Impact of Persuasive Advertising Design in APPs on User Intention to Use

Authors: Yu Baojun, Gong Tingting, Gao Wanrong

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Abstract

[Purpose/Significance] The development of internet communication has intensified competition in the promotion and marketing of mobile APP products, with induced advertising marketing models gradually gaining favor among APP vendors. Investigating the influence of APP induced advertising element design on users' willingness to use APPs can assist APP vendors in selecting appropriate product marketing strategies and expanding download and usage volumes. [Method/Process] Based on the Technology Acceptance Model and Perceived Risk Theory, this study developed a simulated APP induced advertising webpage prototype through the survey experiment method to reproduce the entire process from user click to download, embedded a questionnaire to collect data, and employed structural equation modeling for data analysis. [Results/Conclusion] Through coding and clustering, four APP induced advertising design factors were identified: necessary reminders, reminder clarity, installation options, and advertisement-APP consistency. The findings reveal that: users' perceived risk of APP induced advertising reduces their willingness to use the APP, while satisfaction with APP induced advertising increases users' willingness to use the APP; the four APP induced advertising design factors increase users' willingness to use the APP to varying degrees.

Full Text

The Impact of APP Induced Advertising Design on User Willingness to Use

Yu Baojun, Gong Tingting, Gao Wanrong
School of Business and Management, Jilin University, Changchun 130012

Abstract

[**Purpose/Significance**] The development of internet communication has intensified competition in mobile APP product promotion and marketing, leading APP developers to increasingly adopt induced advertising marketing models. Investigating how design elements of APP induced advertising influence user willingness to use can help APP developers select appropriate marketing strategies and expand download and usage rates. [**Method/Process**] Based on the Technology Acceptance Model and Perceived Risk Theory, this study employs an experimental survey method to develop simulated APP induced advertising webpage prototypes that recreate the entire user journey from click to download. Questionnaires are embedded within the prototypes to collect data, which is then analyzed using structural equation modeling. [**Results/Conclusion**] Through coding and clustering, we define four APP induced advertising design factors: necessary reminders, reminder clarity, installation options, and ad-APP consistency. The findings reveal that users' perceived risk from APP induced advertising reduces their willingness to use the APP, while satisfaction with the advertising increases willingness. The four design factors enhance user willingness to use the APP to varying degrees.

Keywords: APP induced advertising; advertising design elements; user willingness to use; perceived risk

Mobile applications (APPs) have become essential tools for internet users, with approximately 3.59 million APPs currently in the domestic market. To increase downloads, some developers employ induced advertising for product promotion, hiding advertisements within built-in mobile browsers and disguising them as attractive news, videos, or system notifications, or embedding them directly into content to entice clicks. These disguised elements actually display product advertisements and download interfaces. Due to the interactive nature of mobile advertising, users can choose whether to download while viewing ads. However, some APP advertisements are deliberately designed to download and install silently without user permission, undoubtedly infringing upon users' right to know and right to choose, increasing security and privacy risks, and generating negative emotions that affect usage intentions.

Research on APP usage intentions has produced substantial empirical findings using theoretical frameworks such as ECM (Expectation Confirmation Model), TAM (Technology Acceptance Model), and UGT (Uses and Gratifications Theory). Kuo Lun Hsiao found that three APP quality factors—information quality, system quality, and service quality—significantly impact satisfaction and perceived value, thereby influencing continued usage intention [1]. Wei Peng established a model based on the extended Unified Theory of Acceptance and Use of Technology (UTA2) to examine and verify how application type moderates continued usage intention across three popular mobile categories: social, gaming, and productivity applications [2]. From the user perception perspective, numerous scholars have linked perceived usefulness, perceived consistency,

and other factors to APP usage intention. Chen Rong et al. (2016) found that perceived risk significantly affects user satisfaction, which in turn influences willingness to use mobile shopping APPs [3]. Islam T emphasized the importance of self-image congruence for understanding mobile app adoption behavior [4]. Nam C H explored relationships among perceived enjoyment, service quality, advertising, perceived usefulness, perceived ease of use, and continued usage intention [5]. Min-Hwa Lee analyzed taxi APP usage intention and identified performance expectancy as a key determinant [6].

Existing research on how APP advertising design affects user willingness has primarily adopted a product marketing perspective. Xu Minyu et al.' s study [7] demonstrated that cognitive response patterns significantly impact audiences during advertising dissemination, with cognitive reactions influencing attitude formation and change toward applications, generating both positive and negative response modes that affect usage intention. The use of induced advertising for APP promotion has also been termed mobile APP marketing. Users often exhibit resistance factors when encountering mobile advertisements. When APP developers blindly push marketing information, enabling passive or silent downloads without consumer permission, the effect can be counterproductive (Huang Hua, 2010; Sun Yongbo & Gao Xue, 2016) [8][9]. Additionally, Kim and Park [10] identified that online advertising significantly affects shopping intention among various factors influencing online purchasing, suggesting advertising may have similar effects on APP usage intention.

Building on existing research, this paper analyzes the interactive display process of APP induced advertising and proposes that perceived risk and satisfaction generated when users receive induced advertising information become key factors affecting their APP usage. Accordingly, we construct a mobile APP user willingness model. For the advertising display process, we introduce four critical design elements related to users' right to know and right to choose: necessary reminders, reminder clarity, installation options, and ad-APP consistency, investigating their moderating effects on user willingness.

2.1 APP Induced Advertising Display Process

Mobile advertising' s interactive nature allows users to select, exit, or perform other actions while viewing ads. This study analyzed and summarized the display processes, interactive options, and presentation methods of induced advertisements from 18 popular APPs, identifying a general display process and methodology as shown in Figure 1 [Figure 1: see original paper].

Comparative analysis of these 18 APPs' induced advertising display processes revealed that to protect users' right to know and right to choose, seven key process information points should typically be displayed: whether download labels are present, whether the application name is clearly stated, download channels, download progress, whether installation labels are clearly shown, installation channels, and installation progress. The collected advertising samples exhibited

significant variation in the clarity and omission of these seven key information points, as illustrated in Table 1 . Whether these critical process information points are clearly displayed to users affects their willingness to use the downloaded APP.

2.2 Definition of Moderating Variables

To describe variations in displaying these seven key process information points, we propose four variables: necessary reminders, clarity level, installation choice, and consistency between advertisement and actual downloaded APP. Variable definitions and values are as follows.

2.2.1 Necessary Reminders Necessary reminders refer to essential information that induced advertising should communicate to respect users' right to know and right to choose, primarily comprising the presence, absence, or display format of the seven key process information points described above. Using cluster analysis to classify the 18 advertising samples, we limited the "necessary reminder" variable to two categories through the following process:

First, we coded each sample' s display of the seven key process information points, removing three samples with identical coding, leaving 15 advertising samples as shown in Table 2 . Using K-means cluster analysis in SPSS 22.0 with cluster number set to 2, the results appear in Table 3 . We selected the webpage closest to each cluster center as representative: cases 3, 6, and 9 for the first cluster, and cases 10 and 11 for the second cluster. Further coding of these five experimental samples (Table 4) revealed that samples 3, 6, and 9 simultaneously featured "A. Download label" and "D. Download progress," while samples 10 and 11 lacked these two factors. All five samples included factor "B. Application name."

After analyzing the clustered samples, we set the "necessary reminder" variable values as "more" and "less," with specific meanings detailed in Table 5 . The "more" condition includes displaying "download to view" labels after users click the initial ad interface, showing download progress bars during APP download, displaying APP names throughout the download interface, and presenting APP download completion interfaces. The "less" condition lacks these elements.

2.2.2 Clarity Level In *The Design of Everyday Things*, Norman notes that when browsing content-focused mobile interfaces, users must extract needed information from large amounts of data [11]. Text and color are crucial elements in mobile interface design, occupying substantial space. Recognizable text and vivid colors accelerate content dissemination. In design practice, larger font sizes and brighter colors increase reminder clarity. Therefore, this study uses interface text font size and color as values for the clarity level experimental variable, as shown in Table 6 .

2.2.3 Installation Options Analysis of collected samples reveals that many APP induced advertisements complete direct download and installation when users accidentally click, without providing installation options. This design that ignores user choice rights may affect willingness to use the APP. Values for the installation options experimental variable appear in Table 6.

2.2.4 Consistency Between Advertisement and Actual Downloaded APP Many APP induced advertisements fail to display the APP's functions in the ad interface, instead disguising themselves as attractive news or prize links to attract clicks. This soft advertising approach fails to provide correct information guidance, potentially causing user dissatisfaction and affecting usage intention. Values for ad-APP consistency appear in Table 6.

Table 6 presents the values for variables "clarity level," "installation options," and "consistency between advertisement and actual downloaded APP." For clarity level—high: large font size for "download to view"/"view details"and "short video APP" labels, with blue buttons; low: small font size with white buttons. For installation options—present: providing a download choice button after viewing app details; absent: no such button. For consistency—congruent: ad interface content matches the downloaded APP' s attributes, functions, and application scope; incongruent: mismatched content.

2.3 Research Model and Hypotheses

2.3.1 User Perceived Risk and Usage Intention The relationship between perceived risk and usage intention has been extensively tested across applications. Belanger argues that users only consider adopting technology after information risk concerns are properly addressed [12]. E-commerce researchers find that users with lower perceived risk of information systems such as e-banking [13], e-commerce platforms [14], and shopping websites [15] are more likely to use these systems. Shin discovered that perceived risk of social networking sites negatively correlates with usage intention [16]. In mobile information systems, research shows lower perceived risk affects mobile e-banking usage [17], APP usage intention [18], and cloud storage service adoption [19]. Therefore, this study proposes that when users perceive lower risk from APP induced advertising, their intention to use the APP strengthens, believing such APPs are less likely to cause negative events (e.g., personal information leakage). Based on this, we hypothesize:

H1: User perceived risk of APP induced advertising negatively correlates with willingness to use the APP.

2.3.2 User Satisfaction and Usage Intention Bhattacherjee' s ECM theoretical model validates user satisfaction as a key variable positively affecting information system usage intention [20]. Numerous scholars have confirmed that user satisfaction positively influences continued usage intention across contexts including mobile libraries [21], online shopping [22], reading promotion [23], and

mobile data services [24]. Delone notes that higher system satisfaction strengthens usage intention [25]. Calisir F found that under mandatory use conditions, systems with higher satisfaction demonstrate greater usage efficiency [26]. The APP induced advertising display process can be viewed as a technology adoption process. If users are satisfied with the entire display process from viewing ads to clicking download and installation, their willingness to use the downloaded APP increases. Based on this, we hypothesize:

H2: User satisfaction with the APP induced advertising display process positively correlates with willingness to use the APP.

2.3.3 Moderating Effects of Necessary Reminders, Reminder Clarity, Installation Options, and Ad-APP Consistency Cognitive response theory states that when audiences receive information, cognitive responses affect attitude formation and change, even becoming dominant conditions for attitude change [27]. From the audience perspective, advertising exposure leads to cognitive responses that influence attitude change. Users' perceived risk of advertising represents one cognitive response manifestation—the possibility that ad content may cause losses [28]. Sun Yongbo et al. note that alliance APPs conduct marketing activities based on a software platform with multiple merchants, triggering users' perceived privacy risk and affecting purchase intention [29]. APP induced advertising shares similarities with alliance APPs, relying on news, videos, and other carriers to increase downloads. This induced advertising model can also cause perceived risk, thereby affecting user satisfaction and willingness to use the downloaded APP.

According to information foraging theory [30], when users are interested in information, they continue clicking, requiring increasingly stronger information attraction; otherwise, information "foragers" abandon the search. For APP induced advertising, display content must be richer, with clear descriptions and links providing clear guidance about what information will be obtained next, thereby attracting users. On one hand, advertising content must satisfy consumers' right to know [31]. When users click ads to 深入了解 induced advertising content, interfaces that present necessary reminder feedback such as "download to view" and "download progress" informing users of current status, with clear and prominent reminder information, and where the actual APP obtained matches or exceeds the induced ad' s attributes, functions, and scope, ensuring content and visual continuity [32], lead users to feel their right to know is respected throughout the download process, psychologically reducing perceived risk and increasing satisfaction. On the other hand, advertising content must ensure consumers can effectively exercise free choice rights [33]. If the APP induced advertising display process provides a download choice button after users browse app details—i.e., includes the installation option element—users feel their choice rights are respected, reducing perceived risk while increasing satisfaction with the display process and further enhancing APP usage intention.

Based on this analysis, we propose:

2.3.3.1 Moderating Effects on Perceived Risk → Usage Intention

H3: Under high necessary reminder conditions, the negative effect of perceived risk on usage intention will be weaker than under low necessary reminder conditions.

H4: Under high reminder clarity conditions, the negative effect of perceived risk on usage intention will be weaker than under low reminder clarity conditions.

H5: When installation options are present, the negative effect of perceived risk on usage intention will be weaker than when installation options are absent.

H6: When advertisement and actual downloaded APP are consistent, the negative effect of perceived risk on usage intention will be weaker than when they are inconsistent.

2.3.3.2 Moderating Effects on Satisfaction → Usage Intention

H7: Under high necessary reminder conditions, the positive effect of satisfaction on usage intention will be stronger than under low necessary reminder conditions.

H8: Under high reminder clarity conditions, the positive effect of satisfaction on usage intention will be stronger than under low reminder clarity conditions.

H9: When installation options are present, the positive effect of satisfaction on usage intention will be stronger than when installation options are absent.

H10: When actual downloaded APP is consistent with the advertisement, the positive effect of satisfaction on usage intention will be stronger than when they are inconsistent.

The theoretical research model is shown in Figure 2 [Figure 2: see original paper].

3 Research Design

To measure user responses to different types of induced advertising, this study employs a survey experiment method. First, we developed a simulated APP induced advertising webpage featuring 16 types of induced ads, each representing one combination of values across the four variables: necessary reminders, clarity level, installation options, and ad-APP consistency. Participants were randomly assigned to one advertising mode, experiencing the complete process from display to download and installation through interactive operations. Questionnaires then measured user perceptions and attitudes toward the process.

3.1 Simulated Induced Advertising Design

Based on the moderating variable values—(1) more vs. less necessary reminders; (2) high vs. low clarity; (3) presence vs. absence of installation options; and (4) consistency vs. inconsistency between advertisement and actual APP—we

enumerated all possible combinations, yielding 16 distinct display modes. Accordingly, we designed 16 modes of interactive simulated webpages, as shown in Table 7 .

Following these 16 display modes, we created 16 simulated webpages, each modeling the complete APP download process through induced advertising: from viewing browser ads, clicking download, to installation completion, supporting user interactive operations. Example webpage prototype elements are shown in Figure 3 [Figure 3: see original paper].

3.2 Questionnaire Measurement

After users completed the full experience with a randomly assigned induced advertisement, the questionnaire measured their perceptions and attitudes regarding perceived risk, satisfaction, usage intention, and their experience of the advertisement across the four dimensions. Scale items are detailed in Table 8 .

The scales include: Necessary Reminder (NR) with 3 items measuring whether download prompts help users understand and remind them; Clarity (DC) with 3 items assessing prompt prominence and readability; Installation Option (IO) with 3 items evaluating whether users feel they have choice rights; Ad-APP Consistency (AC) with 3 items measuring congruence; Perceived Risk (PR) with 6 items adapted from Pavlou et al. (2007) [37] assessing information collection and privacy concerns; Satisfaction (US) with 3 items from Bhattacherjee (2001) [38]; and Usage Intention (UI) with 3 items from Venkatesh & Goyal (2010) [39].

4 Data Analysis

4.1 Descriptive Statistical Analysis

A total of 535 users participated in the simulation and completed questionnaires. After removing invalid responses, 504 valid questionnaires remained (94.21% validity rate). Each participant encountered a randomly generated advertising mode. Statistical analysis revealed relatively uniform distribution across the 16 advertising modes. Descriptive statistics are shown in Table 9 , including age distribution and frequency of passive APP downloads.

4.2 Manipulation Check

To verify whether experimental variable control affected participants as intended, we designed three manipulation check questions for each moderating variable, using mean values for independent samples t-tests [40]. Results in Table 10 show participants rated necessary reminders (more > less), reminder clarity (high > low), installation reminders (present > absent), and ad-APP consistency (consistent > inconsistent) significantly higher, with all differences statistically significant. This confirms successful manipulation of the four experimental variables.

4.3 Reliability and Validity Tests

To demonstrate questionnaire validity and reliability, we conducted reliability and validity analyses. Cronbach' s Alpha coefficients assessed reliability; values above 0.6 indicate good reliability. Table 11 shows all dimension α values exceed 0.9, confirming data reliability.

Confirmatory factor analysis indicated good overall model fit: ^{2}/df = 1.181, RMSEA = 0.019, GFI = 0.988, AGFI = 0.977, CFI = 0.999, IFI = 0.999, TLI = 0.999. For convergent validity, factor loadings for perceived risk (pr), satisfaction (us), and usage intention (ui) all exceeded 0.9, with average variance extracted (AVE) values above 0.8 and composite reliability (CR) above 0.9, indicating excellent convergent validity (Table 12). For discriminant validity, significant correlations ($p < 0.001$) existed among pr, us, and ui, with correlation coefficients' absolute values all less than corresponding AVE square roots, demonstrating both correlation and discrimination (Table 13).

4.4 Hypothesis Testing

4.4.1 Main Effects Test Using AMOS 22, we estimated base model parameters via structural equation modeling, including only direct effects (H1 and H2). Fit indices indicated good model fit: ^{2} = 38.171, ^{2}/df = 1.590, CFI = 0.993, TLI = 0.990, RMSEA = 0.029, PCLOSE = 0.985. Table 14 shows perceived risk negatively affects usage intention (β = -0.29, $p < 0.001$, H1 supported), while satisfaction positively affects usage intention (β = 0.41, $p < 0.001$, H2 supported). Thus, both H1 and H2 are supported.

4.4.2 Moderating Effects of APP Induced Advertising Elements We used multi-group analysis to test moderating effects, which can compare variable values, correlation coefficients, and impact coefficients across groups, as well as overall model differences. Assuming the unconstrained model is true, we tested measurement coefficient models across four groupings. Non-significant P-values ($P > 0.05$) indicate model invariance [41]. Table 15 shows P-values of 0.313, 0.559, 0.305, and 0.452 for "more/less necessary reminders," "high/low reminder clarity," "presence/absence of installation options," and "consistent/inconsistent ad-APP," respectively—all exceeding 0.05. This indicates no significant model differences across groups, demonstrating cross-group invariance.

We then used "parameter pairing" for path difference analysis, with critical ratio as the reference. Absolute critical ratio values exceeding 1.96 indicate significant differences at the 0.05 level, while values exceeding 3.29 indicate significance at the 0.001 level [42]. Table 15 critical ratios reveal significant differences across all four moderating variable groupings for both perceived risk → usage intention and satisfaction → usage intention paths.

Figure 4 [Figure 4: see original paper] presents structural model analysis results. All hypotheses are supported, with detailed results summarized in Table 16 .

5 Conclusion

5.1 Research Findings

When mobile users click APP induced advertising that triggers downloads, discrepancies from expectations create perceived risk, affecting user satisfaction and subsequent usage intention. Analysis of the four variables—necessary reminders, reminder clarity, installation options, and ad-APP consistency—reveals: (1) Perceived risk from APP induced advertising reduces usage intention, while satisfaction increases it. When induced advertising design ensures users' right to know and choose through these four elements, usage intention improves to some extent. (2) Rich necessary reminder content reduces the negative effect of perceived risk on usage intention while strengthening satisfaction' s positive effect. Informing users about upcoming download content when they click provides clearer expectations and full knowledge, reducing risk perception. Displaying download progress and APP names throughout the process makes users feel the download is controllable and their right to know is respected, enhancing satisfaction. Both reduced risk perception and increased satisfaction improve usage intention. (3) Font size and clarity of download labels affect perceived risk and usage intention. When "download to view," "view details," or "short video APP" labels appear in large, conspicuous, clear fonts and button colors after clicking, users clearly understand download purposes before downloading. Such high-clarity reminders make users feel their rights are respected, reducing "deception-induced" anger. Clear, explicit communication also makes APPs appear more "aboveboard," reducing perceived risk, building trust, and enhancing satisfaction and usage intention. (4) Installation options are crucial for exercising choice rights and clearly signaling "this is an APP download/installation." When users feel the download process remains under their control, with choice buttons after viewing details, their autonomous decision-making power is ensured. This improves download experience, substantially reduces perceived risk' s negative effect, and strengthens satisfaction' s positive impact on usage intention. (5) Inconsistency between ad content and downloaded APP is a major trigger for feeling deceived and generating strong perceived risk. When ads disguised as news or soft articles create expectations of reading focus news or watching interesting videos but actually lead to APP downloads, users feel deceived, triggering strong dissatisfaction and anger. This deception intensifies perceived risk, especially when ad content diverges greatly from the APP' s attributes, functions, and scope. Consistency between ad display content and downloaded APP can weaken perceived risk' s negative effect on usage intention.

Based on these findings, APP developers using induced advertising should: (1) Reduce perceived risk by improving ad-APP consistency, ensuring information from ads matches actual APP attributes, functions, and scope. This can be achieved by ensuring content relevance (e.g., using game background story videos for game APP ads) or adding introduction interfaces before download that concisely present APP attributes and functions, giving users consideration time and choice power. (2) Optimize induced advertising interface design. Since

more necessary reminders, higher clarity, installation options, and ad-APP consistency both weaken perceived risk's negative effect and strengthen satisfaction's positive effect, designers should respect users' right to know and choose. Specifically: increase necessary reminders including "download to view" labels after initial clicks, download progress displays, and "download complete" notifications to ensure transparency; improve reminder clarity by placing information prominently using high-contrast colors and appropriate font sizes for readability while maintaining visual continuity; and provide "download or not" buttons after users browse app details to respect choice rights.

5.2 Research Limitations

First, data primarily came from university students. User groups may differ from middle-aged and elderly users in advertising recognition, perceived risk factors, and satisfaction components. The sample lacks comparison across age structures and occupational groups. Second, to demonstrate the effects of the four design elements, moderating variables were dichotomized ("more/less," "high/low," "present/absent," "consistent/inconsistent"). While intuitive, this approach lacks refinement. Future research should further identify additional design elements, develop more granular variable levels, and expand sample collection to enrich the study.

Author Contributions:
Yu Baojun: Conceptualized research, designed study, wrote and revised manuscript
Gong Tingting: Wrote and revised manuscript
Gao Wanrong: Collected data and performed data analysis

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Yu baojun, Gong Tingting, Gao wanrong
School of Business and Management, Jilin University, Changchun 130012

Abstract: [Purpose/significance] The development of Internet communication has brought more fierce competition for the promotion and marketing of mobile app products, and the induced advertising marketing model has gradually been respected by app manufacturers. Exploring the impact of the design of APP induced advertising elements on users' willingness to use app will help app manufacturers choose an appropriate product marketing model and expand downloads and usage. [Method/process] Based on the technology acceptance model and perceived risk theory, a prototype of simulated app induced advertising web page was developed by experimental method to reproduce the whole process from Click to download, embedded in the questionnaire to collect data, and analyzed the data by structural equation model method. [Results/Conclusion] Four design factors of APP induced advertising are defined through coding and clustering: necessary reminder, clarity of reminder, installation options and consistency between advertising and app. The study found that users' perceived

risk of APP induced advertising will reduce app use intention, and users' satisfaction with app induced advertising will improve users' app use intention; Four app induced advertising design factors will improve users' willingness to use app to varying degrees.

Key Words: App induced advertising; advertising design elements; user' s willingness to use; perceived risk

Note: Figure translations are in progress. See original paper for figures.