

PAPER

Study on the Willingness of Mobile Advertisement Users Based on TAM Model

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ABSTRACT

This study aims to explore the framework of the technology acceptance model (TAM) to examine how subjective norms, perceived precision, and perceived control can positively influence users' willingness to adopt mobile ads by enhancing perceived usefulness. In the context of the rapid development of the digital era, mobile advertising serves as an important marketing tool. Its user acceptance directly impacts the marketing effectiveness of enterprises. Therefore, a profound comprehension of the key factors that influence user adoption of mobile ads is crucial for designing more effective mobile ad strategies. In this study, we collected the attitudes and responses of users from various backgrounds towards mobile advertising and conducted data analysis using a structural equation model. The study found that subjective norms, perceived accuracy, and perceived control are important factors influencing users' perceived usefulness. Additionally, perceived usefulness significantly and positively impacts users' willingness to adopt mobile ads.

KEYWORDS

mobile advertisement, users' willingness, subjective norms, technology acceptance model (TAM)

1 INTRODUCTION

In the digital age, mobile advertising has become an indispensable part of enterprise marketing strategies due to its convenience, personalization, and wide coverage. With the popularity of smartphones and the mobile Internet, people's habits of consuming information have undergone fundamental changes, providing fertile ground for the development of mobile advertising. Despite the enormous potential of mobile advertising, there are significant individual differences in user acceptance. This makes it crucial for enterprises to address how to enhance users' willingness to adopt mobile advertising. The technology acceptance model (TAM) is a theoretical framework widely used to explain and predict users' behavior in adopting new technologies. The model was originally proposed by Davis in 1989, and the core idea

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is that perceived usefulness (PU) and perceived ease of use (PEOU) are the two main factors that affect user acceptance and use of technology products. Over time, many scholars have extended and improved the TAM, incorporating additional dimensions such as social impact and cognitive risk to accommodate various research contexts and subjects. In the mobile advertising space, traditional TAM models need to be further refined and expanded to more accurately capture the key factors that influence users' willingness to adopt. Based on this premise, the study aimed to investigate how subjective norms, perceived precision, and perceived control can influence the intention to adopt mobile adoption through perceived usefulness.

2 LITERATURE REVIEW

Chu's (2014) early work laid an important foundation for mobile advertising research [1]. Subsequently, scholars such as Liu (2015) and Qi (2016), respectively, from different dimensions, to expand the theory and practice of mobile advertising research [2, 3], involving advertising types, analyzing market environments, and developing precise marketing strategies based on cloud data. However, in this extensive research background, there is a relatively lack of research from the perspective of users, especially to explore the acceptance and adoption mechanisms of mobile advertising from the demand perception, consumption habits, and characteristics of mobile users. Although Jiang (2013) and other scholars have started to investigate the factors influencing consumers' willingness to adopt mobile advertising from a perspective, they have conducted in-depth discussions on the characteristics of advertising models, offering a fresh perspective and research direction for future studies. By considering users' subjective norms, perceptual accuracy, and perceived control, this study aims to explore how these factors influence users' willingness to adopt mobile ads through perceived usefulness. The goal is to provide a scientific basis and guidance for advertising design, content innovation, and the formulation of marketing strategies. The purpose of this study is not only to fill the gap in the existing research but also to explore how mobile advertising can more effectively meet user needs and achieve precision marketing in the rapidly developing technology environment. This exploration aims to promote the sustainable development and innovation of the mobile advertising industry.

The TAM is widely used as a theoretical basis in research areas that explore users' willingness to adopt mobile ads. Existing research explains how users perceive and accept mobile advertising from various perspectives, including the original TAM, framework extensions, user attitudes, cultural variances, and specific market analyses. The pioneering work of Davis (1989) established the TAM, suggesting that perceived usefulness and perceived ease of use are the key drivers of technology acceptance. This provides a powerful framework for follow-up research to understand user attitudes and acceptance of mobile advertising [5]. Venkatesh and Davis (2000) made a theoretical extension of TAM and proposed TAM 2, adding social influence and facilitation conditions as new variables [6]. This extended model provides a more comprehensive perspective on user behavior in the mobile advertising field. Okazaki and Mendez (2013) discussed the regulatory role of gender in the perception of mobile commerce convenience. They found that men and women have different levels of acceptance of mobile ads, which serves as a basis for developing targeted advertising strategies [7]. Zhou (2012) focuses on the factors influencing mobile Internet users, emphasizing the influence of user attitudes and social norms on the adoption of mobile advertising adoption [8]. Bamba and Barnes (2007), emphasized the importance of personalization and user control in

mobile advertising acceptance [9]. Kim and Han (2008) studied the role of utilitarian and hedonistic values in a mobile data service environment, providing insight into the complex motivation of users to accept mobile advertising [10]. These studies explore users' acceptance and willingness to adopt mobile advertisements from various perspectives, offering a comprehensive theoretical and empirical foundation for research based on TAM frameworks.

3 STUDY HYPOTHESES AND MODEL CONSTRUCTION

In the modern marketing environment, mobile advertising serves as an effective communication and marketing tool. Its acceptance directly impacts the effectiveness of advertising and the marketing success of enterprises. The TAM, a classic theory used to explain and predict users' adoption of technology products and services, has been widely applied in various contexts, including mobile advertising. Davis (1989) emphasizes the impact of PU (PEOU) on technology adoption and use behavior through the proposed TAM [5]. However, with the rapid development of mobile Internet and changes in user behavior, research on the intention to adopt mobile ads will need to consider other potential influencing factors. In this context, this study proposes that subjective norms, perceptual accuracy, and perceived control are important factors that affect users' perceived usefulness, consequently influencing users' willingness to adopt mobile ads. Subjective norms, which refer to the extent to which individuals who are important to them believe they should or should not perform an act, have been shown to have a significant impact on user behavioral intentions in numerous consumer behavior studies. Perceptual accuracy and perceptual control refer to the user's evaluation of the relevance and accuracy of the advertising content, respectively, and the user's sense of control in the process of receiving advertisements. These factors are particularly important in the context of mobile advertising, as users often prioritize the relevance of information and value the ability to control the information they receive.

Based on the above findings, the study makes the following assumptions:

- H1: Subjective norms positively influence users' perception of usefulness. When users perceive mobile ads as important to them, they are more likely to find mobile ads useful.*
- H2: Perceptual accuracy positively affects users' perceived usefulness. Users' high ratings of the relevance and accuracy of ad content will increase their perception of the usefulness of ads.*
- H3: Perceptual control has a positive impact on users' perceived usefulness. Users who can effectively control the ad messages they receive are more likely to see mobile ads as useful.*
- H4: Perceived usefulness positively affects users' willingness to adopt mobile ads. When users perceive mobile ads as useful, their willingness to engage with the ads increase.*

4 STUDY DESIGN

In the selection of variables and hypothesis analysis under the premise of the research, the questionnaire will be divided into three parts. The first part will cover the basic information of the sample, mobile application usage, and behavioral intention statistics. This includes the research object's gender, age, education, income, types of

mobile applications used, monthly mobile payment amounts, and willingness to engage with mobile advertising information. The second part pertains to the dimensional measurement of external variables (subjective norms, perceptual accuracy), intermediate variables (perceptual usefulness), and dependent variables in the model. The third part involves asking the respondents to share their views on mobile advertising and discuss the open topic of the development, aiming to gather the sample's opinions, needs, and suggestions regarding mobile advertising. Considering the characteristics of the sample, this paper has modified and adjusted the order and content of the questions in the questionnaire. Tables 1 to 5 present the question design for the individual constructs.

Table 1. Question design of the subjective specifications (SN) measurement

No.	Item
Q1	The attitude and opinions of my friends, colleagues, or family members toward mobile advertising messages will also affect my attitude (SN1).
Q2	What other comments I see on the app store, the official website comment section, and related forums will affect my willingness to adopt and click on the ad (SN2)
Q3	Many people around me think that good product advertising makes it easier to me to accept, (SN3)

Table 2. Question design of the perceptual precision (PP) measurement

No.	Item
Q4	The mobile ads I saw basically met my actual purchase needs (PP1).
Q5	I receive many mobile ad products that can purchase. (PP2)
Q6	Although I did not purchase the advertised products, I believe that most of the products I typically encounter in mobile advertisements align with my work and lifestyle requirements (PP3).

Table 3. Question design for the perceptual usefulness (PU) measurement

No.	Item
Q7	Mobile advertising can always provide the product or service information that I am interested in. (PU1)
Q8	Mobile advertising can always provide the product or service information that I am interested in. (PU2)
Q9	In my opinion, browsing the mobile ads that are pushed can help me easily obtain information about the goods or services I want, reduce the time it takes to search for relevant information, and improve purchasing efficiency (PU3).
Q10	A lot of the information I come across in mobile ads is useful and it brings me joy, (PU4)

Table 4. Question design of the perceptual control (PC) measurement

No.	Item
Q11	I have the option to click on and browse the mobile ads (PC1).
Q12	I don't want mobile ads to appear frequently without prompt or permission, as this would disrupt my normal use of program software (PC2).
Q13	I don't want mobile ads intruding on in my personal time (PC3).

Table 5. Question design of the willingness to adopt (AI) measurement

No.	Item
Q14	I think I will consider using mobile ads in the future (AI1).
Q15	I prefer practical, interactive mobile ads (AI2)
Q16	I'm willing to adopt interesting or valuable mobile ads and share them with the people around me (AI3).

In this survey, a total of 207 respondents participated, with women accounting for 67.1% (139) and men for 32.9% (68), indicating a high proportion of female users in the sample. In terms of age distribution, the vast majority of respondents (73.4%, 152) were aged 20–30, while those over 50 accounted for only 0.5% (1), indicating that the participants were predominantly young. In terms of educational background, 76.3% (158) were the largest proportion of the sample, followed by junior college (8.7%, 18) and master's degree (7.7%, 16). Fewer respondents had a high school diploma or lower (5.3%, 11) or a doctorate degree or higher (1.9%, 4). This distribution offers a representative foundation for a more profound comprehension of users' readiness to embrace mobile advertisements, particularly focusing on the preferences and acceptance of young, highly educated demographics in the context of mobile ad strategies.

Table 6. Basic information statistics

Category	Sample Number	Proportion	
Gender	Male	68	32.9%
	Female	139	67.1%
Age	Age under 20 years	13	6.3%
	20–30 Years old	152	73.4%
	31–40 Years old	33	15.9%
	41–50 Years old	8	3.9%
	Age more than 50 years	1	5%
Educational background	High school and below	11	5.3%
	Junior college education	18	8.7%
	Undergraduate	158	76.3%
	Master	16	7.7%
	Doctor	4	1.9%

5 EMPIRICAL TEST

The SPSS16.0 software processing revealed that the overall KMO value of the scale was 0.900, and the significance level in the Bartlett sphericity test was 0.000, indicating string significance, and the scale passed the test. The model explained 61.746% of the variance in the simultaneous rotation component matrix. In addition, the reliability and validity of the data are further analyzed by SmartSPL3.0 software. The reliability is mainly determined by the value of Cronbach alpha coefficient and composite reliability (CR), while and the convergence degree of validity is judged by the value of the factor loading and the average variance extracted (AVE). The results are shown in Table 7. In terms of reliability, all variables except for subjective norms and adoption willingness have a Cronbach's alpha coefficient greater than 0.7. These two variables are only slightly below 0.7, indicating that the questionnaire's reliability is good. At the same time, the consistency ratio (CR) value of all variables is consistently greater than 0.8, indicating that the credibility of the nine factors in the questionnaire is very high. As for validity, because almost all the variables' factor loads are greater than 0.7, only the subjective specification item

has a factor load that did not reach 0.7. Only two item loads will not affect the final analysis, and the variable AVE is greater than 0.5. Therefore, the items of this scale measure convergence validity well, indicating that the scale can explain the original variables effectively.

At the same time, this study also needs to determine whether the variables are suitable for comparative analysis. As shown in Table 8, we can observe that the AVE value of each variable in the sample data is generally higher than the correlation coefficient between these variables. Additionally, other variables and all values are mostly below 0.85, meeting the criteria for good reliability among the variables. Therefore, the scale construction and the differential validity of the study model are considered satisfactory.

Table 7. Results of the variable reliability and validity tests

Constructive	Question Item	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
Subjective norms	SN1	0.836	0.657	0.809	0.590
	SN2	0.619			
	SN3	0.829			
Perceived precision	PP1	0.859	0.779	0.869	0.690
	PP2	0.776			
	PP3	0.854			
Perceived usefulness	PU1	0.841	0.872	0.913	0.723
	PU2	0.837			
	PU3	0.858			
	PU4	0.865			
Perceived control	PC1	0.848	0.721	0.836	0.630
	PC2	0.802			
	PC3	0.726			
Advertising adoption will	AI1	0.871	0.681	0.824	0.609
	AI2	0.635			
	AI3	0.797			

Table 8. Differential validity analysis among the variables

	Subjective Norms	Perceived Control	Perceived Usefulness	Perceived Precision	Advertising Adoption Will
Subjective norms	0.768				
Perceived control	0.269	0.794			
Perceived usefulness	0.537	-0.020	0.850		
Perceived precision	0.535	0.071	0.806	0.831	
Advertising adoption will	0.571	0.282	0.597	0.609	0.781

In order to ensure the accuracy and efficiency of the data results, this study conducted structural equation analysis on 207 samples. The study tested the significance of the path coefficient in the model and the interpretative ability of the variable variance (R^2). $R^2 = 0.729$ for the integration of subjective norms and perceived accuracy on perceived usefulness, and $R^2 = 0.391$ for the integration of perceived usefulness and perceived control on willingness to adopt. This indicates that the explanatory variance of the variables reached 72.9% and 39.1%, respectively, both exceeding the acceptance level of 0.3, demonstrating strong explanatory power.

As shown in Table 9, H1 ($B = 0.114^*$, $p < 0.05$), H2 ($B = 0.543^{***}$, $p < 0.001$), H3 ($B = 0.326^{***}$, $p < 0.001$), H4 ($B = 0.625^{***}$, $P < 0.001$) are valid, which indicates a significant positive relationship between perceived control, subjective norms, perceived accuracy, and perceived usefulness. Similarly, there is a significant positive relationship between perceived usefulness and willingness to adopt.

Table 9. Assumes test

Hypothesis	Path Coefficient	T Value	P Value	Result
Subjective norms→Perceived usefulness	0.114*	1.870	<0.1	支持
Perceived control→Perceived usefulness	0.326***	5.517	<0.001	支持
Perceived precision→Perceived usefulness	0.543***	9.290	<0.001	支持
Perceived usefulness→advertising adoption will	0.625***	16.077	<0.001	支持

The mediation effect test is a statistical method used to examine the impact of one variable on the relationship between two other variables. Often, this variable is referred to as a mediator variable because it mediates the effect of the independent variable on the relationship between the dependent variables. These hypothetical pathways represent the influence of subjective norms, perceived control, and perceived precision on the willingness to adopt, mediated by PU. According to Table 10, the following conclusions can be drawn: for the path of PU of subjective norms, the effect of subjective norms on perceived usefulness was significant ($P < 0.1$), and indirectly influenced the willingness to adopt through PU, supporting the existence of the mediation effect; for the path of PU of control, the effect of perceived control on PU was highly significant ($P < 0.001$), and indirectly influenced the willingness to adopt through PU, also supporting the existence of the mediation effect; for the path of perceived precision and PU to adopt willingness, the effect of perceptual accuracy on perceptual usefulness was also very significant ($P < 0.001$), and indirectly influenced the willingness to adopt through perceived usefulness, also supported by the existence of a mediation effect. In conclusion, it can be confirmed that there is a mediating effect of perceived usefulness in all three pathways. Specifically, perceived usefulness plays a partial interpretive or conductive role between the independent and dependent variables.

Table 10. Test of the mediation effect

Hypothesis	Path Coefficient	T Value	P Value	Result
Subjective norms→Perceived usefulness→advertising adoption will	0.071*	1.791	<0.1	支持
Perceived control→Perceived usefulness→advertising adoption will	0.204***	5.333	<0.001	支持
Perceived precision→Perceived usefulness→advertising adoption will	0.340***	8.140	<0.001	支持

6 MANAGEMENT PRACTICE APPLICATION

6.1 Attach the importance of user perception

The results suggest that the effects of subjective norms, perceived control, and perceived accuracy are all significant for users' perceived usefulness. This implies that when designing products or services, managers should focus on users' cognition of their subjective norms, perceived control, and perceived precision. They should aim to enhance the perceived usefulness of products or services to encourage users to adopt them.

6.2 Understand user needs and provide accurate solutions

The impact of perceptual accuracy on perceptual usefulness is very significant. This indicates that managers should be active in providing precise and effective solutions when designing products or services to meet the actual needs of users. By providing an in-depth understanding of users' needs and preferences and offering products or services that match them, the perceived usefulness of the product or service can be enhanced. This, in turn, can increase users' willingness to adopt.

6.3 Establish positive subjective norms and perceptual control

Also, the study found that the effects of subjective norms and perceived control on perceived usefulness were significant. Therefore, managers should strive to establish positive subjective norms and perceived control. This can be achieved by enhancing users' cognition and control of products or services through positive word-of-mouth, user evaluation, and social influence. This helps enhance users' perceived usefulness of products or services, thus improving users' willingness to adopt them.

6.4 Focus on the improvement of user experience

The perceived usefulness of a product or service to users directly affects their willingness to adopt it. Therefore, managers should continue to enhance the user experience, focusing on ease of use, functionality improvement, service quality, and other aspects. By enhancing users' perceived usefulness, they can increase their willingness to adopt and promote products or services, leading to successful promotion and application.

6.5 Strengthen the management of the intermediary effect

The findings confirm the mediating effect of perceived usefulness between subjective norms, perceived control, perceived precision, and willingness to adopt. Therefore, when promoting products or services, managers should pay attention to the management of the intermediary effect. This involves enhancing users' willingness to adopt by improving their perceived usefulness of products or services.

This may involve improving the characteristics of products or services, enhancing brand image, strengthening marketing publicity, and considering various factors to effect. This is essential for achieving an intermediary effect so as to achieve the successful promotion and application of products or services.

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