

How to Forecast Behavioral Effects on Mobile Advertising in the Smart Environment using the Technology Acceptance Model and Web Advertising Effect Model

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Abstract

This paper proposes and then verifies a model that can be used to forecast the effects of behavior on mobile advertising based on the Technology Acceptance Model (TAM) and Web Advertising Effect. The objective of this research is to probe the relationship between the cause and effect of the entertainment, informativeness, usefulness, capacity to accommodate smart-environment technologies, Hedonic Adaptation Model (HAM), etc. that mobile advertisements provide, as well as the attitudes toward advertisements in general. In order to accomplish this goal, the research was verified using Structural Equation Modeling (SEM), and the results are as follows. First, the informativeness of mobile advertising has a positive effect on the recognized ease of use. Second, the entertainment and informativeness of mobile advertising has positive effects on the recognized usefulness. Third, the recognized ease of use has a positive effect on the recognized usefulness. Fourth, the informativeness of mobile advertising causes a positive effect on smart-environment technologies. Fifth, the entertainment and informativeness of mobile advertising cause positive effects on the HAM. Sixth, smart-environment technologies cause positive effects on the HAM. Seventh, the recognized usefulness causes a positive effect on the value of mobile advertising and the intention of use. Eighth, the HAM has a positive effect on the value of mobile advertising and the general attitudes toward it. Ninth, the value of mobile advertising has a positive effect on the attitudes toward advertising. Tenth, the attitudes toward mobile advertising have a positive effect on the intention of use.

Keywords: Smart device, technology acceptance model, smart device environment technologies, hedonic adaptation model.

1. Introduction

Along with recent developments in information and communication technology, social network services (SNS), such as blogs, Twitter, Instagram, and Facebook, have begun to exert a significant influence in the modern world. This is because new information and communications technologies enable users to be continuously connected to the network, and this new reality is effecting significant changes in user behavior because the production and consumption of information can now take place simultaneously [1, 2].

The most powerful feature of SNS is that they enable real-time bidirectional communications to take place. In other words, SNS enable restless interaction between individuals through the internet regardless of their time and location. These changes have not only affected human life and culture, but have also connected human societies in ways that are very much like the nervous system in the brain, and have thereby accelerated changes in the conventional industrial system. This is possibly due to the properties of bidirectional communications, such as speed, variety, expandability, and integrity. Therefore, in the present rapidly changing digital environment, a very important issue that is being raised in the advertising industry is to be able to provide differentiated value by presenting more interesting and beneficial functions [3]. Hence, whereas traditional advertisements put an emphasis on paid media (media where advertising time must be purchased, such as TV, radio, newspapers, magazines, and internet advertisements) and owned media (media self-owned by companies, such as stores and homepages), the present advertising industry emphasizes the management of earned media (media spreading brand reputation through word-of-mouth or articles on SNS).

According to [4], the amount spent on advertisements in Korea was 11.2 trillion KRW in 2015, which was approximately 4% more than the amount spent in 2014 (10.7 trillion KRW). In 2015, the size of the advertisement market in Korea was about \$8.65 billion [5], a year-over-year increase of approximately 3.3%. Notably, the size of the mobile advertisement market in Korea was only 1.1 trillion KRW, which is only 9.6% of the total advertisement cost, although this was approximately 126% larger than the size of the mobile advertising market in 2013 (0.5 trillion KRW) [4]. More importantly, according to [6], the digital advertisement cost globally increased by 71.2% in 2015 (\$121.5 billion) in comparison with that of 2013 (\$170.5 billion), and will increase further by about 67.7% by 2018, reaching \$252.0 billion. These numbers verify that the percentage of the advertising market that is focused on smart media advertisements, which include internet and mobile advertisements, is increasing rapidly.

Generally, the purpose of advertisements is to create and intensify a brand through interactions between consumers and advertisers. As mentioned above, due to the development of new information and communications technologies, the adoption of devices such as smart phones, tablet PCs, and smart bands have contributed to the development of a new SNS culture through the internet. These changes in the modern environment have enabled interaction between anyone without regard to time and place, and have significantly affected the advertising industry. Therefore, the purpose of the study described in this paper was to consider the recent changes in mobile advertisements that are closely related to our daily life, and then to develop and provide a creative framework for a comprehensive and systematic understanding of the mobile advertising that is presented in the smart device environment. This article examines the effect of smart device environment technologies and entertainment variables, such as hedonic information, on mobile advertising on the basis of an IT acceptance

theory and a web advertisement effect model. Through this examination, the relationship with utility, which has been regarded as having an absolute influence on technology acceptance attitude and intention, was investigated.

2. Literature Review and Hypotheses

2.1 Properties of Mobile Advertising in Smart-Device-Environment

In earlier times, advertisements were presented to a non-specific audience through TV, radio, newspapers, and magazines. However, in the modern age, digital nomads are able to view advertisements anytime and anywhere on a myriad of devices. In particular, smart phones have expanded to provide mobility, ubiquity, personal identity, and location, and have enabled real-time inquiry and search for information [7]. In the same way, mobile advertising has evolved to allow customization, location-based services, and interactivity [8]. Therefore, the advent of smart media has enabled mobile advertising to offer a level of interaction that was previously impossible in conventional advertising, and has improved the efficiency of managing customers on the basis of customer information [9]. Additionally, mobile advertising facilitates the ability to both assess immediate reactions from users and to present one-to-one targeted advertisements through story-telling (content delivery), something that was not available to the early advertising industry [3]. The types of mobile advertisements in use include augmented-reality (AR), location-based (LB), QR-code, SNS-connected, branded-application, and social-commerce.

Some of the factors that are used to evaluate the acceptance attitudes toward, and the effects of, mobile advertising include the concepts of entertainment and informativeness. Entertainment refers to the ability to fulfill (by means of an advertisement) the aesthetic and emotional desires of the customer, such as the desire for comfort and happiness [10]. Advertising that is perceived as 'fun' is able to change the attitudes of consumers in order to form positive emotions based on the impression and brand of the product [11]. In addition, the purpose of entertainment is to portray fun and happiness in order to catch the eye of the viewer, and thereby create a positive effect relative to the impression of the product or brand [12, 13]. Above all, the importance of the entertainment in mobile advertising is emphasized because it gives added value to the product through various multimedia functions [14]. The entertainment is a very critical component of the content and function of an advertisement. Therefore, fresh and fun advertising is required more than anything else in order to produce the desired advertising effect. The assessment of the entertainment is an essential prerequisite in the evaluation of an advertisement, in the sense that the inclusion of entertainment more opportunities for consumers to engage with the advertisement [15]. Another representative function of an advertisement is informativeness, because one of the original properties of advertising is to provide accurate, objective, and new information [2, 14]. In addition, the success of an advertisement is dependent upon how many objective and accurate informative clues are provided for consumers in order to enable them to make a wise decision [16]. Informativeness is one of the most important prerequisites of advertising because it is able to change the recognition, attitude, satisfaction, and effect of an advertisement by providing users with information about a specific product or service [2, 17]. An accurate description of a product is a critical factor in the recognition of the value of the advertisement by the consumer [18]. In contemporary society with the rapid development of information technology, people are regularly presented with a variety of information delivered through various media. In this situation, the success of an advertisement is very dependent on the informativeness of the

advertisement, and whether it is able to build public confidence as a result. For these reasons, informativeness is an essential prerequisite in the evaluation of an advertisement, along with entertainment.

Entertainment and informativeness have been proven to be essential prerequisites not only for current mobile advertisements, but also in past studies of traditional advertisements [19, 20]. The authors of [21] proposed the single concept of 'infotainment' by merging entertainment and informativeness. Since most users access SNS for reasons of entertainment and information, the entertainment and informativeness of an advertisement were classified as advertisement content factors in the predictive model for consumer reaction proposed in [22, 23]. Therefore, in the present study, entertainment and informativeness were selected as key leading variables.

2.2 Information Technology Acceptance Model (TAM Model)

In modern society, novel technologies are continually being developed and introduced. However, such technologies are meaningless unless there is also the will to introduce and accept them. Moreover, if a person living in a modern society does not accept a new information technology or system, that person will fall behind other people. Therefore, the introduction and acceptance of a new information technology or system is a critical factor that may decide its success or failure [24]. A representative study in this regard is the technology acceptance model (TAM).

The TAM, as proposed in [25] to explain the process of adoption of information technology by individuals, is a theory that explains the factors in information-technology acceptance and the actual utilization by users on the basis of the Theory of Reasoned Action (TRA) proposed by [26]. Therefore, just like the TRA, the TAM explains that user behavior is determined by behavioral intention, which in turn is determined by user attitudes. However, the TAM eliminated the subjective norm from the TRA factors and explained the acceptance of information technology by using belief variables, such as the perceived usefulness and perceived ease of use. This is because the subjective norm is generally difficult to understand, and the direct effect of the subjective norm and the objective effect of attitude on behavioral intention are rarely separated [25].

The perceived usefulness refers to a subjective judgment of a person regarding the possibility of acquiring an expected result or product, or on enhancing job performance by using information technology [27]. The authors of [28] defined the perceived usefulness as a belief held by a consumer about the integration of his or her daily activities with mobile services. Hence, the perceived usefulness may be defined as an external motivating factor for a specific application. The perceived ease of use, in contrast, refers to the degree to which a person believes that using a particular technology will be free from effort [29]. The authors of [31] defined the perceived ease of use as the degree to which a person believes that using a particular system is convenient. Thus, the perceived ease of use may be defined as the degree of perception about how free from effort a user may be when using a particular information technology. These two factors are critical to the attitude toward the utilization of information technology.

2.3 Smart Device Environment Technologies

Smart phones are intelligent terminals that have functions similar to those of personal computers, and have more advanced abilities than conventional feature phones. While conventional advertisements delivered to feature phones were originally provided via text

messages and pictures, mobile advertising now delivers advertising messages through the wireless internet that include music, graphics, sound, and text, which are intended to convey the message to consumers or to provoke a reaction from consumers [32]. In early studies on mobile advertising, the effect of mobile advertisements was explained on the basis of the Web Advertising Model (WAM) proposed in [10], which was based on the idea that mobile advertising is similar to web advertising. In previous studies, various analyses have been performed to measure the advertising effect of mobile advertisements by using the TAM model and the WAM theory [2, 3]. However, the perceived ease of use suggested in the TAM model and Ducoffe's WAM model had limitations in terms of measuring the effect of mobile advertising. Consequently, in the present study, an alternative inventory is proposed.

As mentioned above, the recent development of smart phones has enabled many people to obtain real-time information. Learning and using a novel information technology through smart phones is a form of innovation [33], and the level of innovativeness is dependent on the innovativeness that a person possesses [34]. In other words, the purpose and intention of using a smart phone may be dependent on the ability of a user to utilize the newest devices. Hence, the concept used in the present study—Smart Device Environment Technologies (SDET)—may be defined as the degree to which a person believes that interacting with a particular advertisement based on the smart device environment technology would be free from effort [3]. Thus, in order to evaluate the potential of a mobile advertisement, it is very important to understand how people accept and adopt a novel technology. In the present study, the effect of a mobile advertisement was measured by using a variant of SDET, which is an advanced concept originating from the perceived ease of use of the TAM model.

2.4 Hedonic Adaptation Model (HAM)

The effect of practical properties on technology acceptance has already been investigated through the TAM in many previous studies [29, 30]. In particular, as individual-centered devices, such as smart phones, are introduced, studies have been conducted from various points of view by using various factors that may affect an intention of utilization by the user, including their happiness, entertainment, and playfulness [31]. To explain the effect of mobile advertising, WAM was suggested in [10] and formed the basis of various analyses that have been performed. In particular, some studies were conducted by dividing the input variables of a mobile advertisement into hedonic variables and utilitarian variables in order to provide a framework for understanding the effect of mobile advertising [36, 41, 42]. However, these studies were conducted with respect to mobile advertising in the general feature phone environment and not in the smart device environment.

Previous studies pointed out that various other studies may need to be conducted on mobile advertising in the smart device environment. Such advertising can rapidly and accurately deliver messages about a specific product or service while providing hedonic functions through the entertainment-content functions that were not available in conventional feature phones [3, 32, 34, 35]. Although only a few studies have been conducted on the hedonic characteristics, they are considered to be very important in mobile advertising. This is based on the fact that previous studies were conducted by combining theoretically similar hedonic characteristics—such as 'fun', 'exciting', 'delightful', 'thrilling', and 'enjoyable'—with the TAM theory in order to explain the entertainment construct that an advertisement provides. In addition, a hedonic characteristic is a factor that may represent the perceived usefulness in the smart device environment, referring to an overall component that enables recognition of the perceived usefulness of an individual in constructing personalized fitness [3]. In this aspect, a hedonic characteristic is highly related to the usefulness of an advertisement, and may be

considered as an extended concept of the perceived usefulness of the TAM, or as an optimum explanatory variable.

2.5 Hypothesis and Research Model

The authors of [3] investigated the effects of the entertainment and informativeness of mobile advertising in Davis's TAM and in the model in which the hedonic characteristics and smart TAM were combined, and then examined the difference of the effects in the two models. The study by [3] was limited because the interactions between the TAM and the hedonic-smart TAM model were not considered. Therefore, on the basis of the research model proposed in [3], the following hypotheses and research model were established for the present study. The research model is shown schematically in Fig 1.

H1. Entertainment and informativeness of mobile advertising have a positive effect on the perceived ease of use.

H2. Entertainment and informativeness of mobile advertising have a positive effect on the perceived usefulness.

H3. Perceived ease of use has a positive effect on the perceived usefulness.

H4. Entertainment and informativeness of mobile advertising have a positive effect on the SDET.

H5. Entertainment and informativeness of mobile advertising have a positive effect on the HAM.

H6. SDET has a positive effect on HAM.

H7. Perceived usefulness has a positive effect on the value of mobile advertising, the attitude toward mobile advertising, and the intention to use mobile advertising.

H8. HAM has a positive effect on the value of mobile advertising, the attitude toward mobile advertising, and the intention to use mobile advertising.

H9. The value of mobile advertising has a positive effect on the attitude toward mobile advertising.

H10. The attitude toward mobile advertising has a positive effect on the intention to use mobile advertising.

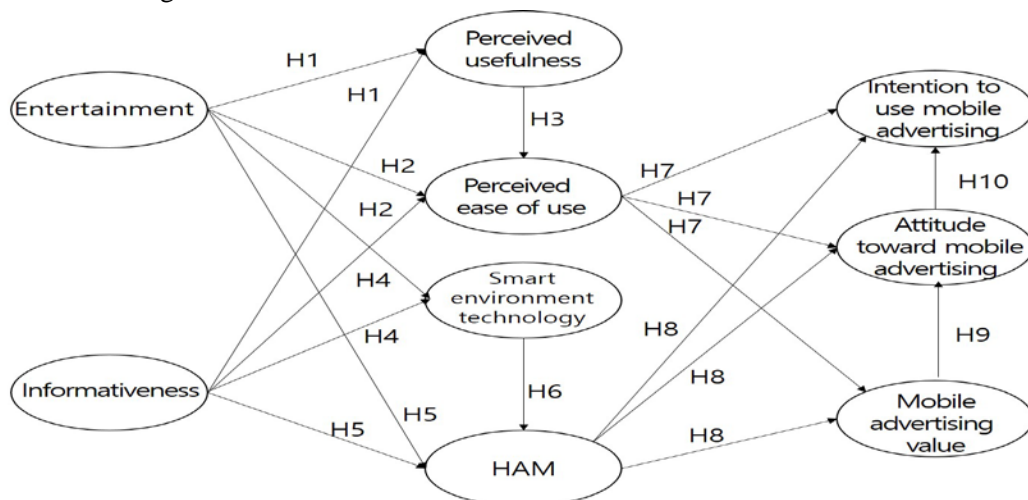


Fig. 1. Research Model

3. Research Methodology

3.1 Operational Definition of Variables

The entertainment was defined to be the degree of fun and happiness acquired from mobile advertising [10]. Also, the entertainment means the degree of perception that the specific behavior itself is regarded as interesting [46]. In this regard, the entertainment was defined as 'the degree of interest that an individual feels by experiencing advertising in the smart phone environment'. Informativeness was defined as 'the degree of information that an individual senses by experiencing advertising in the smartphone environment' on the basis of the definitions in [19]. This informativeness can be one of the most fundamental attributes that every advertisement has. The reason is that the ability to describe products in detail and to deliver the necessary information are a crucial clue in sensing the value of advertising among consumers [18, 19].

The perceived ease of use was defined as the degree to which a person believes that using a smart-phone-environment advertisement would be free from effort, on the basis of the definitions by [51]. Perceived ease of use was defined to include such elements as ease of understanding, ease of learning, convenience, and ease of connection. Perceived usefulness was defined as the degree to which a person believes that the personal and social benefits obtained from smart-phone-environment advertising enhance his or her job performance. Perceived usefulness was defined to include such elements as variety, usefulness, efficient job handling, and convenience provisions.

To measure the effects of advertising in the smart device environment, this work used the technologies in the smart device environment as an advanced concept of recognized ease. Whereas recognized ease means 'a degree of effortlessness in using advertising', the technologies in the smart device environment are defined as 'a degree of effortlessness in using advertising connected with the technologies of the smart device environment'. Smart Device Environment Technologies consist of AR, LB, Real-time, and SNS.

In this work, the HAM was found to include the precursory factors that best explain mobile advertising in the smart environment. The HAM is a construct that can comprehensively explain the characteristics of the smart environment that reflect personalized fitness, scenario, user pattern, interactiveness, the technology of recognizing an advertising satisfaction circumstance (thanks to the emergence of various methods, such as AR + VR and 3D in the conventional text environment), the advertising producer (thanks to an increase in the processing speed of smart devices), and the mash-up function. Therefore, the HAM in this work is defined as 'the degree of trust by an individual that mobile advertising in the smart environment is interesting, beneficial, useful, and personalized' [36].

In order to measure the effects of advertising, this study used the following variables: mobile advertising value, attitude toward mobile advertising, and intention to use mobile advertising. First, the mobile advertising value is meant to be the subjective evaluation of the consumers' relative value and utility on advertising [10]. The quality of information is a key factor in evaluating success in the new smart device environment [47]. This is because in the mobile environment, the requests and surroundings of the users are ever changing. In order to enhance the value of information which users recognize, it is critical to provide information that corresponds to the demands of individual users [48, 49]. For these reasons, this study defined the mobile advertising value as the useful and important information which consumers can glean from specific advertisements. The attitude toward advertising means the predisposition of users responding to advertising in a favorable or unfavorable manner [50]. In

other words, the attitude toward advertising means the behavioral factors of consumers, such as positive or negative feelings, emotions, intentions, faith, etc. in specific advertising. In that respect, the attitude toward advertising was defined as 'the degree of value and reaction that an individual feels by experiencing advertising in the smartphone environment' [36]. Lastly, the advertising acceptance (use and behavior) intention was defined as 'the degree to which an individual accepts the use of advertising in the smartphone environment and its transmission by word of mouth' [36].

3.2 Research Methodology

The population of the present study included smart phone users in Korea. Sampling of the subjects was performed in the Seoul Metropolitan Area and in other metropolitan cities according to the demographic ratios of gender and age groups. The survey was performed after verifying that the respondents were smart-phone users by asking a screening question. The survey was performed by distributing self-administered questionnaires. The subjects responded in a self-reporting manner, and then the answered questionnaires were collected. A total of 350 copies of the questionnaire were distributed from May 23, 2011 to June 7, 2011. A total of 314 returned questionnaires were used in the final data analysis (not counting 16 questionnaires that were considered to be not appropriate for the study).

The collected data were analyzed by performing frequency analysis, exploratory factor analysis, confirmatory factor analysis, construct validity analysis, correlation analysis, and structural equation model analysis using SPSS 21.0 and AMOS 21.0. The significance was verified at the levels of $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively. The goodness of fit of the structural model was determined with reference to the standards suggested by [37], which were the comparative fit index (CFI) (0.9 or higher), Tucker-Lewis Index (TLI) (0.9 or higher), and the root mean square error of approximation (RMSEA) (0.08 or lower).

4. Research Methodology

4.1 Characteristics of the Samples

A frequency analysis was performed to investigate the demographic characteristics of the respondents and the results are shown in **Table 1**. Among the 314 respondents included in the data analysis, 57.3% were male and 42.7% were female. The ages of the respondents were 20s (32.8%), 30s (39.8%), 40s (19.7%), and 50 or older (7.6%). The educational levels of the respondents included high school graduation or lower (2.9%), college graduation (13.4%), university graduation (62.7%), and graduate school or higher (21.0%). The occupations of the respondents included university student (2.2%), employee (83.8%), homemaker (3.8%), business owner (5.1%), and others (5.1%).

Table 1. Demographic Characteristics of the Respondents

Characteristics	Description	No. of Respondents	Percentage (%)
Gender	Male	180	57.3
	Female	134	42.7
Age	20s	103	32.8
	30s	125	39.8
	40s	62	19.7
	50s	23	7.3
	60 or higher	1	0.3

Educational Level	High school graduation or lower	9	2.9
	College graduation	42	13.4
	University graduation	197	62.7
	Graduate school or higher	66	21.0
Occupation	University student	7	2.2
	Employee	263	83.8
	Homemaker	12	3.8
	Business owner	16	5.1
	Others	16	5.1
Total		314	100.0

4.2 Exploratory Factor Analysis, Confirmatory Factor Analysis, and Construct Validity

An exploratory factor analysis (EFA) was employed using the principal component analysis with varimax rotation. Factor extraction was based on the existence of eigenvalues higher than 1, with the requirement that the factorial loadings were higher than 0.5 and a significant total explained variance [45]. For the EFA results, the entertainment factor loadings were in the range from 0.861 to 0.749, informative factor loadings were in the range from 0.862 to 0.744, perceived ease of use factor loadings were in the range from 0.835 to 0.704, perceived usefulness factor loadings were in the range from 0.842 to 0.757, smart environment technology factor loadings were in the range from 0.782 to 0.698, HAM factor loadings were in the range from 0.788 to 0.683, mobile advertising value factor loadings were in the range from 0.907 to 0.874, attitude toward mobile advertising factor loadings were in the range from 0.932 to 0.832, and intention to use factor loadings were in the range from 0.961 to 0.869.

To verify the goodness of fit of the inventory, the reliability, confirmatory factor analysis (CFA), and construct validity were analyzed and the results are shown in [Table 2](#). Specifically, the average (AVE) value was in the range from 0.636 to 0.823, which satisfied the criterion of 0.50 or higher. The reliability value was in the range from 0.826 to 0.948, which satisfied the criterion of 0.70 or higher. Therefore, it was found that the inventory employed in the present study secured the validity of the construct.

Table 2. Verification of Goodness of Fit

Latent variable	Path	Measured variable	Standard estimate	Standard error	Critical ratio (C.R.)	AVE	Reliability
Entertainment	→	Entertainment 1	0.254	0.028	8.961***	0.730	0.911
	→	Entertainment 2	0.272	0.026	10.337***		
	→	Entertainment 3	0.171	0.021	8.082***		
	→	Entertainment 4	0.352	0.033	10.541***		
Informative	→	Informativeness 1	0.327	0.032	10.385***	0.763	0.926
	→	Informativeness 2	0.241	0.028	8.595***		
	→	Informativeness 3	0.338	0.033	10.341***		
	→	Informativeness 4	0.359	0.034	10.484***		
Perceived ease of use	→	Perceived ease of use 1	0.371	0.037	10.15***	0.767	0.928
	→	Perceived ease of use 2	0.301	0.032	9.519***		
	→	Perceived ease of use 3	0.285	0.033	8.526***		
	→	Perceived ease of use 4	0.399	0.04	10.03***		
Perceived usefulness	→	Perceived usefulness 1	0.258	0.027	9.641***	0.773	0.929
	→	Perceived usefulness 2	0.415	0.038	10.88***		
	→	Perceived usefulness 3	0.298	0.029	10.336***		

	→	Perceived usefulness 4	0.297	0.028	10.587***		
Smart environment technology	→	Smart environment 1	0.474	0.044	10.664***	0.823	0.948
	→	Smart environment 2	0.55	0.053	10.332***		
	→	Smart environment 3	0.336	0.041	8.269***		
	→	Smart environment 4	0.487	0.051	9.615***		
HAM	→	HAM1	0.267	0.028	9.415***	0.809	0.942
	→	HAM2	0.398	0.038	10.416***		
	→	HAM3	0.473	0.043	10.952***		
	→	HAM4	0.395	0.035	11.129***		
Mobile advertising value	→	Advertising value 1	0.185	0.02	9.115***	0.640	0.841
	→	Advertising value 2	0.182	0.021	8.855***		
	→	Advertising value 3	0.215	0.023	9.181***		
Attitude toward mobile advertising	→	Attitude toward advertising 1	0.169	0.02	8.264***	0.675	0.859
	→	Attitude toward advertising 2	0.232	0.023	10.036***		
	→	Attitude toward advertising 3	0.229	0.022	10.288***		
Intention to use mobile advertising	→	Intention to use 1	0.253	0.024	10.514***	0.636	0.826
	→	Intention to use 2	0.115	0.017	6.88***		
	→	Intention to use 3	0.161	0.018	8.807***		

4.3 Correlation Analysis

Table 3 shows the result of the correlation analysis conducted to examine the relationship between the entertainment, informative, perceived ease of use, perceived usefulness, smart environment technology, HAM, mobile advertising value, attitude toward mobile advertising and intention to use mobile advertising. As shown in the table, the results showed that statistically significant correlations existed among all variables, and all were positive correlations.

Table 3. Correlation analysis

	1	2	3	4	5	6	7	8	9
1. Entertainment	1								
2. Informative	.624***	1							
3. Perceived ease of use	.296***	.404***	1						
4. Perceived usefulness	.631***	.789***	.485***	1					
5. Smart environment technology	.421***	.482***	.503***	.589***	1				
6. HAM	.584***	.712***	.468***	.759***	.575***	1			
7. Mobile advertising value	.564***	.667***	.442***	.727***	.563***	.727***	1		
8. Attitude toward mobile advertising	.624***	.675***	.472***	.714***	.566***	.761***	.767***	1	
9. Intention to use mobile advertising	.549***	.671***	.502***	.710***	.592***	.719***	.727***	.827***	1

4.4 Evaluation of the Goodness of Fit of Study Model

Table 4 shows the overall goodness of fit of the study model. Specifically, the CFI value was 0.948, the TLI value was 0.942, and the RMSEA value was 0.056. The CFI and TLI values were higher than the criterion of 0.9, and the RMSEA value was lower than the criterion of 0.08, both satisfying the standards. Therefore, it was found that the goodness of fit of the study model was acceptable in the present study.

Table 4. Goodness of Fit Index

χ^2	<i>Df</i>	CFI	TLI	RMSEA
951.116	476	.948	.942	.056

4.5 Results of Hypothesis Testing

Table 5 shows the path coefficient testing results with respect to the direct effect in the study model.

Testing of H1 showed that only the informativeness of mobile advertising had a positive effect on the perceived ease of use. Specifically, the path coefficient of the entertainment to perceived usefulness was -0.002 ($t = -0.057$, $p = 0.971$), which was not significant. The path coefficient of informativeness to the perceived ease of use was 0.410 ($t = 5.690$, $p = 0.001$), which was significant.

Testing of H2 showed that both the entertainment and informativeness had a positive effect on the perceived usefulness. Specifically, the path coefficient of the entertainment to the perceived usefulness was 0.158 ($t = 3.598$, $p = 0.001$) and that of the informativeness to the perceived usefulness was 0.726 ($t = 3.597$, $p = 0.001$), indicating that both of the path coefficients were significant.

Table 5. Path Coefficient Testing Results

Hypothesis	Path	B	S.E.	t	p
H1	Entertainment → Perceived ease of use	-0.002	0.057	-0.037	.971
	Informative → Perceived ease of use	0.410	0.072	5.690	.001
H2	Entertainment → Perceived usefulness	0.158	0.044	3.598	.001
	Informative → Perceived usefulness	0.726	0.066	10.954	.001
H3	Perceived ease of use → Perceived usefulness	0.194	0.054	3.597	.001
H4	Entertainment → Smart environment technology	0.094	0.056	1.673	.094
	Informative → Smart environment technology	0.456	0.072	6.305	.001
H5	Entertainment → HAM	0.154	0.045	3.413	.001
	Informative → HAM	0.541	0.066	8.233	.001
H6	Smart environment technology → HAM	0.303	0.060	5.050	.001
H7	Perceived usefulness → Mobile adverting value	0.342	0.063	5.411	.001
	Perceived usefulness → attitude toward mobile advertising	0.078	0.070	1.119	.263
	Perceived usefulness → intention to use mobile advertising	0.189	0.06	3.148	.002
H8	HAM → Mobile advertising value	0.495	0.069	7.150	.001
	HAM → attitude toward mobile advertising	0.572	0.087	6.597	.001
	HAM → intention to use mobile advertising	0.067	0.095	0.698	.485
H9	Mobile advertising value → attitude toward mobile advertising	0.428	0.087	4.904	.001
H10	attitude toward mobile advertising → intention to use mobile advertising	0.667	0.084	7.939	.001
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$					

Testing of H3 showed that the perceived ease of use had a positive effect on the perceived usefulness. Specifically, the path coefficient of the perceived ease of use to the perceived usefulness was 0.194 ($t = 3.597$, $p = 0.001$), which was significant.

Testing of H4 showed that only the informativeness had a positive effect on SDET. Specifically, the path coefficient of the entertainment to SDET was 0.094 ($t = 1.673$, $p = 0.094$), which was not significant. The path coefficient of the informativeness to SDET was 0.456 ($t = 6.305$, $p = 0.001$), which was significant.

Testing of H5 showed that both the entertainment and informativeness had a positive effect on HAM. Specifically, the path coefficient of the entertainment to the HAM was 0.154 ($t = 3.413$, $p = 0.001$), and that of informativeness to the HAM was 0.541 ($t = 8.233$, $p = 0.001$), indicating that both of the path coefficients were significant.

Testing of H6 showed that SDET had a positive effect on HAM. Specifically, the path coefficient of SDET to the HAM was 0.303 ($t = 5.050$, $p = 0.001$), which was significant.

Testing of H7 showed that the perceived usefulness had a positive effect only on the value of mobile advertising and the intention to use mobile advertising. Specifically, the path coefficient of the perceived usefulness to the value of mobile advertising was 0.342 ($t = 5.411$, $p = 0.001$), and that of the perceived usefulness to the intention to use mobile advertisement was 0.189 ($t = 3.148$, $p = 0.002$), indicating that both of the path coefficients were significant. On the contrary, the path coefficient of the perceived usefulness to the attitude toward mobile advertising was 0.078 ($t = 1.119$, $p = 0.263$), which was not significant.

Testing of H8 showed that HAM has a positive effect only on the value of a mobile advertisement and the attitude toward a mobile advertisement. Specifically, the path coefficient of the HAM to the value of a mobile advertisement was 0.495 ($t = 7.150$, $p = 0.001$), and that of the HAM to the attitude toward a mobile advertisement was 0.572 ($t = 6.597$, $p = 0.001$), indicating that both of the path coefficients were significant. On the contrary, the path coefficient of the HAM to the intention to use mobile advertising was 0.067 ($t = 0.698$, $p = 0.485$), which was not significant.

Testing of H9 showed that the value of mobile advertising had a positive effect on the attitude toward mobile advertising. Specifically, the path coefficient of the value of mobile advertising to the attitude toward mobile advertising was 0.428 ($t = 4.904$, $p = 0.001$), which was significant.

Testing of H10 showed that the attitude toward mobile advertising had a positive effect on the intention to use mobile advertising. Specifically, the path coefficient of the attitude toward mobile advertising to the intention to use mobile advertising was 0.667 ($t = 7.939$, $p = 0.001$), which was significant.

5. Conclusions and Implications

One of the main purposes of advertising is to create added value by connecting consumers and producers. Modern people are able to connect to the internet using smart devices, such as smartphones, tablet PCs, and laptop computers, regardless of time and place, and in many ways these smart devices have now become indispensable. Therefore, mobile advertising targeting smart devices has become very important to the advertising industry. The objective of the present study is to investigate the effects of the entertainment, informativeness, and usefulness of mobile advertising, smart-technology acceptance, and the HAM on the overall attitudes toward advertising. A single model was developed by considering the interactions among the TAM, HAM, and smart TAM (which was lacking in the research presented in [3])

in order to verify the effects of mobile advertising on the overall attitudes toward advertising.

The implication of the work of [3] is that previous advertising-effect models, namely Davis's TAM and Ducoffe's WAM, are limited when measuring and understanding the effects of mobile advertising in the smart device environment. The authors of [3] also implied that a model that incorporated new potential factors, such as the HAM and other smart-environment factors, would be more useful in measuring the effect of mobile advertising, and in maximizing the utility of an individual in the smart device environment in comparison with the TAM and WAM. However, previous studies have shown that the attention consumers pay to an advertisement is based to their own desires and needs, and that the attitude of a consumer toward an advertisement depends on how much of the information needed by the consumer is in fact provided by the advertisement. It was pointed out that the entertainment and informativeness provided by an advertisement are closely related to the overall attitude toward the advertisement, not only in traditional media but also in other advertising domains, such as YouTube and mobile advertisements focused on teenagers [10, 38, 39, 40, 43, 44]. Therefore, the factors that have been considered in previous studies should not be neglected, even in the new smart device environment. Most of the hypotheses that were set up in line with this finding in the present study were supported by the results. Notably, it was found that the entertainment had no effect on the perceived usefulness nor on the SDET, indicating that the entertainment provided by a mobile advertisement is attenuated by the entertainment provided by the smart phone. It was also found in the present study that the perceived ease of use did not have an effect on the attitude toward an advertisement. However, the results showed that the perceived ease of use had an effect on the value of an advertisement and on the intention to use advertising, the value of an advertisement on the attitude toward the advertisement, and the attitude toward an advertisement on the intention to use the advertisement. Although the present study showed that the perceived ease of use does not have an effect on the attitude toward an advertisement, the influence of the perceived ease of use should not be neglected because the perceived ease of use may have a positive effect on the overall attitude toward an advertisement.

Consequently, the contributions of this research in both theoretical and practical aspects are as follows.

First, in terms of the theoretical contribution, this study has developed a meaningful and desirable model to maximize the effects of mobile advertising in the smart device environment. In other words, this paper provides a comprehensive framework and guidelines that will aid in understanding the mobile advertising model that is evolving in the current smart device environment by applying the perceived characteristic advertising factors which have been quoted in advertising research to the models on the acceptance of new mobile advertising using the existing TAM as referential model. In conclusion, as pointed out by [3], the results of the present study show that the TAM and WAM, which have been traditionally used to measure the effect of an advertisement, should not be neglected, even though it is also important to measure the effects of mobile advertising by using the new potential factors that are pertinent to the smart environment.

Second, in terms of practical contribution, the results of mobile advertising in the smart device environment will depend on the degree of usefulness and interest with which mobile advertising can provide information to consumers. Therefore, although existing push-type ads that only deliver messages are important, in order to maximize the effects of mobile advertising in the new smart device environment, it will be necessary to upgrade the utilization of advertising according to the various mobile applications types.

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