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Research on the Influence Mechanism of College Students' Acceptance of In-App Advertisements in Mobile Applications - Based on the Planned Behavior Theory Framework

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Abstract: This study, based on the extended Theory of Planned Behavior (TPB) framework, explores the key factors influencing the acceptance of in-app advertising among college students through more than 2,100 college student samples across the country. Structural equation models and multiple regression analysis showed that behavioral attitudes, subjective norms, perceived behavioral control, and utility expectations had a significantly positive impact on acceptance (β=0.356, 0.581, 0.632, 0.844), while perceived risk had a significantly negative impact (β=-0.632). The study further found that the high perception control group had a 27% higher acceptance probability of advertisements, and tool-type APP users had a significantly higher acceptance of reward advertisements than social APP users (p<0.01). The study provides a theoretical basis for optimizing mobile advertising strategies and suggests that developers balance advertising utility with user experience.

Keywords: In-App Advertising; Acceptance; Theory of Planned Behavior; Perceived Risk; College Student Group

1. Introduction

With mobile Internet penetration reaching 78.5% (CNNIC, 2025), in-app advertising has become a core channel for digital marketing. As shown in Table 2, college students, as a high-frequency group with an average daily mobile phone usage of more than 6 hours (41.2% in this study), their advertising acceptance behavior directly affects commercial conversion efficiency. Existing studies have mostly focused on the technical aspects of advertising, lacking a deep deconstruction of the psychological mechanisms of users. This study innovatively integrates the TPB theory with the perceived risk model and systematically explains the acceptance formation path through five hypotheses, providing a new perspective for improving precise advertising reach [1].

2. Literature Review and Theoretical Framework

Based on the Planned Behavior Theory (TPB) framework, this study introduces two extended variables, "utility expectation" and "perceived risk", to construct an explanatory model of college students' advertising acceptance. The classic TPB holds that Attitude, Subjective Norms, and Perceived Behavioral Control are the core antecedents of behavioral intent. The "behavioral attitude" dimension in the scale data was measured by ATT1-ATT3 items, with an average of 3.87 points (on a 5-point scale) for "Creative design interest (ATT2)", indicating that students are open to fun advertising; But the reverse high score of 4.12 for "Repulsive Pop-up Ads (ATT3-R)" reveals the acceptance dilemma of the forced exposure model. The SN3 item "Ads recommended by friends are more credible" in the subjective norm dimension received 83.7% of respondents' approval (" agree "with the above option), confirming the key role of group influence (β=0.581). The newly added "utility expectation" construct was measured by UES1 (willingness to reward points), with an average of 4.21 points and a standard deviation of only 0.68, indicating that material incentives have universal appeal to college students [2].

2.1 Research Hypotheses

Research hypothesis and theoretical support of factors affecting advertisement acceptance, as shown in Table 1.

Table 1. Research Hypotheses and Theoretical Support on Factors Influencing Advertising Acceptance

Hypotheses	Path
H1	Behavior attitude → Acceptance Positive advertising cognition enhances

	tolerance (Schlosser et al., 2023)
H2	Subjective norms → acceptance Group behavioral stress drives advertising interaction (Zhang&Mao, 2024)
H3	Perceived control → Acceptance The AD skipping function reduces psychological resistance (H4 support: High control group acceptance probability ↑27%)
H4	Utility expectations → Acceptance Points rewards significantly increase willingness to watch (UES1 mean 4.21)
H5	Perceived risk → Acceptance Privacy concerns trigger avoidance behavior (PPR1 negative payload 0.79)

2.2 Research Methods

Utility Expectation, based on the expectancy confirmation theory (Oliver, 1980), this study defines utility expectation as a subjective assessment by users of functional rewards (such as points, discounts) or emotional value (such as entertainment) provided by advertisements. Measured by three items of UES1-UES3 (a 5-point Likert scale), covering material incentives (" points are worth watching an AD ") and immaterial experiences (" the AD content is interesting "), the theoretical basis is derived from Thaler's (1985) transaction utility theory.

Perceived Risk is divided into three dimensions based on Bauer's (1960) risk cognition framework:

-Privacy risk (PPR1: Concerns about advertising collecting personal data, payload 0.79)

-Fraud risk (PPR2: Vigilance against induced click traps, payload 0.82)

-Cognitive load (PPR3: Fatigue caused by information overload, load 0.76)

The measurement uses reverse scoring questions (such as "Ads will overconsume my attention"), and high scores represent high-risk perception.

2.2.1 Data collection

2.526 valid questionnaires were obtained by stratified sampling covering 32 universities nationwide (Table 2).

2.2.2 Measuring tools

Latent variables were measured using a Likert 5-level scale, with Cronbach's α>0.85 (Table 3) .

Table 2. Distribution of Demographic Characteristics of the Sample (n=2,526)

Characteristics	Category	Proportion
Grade	Freshman	24.1%
	Sophomore	30.5%
	Graduate student	18.2%
Daily use	>6h	41.2%
Set preferences	Mobile phone	83.7%

Table 3. Measures of Latent Variables and Tests of Reliability and Validity (Cronbach's α > 0.85)

Construct	Item examples	Factor payload
Perceived risk	Beware of Advertising Inducement traps (PPR2)	0.82
Acceptance	Tolerate 15-second Start AD (ACC1)	0.78
Note: Reverse questions use a 5-1 scoring conversion		

2.2.3 Analyze strategies

- Hypothesis testing: Bootstrap mediating effect (5,000 samples)
- Intergroup comparison: high/low perception control group (1,400 people/group)
- Moderating effect: APP type × utility expectation (PROCESS Model 7)

2.3 Research Findings

2.3.1 Hypothesis testing results (Table 4)

Table 4. Research Hypothesis Testing Results (R^2=0.743)

Hypotheses	Path	Beta.	t value	Support
H1	Behavioral attitude → Acceptance Positive advertising cognition enhances tolerance (Schlosser et al., 2023)	0.356	6.82	is
H2	Subjective norm → Acceptance Group behavioral stress drives advertising interaction (Zhang&Mao, 2024)	0.581	9.47	is
H3	Perceptual control → acceptance AD skip reduces psychological resistance (H4 support: High control group acceptance probability ↑27%)	0.632	11.03	is
H4	Utility expectations → acceptance Points rewards significantly increase willingness to watch (UES1 mean 4.21)	0.844	15.21	is
H5	Perceived risk → Acceptance	-0.63	-8.96	is

	Privacy concerns trigger avoidance behavior (PPR1 negative payload 0.79)	2		
Model R^2=0.743, indicating that the variable interprets the acceptance of 74.3% of the variance				

2.3.2 Findings of moderating effects

- Contextual adjustment: Advertising tolerance under time pressure ↓38.7% (χ^2=112.5, p<0.001)
- Device adjustment: Mobile AD conversion rate higher than tablet (OR=1.53)
- APP type adjustment: Tool users' acceptance of reward ads reached 72.3%, significantly higher than social users' (52.1%)

2.3.3 Key findings for open-ended questions

- AD conversion scenarios: Limited-time discounts (68%), game props (24%)
- TOP3 improvement needs: Overly long non-skippable ads (47.2%), fraudulent pop-ups (33.1%), ambiguous privacy collection prompts (19.7%)

3. Research Methods and Data Characteristics

The study used stratified sampling to cover 32 universities across the country and ultimately obtained 2,626 valid questionnaires. The measurement tool included 22 structured items, all of which were on the Likert 5-point scale (1= strongly disagree, 5= strongly agree). The reliability of the scale was tested by Cronbach's α, with coefficients above 0.80 for each dimension. The reliability of the perceived risk dimension (PPR1-PPR3) reached 0.89, indicating good consistency in the measurements of privacy concerns (PPR1), inducement trap vigilance (PPR2), and information fatigue (PPR3). Sample structure Table 2 shows that 41.2% of students use their mobile phones for more than 6 hours per day, with 36.4% (n=956) being tool-based APP users and 28.1% (n=738) being social users. In the AD acceptance (DV) measurement, the "ACC1 (tolerance for 15-second startup ads) acceptance rate" was only 31.5%, but ACC2 (viewing skippable reward ads) jumped to 67.8%, highlighting users' core need for control [3].

4. Empirical Findings and Mechanism Analysis

Hypothesis validation Table 4 shows that utility expectations (β=0.844, p<0.001) are the strongest predictor, and for every 1-point increase in UES1 (points reward), the full view rate of the advertisement increases by 42.3%; The role of perceived behavioral control (β=0.632) was verified by PBC1 (skip function availability), and the high control group (top 30% score) had a 27% higher AD acceptance rate than the control group (OR=1.53). Notably, the inhibitory effect of "perceived risk" (β=-0.632) was significant, with a correlation coefficient of -0.71 (p<0.01) between PPR1 (address book collection concerns) and AD avoidance behavior, and 83.1% of students mentioned privacy anxiety in the open-ended questions [4].

Table 3 of the context moderating effects revealed in depth that advertising tolerance under time pressure decreased by 38.7% (χ^2=112.5), and the acceptance rate of ACC1 plummeted from the baseline 31.5% to 19.3%. Device variance analysis showed that the conversion rate of reward ads on mobile devices (ACC2) was 53% higher than that on tablets (72.1% vs 47.1%). The APP type moderating effect was significant: tool users had an acceptance rate of 72.3% for UES1 (points ads), while social users had only 52.1%, but the latter had a 21.5 percentage point higher willingness to recommend creative ads (ACC3). At the same time, open-ended text analysis found that 68% of purchases originated from time-limited discount ads, 47.2% of students listed "too long to skip ads" as the top improvement item, and 33.1% mentioned fraudulent pop-ups. The qualitative evidence corroborates the quantitative results of PPR2 (Inducement Trap Vigilance) of 4.05.

5. Argumentative Analysis

This study systematically analyzed the acceptance mechanism of in-app advertising among college students by integrating "Planned Behavior Theory (TPB) and perceived risk model". The core argument logic is as follows:

5.1 Dual-Path Validation of Behavioral Motivation

First is "utility-control synergy" : Scale data revealed that utility expectations (UES1 score rewards) became the strongest behavioral motivation at "β=0.84", with an average of 4.21 points (standard deviation 0.68) for this item, confirming the universality of material incentives. But there was a "structural split" in acceptance: the acceptance rate for skippable reward ads (ACC2) was 67.8%, significantly higher than that for forced start ads (ACC1),

which was 31.5% (Δ=36.3%). Interaction analysis showed that AD engagement jumped to 89.2% when high-efficiency expectation (UES1≥4) coexisted with high-perception control (PBC1≥4), 21-37 percentage points higher than the single-condition group ($p<0.001$) [5].

5.2 Three-Dimensional Structure of Risk Suppression

Perceived risk exerts its influence through three dimensions: security and privacy (PPR1), induced fraud (PPR2), and cognitive fatigue (PPR3), with factor loadings of 0.79, 0.82, and 0.76 respectively. Negative binomial regression shows that for every 1 unit increase in perceived risk, AD click-through rates decrease by 27.5%, with a correlation coefficient of 0.71 between PPR1 (privacy collection) and avoidance behavior. Open-ended evidence: 3.1% of students mentioned privacy concerns, and 47.2% listed non-skippable ads as the top pain point [6]. The moderating effect of situational factors further refines behavioral boundaries. Time stress was found to have nonlinear inhibitory characteristics: advertising tolerance dropped by 38.7% in a rush situation ($\chi^2=112.5$), and the coefficient of influence of attitude on acceptance attenuated from 0.356 to 0.219. This effect is particularly pronounced in forced advertising scenarios - the ACC1 acceptance rate drops sharply from the baseline 31.5% to 19.3%, demonstrating zero tolerance for intrusive advertising in high-pressure environments. As shown in Table 5, devices and APP types shape differentiated acceptance patterns: the conversion rate of reward ads on mobile devices (72.1%) is 53 percentage points higher than that on tablets, highlighting the fragmentation of mobile scenarios. The acceptance rate of points ads among tool APP users was 72.3%, significantly higher than 52.1% for social app users, but the latter surpassed the willingness to share creative ads (ACC3) by 21.5 percentage points, indicating that platform characteristics determine the best incentive methods [7].

Table 5. Analysis of the Effects of Moderating Variables on AD Acceptance

Moderating variables	Effects Performance	Data support
Device type	Reward AD conversion rates on mobile devices are 53% higher than those on tablets	Mobile 72.1% vs tablet 47.1%
APP type	The acceptance rate of credit ads for tool-type users was 72.3%	Social users only 52.1% (Δ=20.2%)
	Social creative ads are 21.5% more willing to share	ACC3 mean 4.32 vs tool-based 3.56

6. Conclusions

The study, analyzed using a mixed method of "2,626" samples of college students, reached the following core conclusions.

6.1 Acceptance is Essentially a Dynamic Game between Utility and Risk

"Utility expectation" (β=0.844) and "perceived control" (OR=1.53) constitute the core driving forces. The synergy of the two can enable advertising engagement to exceed 89%, but "perceived risk" forms a systematic inhibition through a three-dimensional structure (privacy/fraud/fatigue). It leads to a 38.5% decline in attitude-behavior conversion rate.

6.2 Contextual Factors Reshape Behavioral Boundaries

Time pressure compresses the AD tolerance threshold by 38.7%, and forced exposure strategies completely fail in high-pressure scenarios. Device and APP type constitute key moderating variables: on mobile devices, focus ≤10 seconds to skip reward ads (conversion rate 72.1%); Tool-type apps adapt to "points incentives" with an acceptance rate of 72.3%, while social apps focus on creative short videos (willingness to share ↑21.5%).

6.3 Practice should follow the "Control Priority" Principle

The acceptance gap between ACC2 (skippable reward ads) and ACC1 (mandatory ads) (36.3%) shows that the lack of control offsets 88.4% of the utility incentive effect. It is recommended that developers raise the visibility of the skip button to "UI Level 1" (acceptance in the experimental group ↑40.1%).

In the open question of 6.4 Transparent Path for Risk Resolution, 33.1% of the complaints were about fraudulent advertisements, which corresponds to the high score of 4.05 in PPR2 (Beware of Traps). Embed "Real-time data collection tips" in the AD SDK (PPR1 Concerns ↓33.8%). Build a fraudulent AD crowdsourcing

tagging system that combines real-time interception with algorithms.

Final conclusion: College students' acceptance of in-app ads is not a passive compromise, but a precise trade-off based on "utility benefit - control cost - risk loss". Developers must place "user sovereignty" at the core of commercialization and reconstruct the trust framework through "contextualized dynamic adaptation (duration compression), enhanced control (one-click skip), and risk transparency (privacy tips)" in order to achieve a win-win situation for commercial value and user experience.

7. Theoretical Advances and Practical Implications

The study found a triple breakthrough in digital advertising theory: The "utility-control paradox" : while utility expectations drive acceptance behavior, the acceptance rate gap between ACC2 and ACC1 (67.8% vs 31.5%) proves that the lack of control offsets the incentive effect. Among the students in the high group, those with both high utility expectations (UES1≥4) and high perceptual control (PBC1≥4) had 89.2% advertising engagement, significantly higher than those in the single-condition group ($p<0.001$). Multi-dimensionality of risk perception: Factor payloads for PPR1 (privacy collection), PPR2 (induced traps), and PPR3 (information fatigue) were 0.79, 0.82, and 0.76 respectively, forming a "safety - cognition - energy" three-dimensional risk structure. Negative binomial regression showed that for every additional 1 point of risk perception, the click-through rate of advertising decreased by 27.5%.

Context-sensitive mechanism: Time pressure works by modulating the attitude-behavior path, and the coefficient of influence of attitudes towards rush hours on acceptance drops from 0.356 to 0.219 (Δ=-38.5%). At the practical level, a dynamic adaptation framework is proposed, a strategy for improving the conversion rate of tool APP points (UEC1 average 4.32 points) is suggested, and a reward mechanism that can be skipped for ≤10 seconds is proposed; Social apps strengthen the ACC3 (Creative Recommendations) advantage and develop immersive short video ads within 15 seconds; Privacy transparency by embedding real-time data collection prompts in the advertising SDK, experiments have shown that this measure reduces PPR1 concerns by 33.8%. The scene response mechanism automatically compresses AD duration based on usage time periods, and the acceptance of 5-second ads during commuting hours is 2.3 times higher than that during regular hours.

We need to pay attention to two limitations. The differences in effect of video/interstitial ads were not distinguished, and graduate students accounted for only 18.2% of the sample. In the future, eye-tracking technology could be combined to capture "unconscious AD avoidance" behaviors (such as the divergence between the ACC3 recommendation intention and the actual length of eye gaze). It is suggested that longitudinal studies be expanded to test the curve of advertising fatigue (PPR3) over usage cycles to provide a basis for dynamic frequency control.

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