed media microenterprises.

**Keywords:** Printed Media; Microenterprise; Mobile Augmented Reality; Advertising; User Evaluation

## I. INTRODUCTION

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 [1, 2]. In addition, microenterprises also provide more affordable goods and services to the community as their prices are usually lower and affordable [3]. In Malaysia, according to Bank Negara Malaysia [4], microenterprise is a business entity with annual sales turnover of less than RM250,000 or full-time employees of less than 5 for manufacturing or agro-based industry or annual sales turnover of less than RM200,000 or full-time employees of less than 5 for others. The main obstacle for microenterprises to start and grow their product business is in terms of financing and budget [5, 6]. They also face other problems that include lack of skill and their efforts of promotion did not reach the required goal [7, 8].

Traditional advertising channels such as television and magazines require high cost [9]. This becomes a constraint to microenterprises that are facing problems in terms of the financial aspect to allocate a lot of money for advertising and promotional activities for their products.

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Print media advertising such as magazines and newspapers also offer advertising space that is equivalent to the price. Most microenterprises could not afford to promote their products this way. Meanwhile, the use of banners and streamers for advertising is also less effective, since they only attract attention of those passersby only. Thus, microenterprises require an alternative approach of advertising which is affordable, effective and trendy.

Nowadays, the use of mobile technology has become one of the important elements in our daily lives. People use smartphone as part of their lifestyle, especially those related to advertising. This technology can expand their advertising activities in addition to communicating with each other. Augmented Reality (AR) is an alternative technology that can be used 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 [10]. This paper introduces Mobile Augmented Reality Advertising (MARA) app, a new approach to advertising through the use of the Mobile Augmented Reality (MAR) technology for the printed media microenterprise.

This paper is structured as follows. In section 2, we discuss the literature review on Augmented Reality, Mobile Augmented Reality and Technology Acceptance Model. In Section 3, we describe briefly on the Mobile Augmented Reality Advertising (MARA) App. In section 4, we present the method, section 5 the results and finally, the conclusion is established in Section 6.

## II. LITERATURE REVIEW

In this section, we elaborate some of the important topics of past literatures that are related to this study. Therefore, the literature review section discusses about Augmented reality (AR), Mobile Augmented Reality (MAR), and Technology Acceptance Model (TAM).

### Augmented Reality (AR)

AR 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 [11]. AR is defined as a view of a physical, real-world environment whose elements are integrated with computer-generated sensory input [12]. Furthermore, Azuma [13] states that 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 [14, 15]. This augmented environment is the direct superimposition of physical objects and computer-reproduced objects. Besides, AR can also be explained through the Milgram’s Reality-Virtually Continuum [16] where the interface at one end provides completely real environment, AR exists in between where the virtual environment is added to the real environment. In order to view both environments, the user has to use some form of device to see the virtual environment that is being overlaid onto the real environment such as smartphone, computer, Head Mounted Display (HMD) and shutter glass.

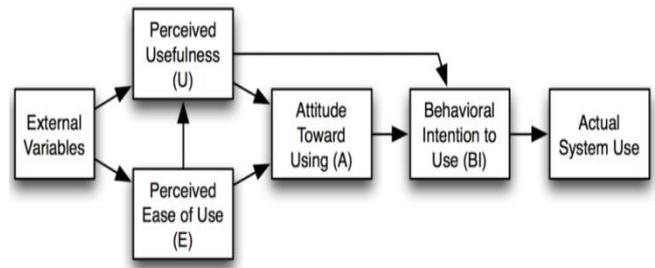
**Mobile Augmented Reality (MAR)**

MAR inherits all the features of AR with the addition that the augmented view is being displayed on mobile devices [17]. MAR uses the features of the mobile devices that include; camera, screen, GPS, accelerometer, compass, image processing, pattern recognition and internet access which enable the interaction between the system and the user [18]. MAR allows the users to interact with the augmented environment without distraction so that they are in focus and freely engage with the environment. Basically MAR can be classified into two main categories; firstly, vision-based MAR that uses the image analysis as a marker or marker less to overlay the content and secondly, that uses several types of sensors to decide what type of content to overlay and where to display it [19].

Several studies on the utilization of AR has been conducted and that include the use of AR for the promotion of higher learning institution [20], enhancing hearing impaired museum visitors’ engagement [21], and AR for enhanced science textbook [22, 23, 24].

**Technology Acceptance Model (TAM)**

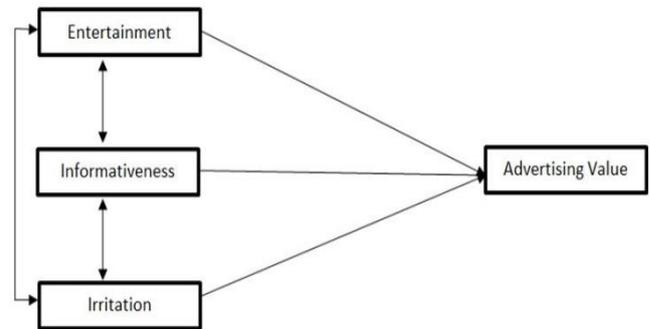
TAM is one of the most widely used models in the evaluation process developed by Davis [25]. TAM is about the person’s acceptance of intention to use a particular technology. According to [26], TAM has a great success in evaluating applications related to information technology. The model is simple and easy to be applied in an evaluation phase [25]. Intention is determined by the person’s attitude towards the use of that technology and the perception regarding its usefulness. Fig. 1 shows the Technology Acceptance Model. Perceived Usefulness (PU) is defined as the prospective user’s subjective probability that using a specific application system will increase his or her job performance [27]. Perceived Ease of Use (PEU) is defined as the degree to which the user expects the target system to be free of efforts [27]. PU is influenced by the PEU. In this study, TAM was used to evaluate the acceptance of the Mobile Augmented Reality Advertising (MARA) App. The following section discusses on the development of the Mobile Augmented Reality in Advertising (MARA) for Printed Media.



**Fig. 1 Technology Acceptance Model [25]**

**Advertising Value Model**

The Advertising Value Model was developed by [36, 37]. According to [36, 37], the advertising value can be explained as consumers’ subjective assessment about the significance or usefulness of the advertisement, entertainment, informativeness and irritation. Fig. 2 shows the advertising value model.[36] proposed this model to measure the perception of consumers about the relative worth or utility of advertising.



**Fig. 2 Advertising Value Model [36, 37]**

**III. MOBILE AUGMENTED REALITY ADVERTISING (MARA) APP**

The Mobile Augmented Reality Advertising (MARA) app has been specifically developed for the printed media microenterprises to help in the promotion of their products and services. MARA has been developed using Unity 3D and Vuforia and it was specifically developed for Android smartphones. MARA is aimed in providing interactive information beyond that of conventional advertising such as brochures, banners and streamers. Through the use of MARA as an advertising app, users will be able to access a more comprehensive as well as interactive information. Idris et al. [28] elaborate on the design and development of the MARA app. The MARA app has been developed for Haza Media, a printed media microenterprise that has been specially selected for this study.

**The MARA Marker**

The MARA marker is a two-sided A4-sized brochure containing information pertaining to the products and services that are provided by Haza Media.

Fig. 3 shows the front and back pages of the MARA marker. The purpose of the marker is to trigger the virtual contents of the MARA app. Altogether there are four colored images that have been used on the front page and they are assigned for Wedding card, Sticker, Tag and Bunting/Banner. Meanwhile the opposite page shows the services and contact information of Haza Media.



Fig. 3 Front and back pages of MARA marker

### The MARA app

The main interface of the MARA app consists of three buttons as shown in Fig. 4. The buttons are; Scan, Help and Booking. The Scan button enables the app to scan any four of the colored images on the marker. When an image is scanned, the virtual content that is attached to it appears on the mobile screen.



Fig. 4 The main interface of the MARA app

When the wedding card image is scanned, the virtual content consists of a collection of images of various wedding cards, price list, sample of testimonies and videos of the wedding cards as shown in Fig. 5. The user can browse all of these by selecting, 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.



Fig. 5 Information pertaining to wedding card

The purpose of the Help button is to provide guidance for first-time users of the MARA app. Once it is scanned, the first screen will display the list of images that are used as markers for this app. The following screens show the steps in using the MARA app. Finally, the Booking button provides the user with information of Haza Media as shown in Fig. 6.



Fig. 6 Information of Haza Media

The following sections elaborate on the evaluation of the MARA app that was carried out among a sample of mobile users. Descriptive statistics analysis was employed to determine the users' perceptions when using the MARA app in terms of perceived ease of use, perceived usefulness, in formativeness, advertising value and intention to use.

IV. METHOD

Research Model

The aim of MARA is to provide interactive information beyond that of conventional advertising such as brochures, banners and streamers. Thus, this study was conducted to evaluate the users' perceptions toward the use of the MARA app in terms of perceived ease of use, perceived usefulness, in formativeness, advertising value and intention to use. The research model for this study is shown in Fig. 7.



Fig. 7 Research model

Sample

The sample for this evaluation were mobile users and they were between the ages of 19 to 39 years old and categorized as youngsters based on Erikson's stages of psychosocial development [29]. For the sample size, a sample of 30 fulfills the minimum number requirement as suggested by Coakes and Steed [30]. The sample was selected using the convenience sampling, a technique of selecting the participants from the population based on accessibility and ease of selection [31].

Instrument

A set of questionnaires has been used as an instrument for the evaluation. The instrument consists of several measurements taken from previous validated instruments and adapted for this study. The measurements include; perceived ease of use, perceived usefulness, in formativeness, advertising value and intention to use. Perceived ease of use is the degree to which a person believes that using a system would be free of effort [25]. Perceived ease of use also refers to the system whether it is easier to be used, save energy and has the intention to be used repeatedly [32]. Perceived usefulness is the degree to which the user believes that using the technology will improve his/her performance [25]. Intention to use is the degree to which a person has formulated conscious plans to perform or not to perform some specified future behaviors [25, 33]. Meanwhile in formativeness is the ability of business to inform consumers about products and services to achieve greatest possible satisfaction [34, 35]. Lastly, advertising value is a subjective evaluation of the relative worth or utility advertising to consumers [36]. Informativeness and advertising value originate from the Advertising Value Model [36]. The instrument for the evaluation consists of two sections namely; User's demographic

data and Users's Perception towards the use of the mobile Augmented Reality Advertising (MARA) app. A 5-point Likert scale anchored by Strongly Disagree (1) and Strongly Agree (5) was used.

Procedure

Prior to the evaluation, the participants were given a brief explanation pertaining to the functions and interfaces of the MARA app. They were given approximately 15 minutes to use and be familiar with the app. A set of questionnaires was handed to each of the participants in order to evaluate the MARA app.

V. RESULTS

Demographic characteristic

The user evaluation was conducted among 60 participants whereby 30 of them were male and 30 were female. The participants' ages were between 19 to 39 years old and they were categorized as youngsters. All of the participants have their own smartphones.

Reliability Analysis

Reliability analysis was conducted to ensure the consistency or stability of the items [38]. The reliability of questionnaires is the ability to produce the same results when filled out by the same-minded people in the same condition and usually expressed in numerical scale from zero (very unreliable) to one (extremely reliable) [39]. Reliability was examined using Cronbach alpha ( $\alpha$ ) and the Cronbach alpha scores for all the measurements were calculated using the SPSS version 22.0. Table 1 shows the Cronbach alpha scores for all the measurements whereby intention to use has a Cronbach alpha of 0.789, perceived ease of use has a score of 0.716, perceived usefulness has a score 0.713, in formativeness has a Cronbach alpha of 0.714 and lastly advertising value has a Cronbach alpha of 0.711. Since all the measurements have Cronbach alpha values of greater than 0.7, then all the measurements are reliable [40].

Table. 1 Cronbach Alpha Scores for All Measurements

Measurement	Number of Items	Cronbach Alpha $\alpha$
Intention to use	4	0.789
Perceived ease of use	4	0.716
Perceived usefulness	3	0.713
In formativeness	5	0.714
Advertising value	3	0.711

Descriptive Statistics Analysis

User evaluation is important in obtaining the users' perceptions towards the use of the MARA app. Descriptive statistics was conducted to determine the mean score and the standard deviation for each item using SPSS version 22.0. The descriptive statistics for all the measurements and items are presented in Table 2.



**Table. 2 Descriptive Statistics**

Measurements and Items	Mean	SD
<b>Intention to use</b>	<b>4.62</b>	
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
<b>Perceived ease of use</b>	<b>4.71</b>	
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
<b>Perceived usefulness</b>	<b>4.83</b>	
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
<b>In formativeness</b>	<b>4.71</b>	
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
<b>Advertising value</b>	<b>4.70</b>	
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 five-point Likert scale. However, in order to determine the participant's level of agreement or disagreement with the statement presented, numerical scales are frequently used. Numerical scale is based on measuring the distance between numbers of positions. In numerical scale, the position to be measured has to be classified into two directional categories (strongly disagree, disagree, strongly agree and agree) without neutral position [41]. Thus, Sugiyono equation [41] was used to calculate the interval range of Likert scales by performing the mathematical equation as follows:

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

RS = Score range

m = highest score on scale

n = lowest score on scale

b = number of classification

$$RS = (5 - 1) / 4 = 1$$

Table 3 illustrates the criteria of analysis for each category by the numerical scales.

**Table. 3 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), in formativeness 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.

## VI. CONCLUSION

This paper has looked into the possibility of introducing the mobile Augmented Reality Advertising app to be used as a marketing and promotional tool for the printed media microenterprises in Malaysia. Along with the advancement of today's mobile technology, the users require app that is straight forward, easy to use, interactive, trendy and easily available anywhere and anytime. MARA app is an application that can provide users with comprehensive information related to products and services that cannot be acquired through traditional advertising. This paper started with brief explanation on the issues faced by the microenterprises regarding to the marketing and promotion of their products and services. Then it proceeds with the literature review pertaining to Augmented Reality, Mobile Augmented Reality and Technology Acceptance Model. This paper also elaborates on the Mobile Augmented Reality Advertising (MARA) App, the method and results of the user evaluation. The main objective of the user evaluation is to determine the users' perceptions towards the use of the MARA app as a marketing and promotional tool for the printed media microenterprise. The results of the user evaluation indicated that the users strongly agreed on all the measurements which include perceived ease of use, perceived usefulness, in formativeness and advertising value. The findings of this study are expected to encourage the printed media microenterprises in Malaysia to utilize the Mobile Augmented Reality app in promoting and marketing of their products and services.

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