Investigating of In-app Advertising Features’ Impact on Effective Clicks for Different Advertising Formats

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Abstract
This paper investigates the factors impacting effective ad clicks and the moderating roles of ad formats. It uses 865,225 impressions of mobile in-app advertising from a digital advertising company in China. Based on the uses and gratifications (U&G) theory and the attention, interest, desire and action (AIDA) model, we identify four ad features, including entertainment, targeting, user control and incentive. We study and compare the relationships between these factors and the effective clicks for three types of in-app advertising formats, including banners, pop-ups, and native ads. The results show entertainment cannot significantly promote effective clicks for all formats but targeting users has positive impact on banners and pop-ups significantly. The use control element has mixed results. The close button declines effective clicks of banner, but the combination of close button and countdown promotes effective clicks of pop-ups. Incentive can only boost effective clicks for natives.

Keywords
Mobile in-app advertising, banner, pop-up, native ad, effective clicks, effectiveness, entertainment, targeting, user control, incentive.

Introduction
The evolution in smartphone technology has led to mobile devices playing a critical role in the life of people all over the world today. In 2017, almost one in three people around the world own a smartphone (Statista, 2018). The increase in mobile device adoption has fueled the growth in mobile advertising, which has been the fastest-growing advertisement format (Lee and Shin, 2016). Mobile ad spending has surpassed desktop advertising in the U.S. and China since 2015 (Appsamurai, 2016). In the US, the revenue from mobile advertising has exceeded the combined ad revenues from newspaper, magazines, and radio (Sun et al, 2016).

Mobile advertising can be classified into three types: Short Message Service (SMS) ads, web ads, and in-app ads. Among them, in-app advertising is the most crucial advertising format in the smartphone era (Grant, 2014). It integrates ads into mobile apps, enabling advertisers to effectively target users based on the relevance of apps. The global pervasion of smartphones devices has dramatically increased mobile apps use. Users are found to spend more than 85% of their mobile time on apps (Perez, 2015).
Unlike web advertising, which can be easily blocked by installed add-ons, in-app advertising cannot be removed by users. In other words, it enables developers to provide free apps, but make money. In-app advertising helps promote brand or product awareness, engagement and advocacy (Jian and Yazdanifard, 2015). Clicking on ads in an app is far more likely than via a mobile browser: the average click-through rate for in-app ads is nearly 2.8 times higher than mobile web ads, and the average revenue generated per thousand impressions for in-app ads is about 2.5 times than that of mobile web ads (Sun et al, 2016).

However, in-app ads may not always be effective. Extant research showed in-app ads annoy users (Gupta, 2013), or even interrupt app usage and hence be viewed as hindrance (Nadeem et al, 2015). In-apps ad such as online banners were found unsatisfactory (Gupta, 2013). Nowadays, advertising has been considered as a part of customer services (Gharibi et al. 2012). Annoying advertising can reduce users’ app experience. In addition, many ad clicks could be unintentional (Gupta, 2013). Studies also showed another incredible fact: billions of dollars were spent for mobile advertising annually, but more than half of this was wasted (Jian and Yazdanifard, 2015). All this indicates that the effectiveness of in-app ad is still questionable. Some marketers may just follow the modern advertising trend and anticipate positive outcomes. However, new methods do not always bring the positive outcome, because the marketers may not understand the nature and the usage of these new ad methods. The improper or incorrect utilization of these new ad methods cannot appeal to their audience. Thus, it is important to explore the effectiveness of in-app advertising and its potential factors, which can maximize the expected revenue generated over the user’s app session. Therefore, this paper aims to address the research question:

1) What are the drivers on effective clicks?
2) How do these drivers impact the effective clicks differently for different in-app advertising formats?

**Literature Review**

Mobile advertising refers to the distribution of advertising messages to audiences via mobile handsets in formats of graphics, text, music, or videos in order to reach advertisers’ goals (Nelson, 2000). Studies in the mobile advertising field have produced a range of results. For example, Tsang et al (2004) conducted the first attitudinal and highly regarded research on mobile advertising. Through survey they identify entertainment followed by credibility and irritation affects consumers’ attitudes to receiving mobile advertising. They also demonstrate a direct and positive relationship between consumer attitudes and behavior intentions, though the general attitudes to receiving mobile ads are negative (Tsang et al., 2004). Later, Gao et al (2009) discovered that interactivity positively influences consumer attitudes towards mobile ads (Gao et al., 2009). Moreover, Zhang and Mao (2008) showed that perceived usefulness and perceived ease of use could predict the intention to receive SMS (Short Message Service) advertising (Zhang and Mao, 2008). Additionally, Moynihan et al. (2010) identified five factors involving attitude towards e-mail marketing, SMS messaging, perceived utility of SMS advertising, perceived knowledge, and self-efficacy concerning SMS advertising’s ability to influence consumers’ beliefs and attitude towards SMS advertising (Moynihan et al., 2010).

There studies on mobile advertising are from pre-smartphone era and focus on legacy format such as SMS text message advertising (Nadeem et al, 2015). The literature on in-app advertising is still scant (Zhong and Michahelles, 2013). However, smartphones and in-app advertising are featured by their signature attributes, and influence their customers in a distinct way from traditional phones and advertisings. Hence, there is a clear need to expand academic research in the context of in-app advertising.

Furthermore, the extant research on the mobile field has still narrowly concentrated on consumer attitudes or behavioral intentions predominantly (Nadeem et al, 2015). In contrast, rare empirical studies have examined consumers’ actual behavior to mobile in-app advertising yet. This study is thus carried out to address the gaps in the current literature for the purpose of a more comprehensive explanation for mobile advertising.

**Theoretical Foundation and Development**

The theoretical framework of this study is based on the users and gratifications (U&G) theory and the attention, interest, desire and action (AIDA) model.
**Uses and Gratifications Theory**

Uses and Gratifications (U&G) Theory proposed a theory to understand users’ psychology and behavior of choosing a medium based on their motivation and needs satisfaction. It assumes that users have no media preference in advance, and suggests that users’ perceptions to media determines their acceptance of media over other information resource such as reviews (Elihu et al., 2011). Entertainment, informativeness, and irritation were identified as crucial dimensions that affect users’ acceptance of a medium and gratification (Ha et al., 2014). In particular, entertainment and informativeness positively impact on attitudes, but irritation negatively impacts, whether the internet or mobile networks are involved (Shankar and Balasubramanian, 2009). It has been used to explain users’ motivation to accept traditional media such as TV (Eighmey and McCord, 1998). In this study, the U&G theory is adopted to understand users’ psychology and behavior on accepting in-app advertising, which is a special form of mass communication.

**AIDA model**

The attention, interest, desire and action (AIDA) model proposed sequential stages that explicate a customer’s response through the notice of products, the awareness of interests, the arousal of desires, and the decision of consumption (Lewis, 1908). It has been widely applied in marketing for understanding how advertisements impact user subsequent actions. Here, the AIDA model is also adopted to illustrate how in-app advertising affects consumer behaviors.

**Theoretical Development**

This study investigates the effective clicks of an in-app advertisement, which indicates users’ responses to an advertising that are followed by consumption or advertised app download. Some research reported that in 2016, 60 percent of mobile advertisement clicks were accidental, and suggest that clicks should be replaced with consistent measurement of mobile branding and sales-lift effectiveness to evaluate digital advertising performance (Fulgoni and lipsman, 2017). Therefore, the clicks used in this research are effective clicks of users and followed by purchase or advertised app download. In this way, the performance of in-app advertising can be gauged more accurately.

In this study, we propose that entertainment, targeting, and user control as three factors that impact effective clicks of in-app advertisements. They are derived from the key dimensions of U&G theory—entertainment, informativeness, and irritation, respectively. Additionally, incentive is identified as the fourth factor based on the AIDA model.

Entertainment refers to the interest and enjoyment element that a media contains. In-add advertisement, entertainment element could be including animation and/or celebrity images in the ads. The U&G theory..... Prior studies showed that interesting and pleasurable advertisements move and familiarize customers (Liu et al., 2012). Some research has validated that entertainment could foster a positive attitude of customer towards in-app advertising (Raines, 2013; Le and Nguyen, 2014). Thus, we expect that entertainment is an important factor to affect users’ acceptance of in-app advertising and proposed the following hypothesis:

H1: Entertainment positively impacts users’ effective clicks of in-app advertising.
Targeting is proposed as the second factor in this study. It refers to distributing advertisings to app users based on their personal information. Targeting user is derived from informativeness, which is also a key dimension of U&G. It refers to the degree of information richness and the usefulness of a provided media (Ducoffe, 1996). Suitable information does not anger consumers (Varshney, 2003), and in fact, consumers expect information that fits their preferences and interests when they use mobile devices (Robins, 2003). Recipients of useful information have a positive response to advertising (Aitken et al., 2008). To provide an ad to a customer who desires the products can make the ad perceived more informative. Thus, targeting customers through personalized information and providing relevant and informative advertising is expected to boost effective ad clicks. Therefore, the second hypothesis is proposed as follows:

H2: Targeting positively impacts users' effective clicks of in-app advertising.

User control is proposed as the third factor, which enables users to close ads or see remaining time of ads. User control is derived from the irritation of U&G theory. Irritation refers to the way that such advertising annoys consumers (Liu et al., 2012). Users refuse advertisements that are overly manipulative and that irritate them (Ducoffe, 1995). Especially, when consumers receive an excessive number of advertisements, they would feel disturbed (Bruner and Kumar, 2007). Irritation has been shown to determine customers' attitudes towards in-app advertising (Raines, 2013). Recent research indicates minimizing disruption ranked as the top factor for creating positive ad experiences (Singh, 2016), and suggests the advertisement element which give users more controls can reduce irritation (Watson et al., 2013). When the usage of an app is hindered by advertisements, a close button can enable the user to break away from the hindrance. A countdown, which indicates the remaining time of an ad and hints the end of an ad, aims at making user patient to the ad content. Thus, we expect that different user controls differently impact users effective clicks. Therefore, user control is explored at three levels: close button only, countdown only, countdown and close button simultaneously. Because user control aims at reduction of irritation, which negatively impacts the internet and mobile networks (Shankar and Balasubramanian, 2009), we therefore hypothesize as follows:

H3: User control positively impacts users' effective clicks of in-app advertising.

Incentive refers to the ad that rewards users with free gifts, coupons and so on by clicking on the ads, downloading advertised apps, etc. Based on the AIDA model, attempting to sell something should firstly attract attention and awareness of customers (Barry and Howard 1990). It was found that incentive advertising could successfully attain customer's attention (Jian and Yazdanifard, 2015). Since receipts of rewards can dramatically attract customer's attention, Incentive is thus expected to be an important factor impacting the effectiveness of an in-app advertisement. In particular, we hypothesize:

H4: Incentive positively impacts users’ effective clicks of in-app advertising.

Ad format
Mobile apps apply various formats of advertising, such as banner, Interstitial, native, rich media, and videos (MMA 2015). Previous research suggests that various mobile advertising formats have different impacts on advertising effectiveness and advertising persuasion (Wang, 2003). Outing (2004) examined various formats of web ads and proposed that larger web ad format were easier seen than smaller ones. In the same token, larger size web banner ads were easier to attract users’ attention (Rosenkrans, 2010). However, they did not generate more clicks (Bhave et al 2013). More recently, pop-ups were found to gain more positive attitude from users than banners (Xie et al, 2013). Given the mixed results, it is worthwhile to explore what impact effective clicks with the condition of various in-app advertising formats, which features the focus of this study.

Mobile in-app advertisings are usually categorized into banner, interstitial, native, and video (AdMob1, 2017). Moreover, video ads are usually applied in the native and interstitial ads, hence, this paper focuses on the format of banner, interactive (pop-up), and native, but video is investigated as an element of Entertainment.

Banners are advertisements with relevant text and graphics displayed at the top or bottom of the screen, but have little space for detailed information. It is predominantly employed for brand recognition,
because it enables a brand or a product to simply be viewed by as many people as possible (GIMBAL, 2017).

Pop-ups are usually called interstitials, but to emphasize the popping format, they are called pop-ups in this study. They are displayed across the entire or close to entire screen, and often pop up at “natural transition points in the flow of an app, such as between activities or during the pause between levels in a game” (AdMob2, 2017). Pop-ups contain more contents than banners due to their much larger size, thus feature more calls to action, but the development costs are higher than banner ads (Reynolds, 2014).

Native ads mimic original format or layout of their host app in order to seamlessly fit in and naturally integrate with their host app. They attempt to not look like ads and provide optimal user experience (GIMBAL, 2017). The development costs of native ads are also higher than banner ads (Reynolds, 2014).

The proposed research model is illustrated in Figure 1, and this research model will be examined respectively for three formats of in-app advertisement involving banner, pop-up, and native ads.

![Figure 1. Research Model](image)

**Research Context and Data**

We obtained the in-app advertisement data from a large digital advertising companies in China. Examining mobile use in China is critical for research as it has the most mobile phone subscribers in the world and the highest growth rate of mobile device use (Xie et al 2013). And, China is the second largest mobile advertising market in the world after United States (Dogtiev, 2017).

One of the predominant services of this company is to provide a platform that bridges advertisers and app publishers to grow their business. The company offers advertising solutions to the advertisers, and embed the in-house designed ads into apps on the platform through designed algorithms. This platform is compatible with a variety of mobile OS systems, including Android, iOS, webOS, Flash Lite, Windows Phone, and all standard mobile web browsers. This company is collaborating with more than 70,000 apps and thousands of advertiser clients so far. It has more than 300 million app users. The single ad and single day impressions is as high as 120,000, and the single ad and single day clicks is about 10,000.

The study randomly selects 1000 users. All of their app usages during the month of January in 2018 were observed. In total, it includes 132,603 single time app usages, which contain 865,225 impressions for advertisements, including 101 banners, 223 pop-ups, and 133 natives, in 227 apps. Each app only applies one type of advertising format.

**Results and Discussion**

Based on the statistics of the sample data, pop-ups have the highest clicks rate (13.83%), followed by Natives (3.11%), while Banners have the lowest clicks rate (1.02%). It is consistent with the extant study that indicates 80% of users do not like banners (Gupta, 2013).
Next, logistic regression models are used to estimate the probability of effective clicks for the three ad formats. The unit of analysis is each single advertisement impression. The logistic regression model equation is displayed as below,

\[
P(\text{Effective Clicks}) = F(\beta_0 + \beta_1 \text{Entertainment} + \beta_2 \text{Targeting} + \beta_3 \text{UserControl} + \beta_4 \text{Incentive}).
\]

Here, \(P\) is the probability and \(F\) is the cumulative distribution function of the logistic distribution. Entertainment, targeting and incentive are measured as binary variables, and user control is a categorical variable with two or three levels, depending on the ad format. For the banner format, we only include an indicator variable for a close button, because banners apply no user control, and close button only. For the pop-up format, user control has three levels and we include an additional indicator variable for a close button combined with a countdown. The estimation results with p-values in parenthesis are presented in table 1.

<table>
<thead>
<tr>
<th></th>
<th>Banner</th>
<th>Pop-up</th>
<th>Native</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entertainment</td>
<td>0.14 (0.22)</td>
<td>1.29* (0.07)</td>
<td>0.07 (0.28)</td>
</tr>
<tr>
<td>Targeting</td>
<td>2.25** (0.01)</td>
<td>3.35*** (0.00)</td>
<td>1.65* (0.06)</td>
</tr>
<tr>
<td>User Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UserControl_CloseButton</td>
<td>-0.13* (0.05)</td>
<td>0.29 (0.13)</td>
<td>N/A</td>
</tr>
<tr>
<td>UserControl_CloseButton+Countdown</td>
<td>N/A</td>
<td>0.93** (0.04)</td>
<td>N/A</td>
</tr>
<tr>
<td>Incentive</td>
<td>-0.22 (0.49)</td>
<td>0.76* (0.08)</td>
<td>0.98** (0.04)</td>
</tr>
<tr>
<td>Pseudo R</td>
<td>0.1993</td>
<td>0.3169</td>
<td>0.2753</td>
</tr>
<tr>
<td>N (Impression)</td>
<td>80,237</td>
<td>586,196</td>
<td>198,792</td>
</tr>
</tbody>
</table>

Notes: *\(p<0.1\); **\(P<0.05\); ***\(P<0.01\).

**Table 1. Estimation Results**

**Entertainment**

Based on the results in table 1, entertainment does not show significant impact on banners (\(p\)-value=0.22), pop-ups (\(p\)-value=0.07), or natives (\(p\)-value=0.28), which is, interestingly, different from current research results.

Banners as a small size format may limit the representation/impression of entertainment elements, resulting in an incomplete reveal of their fascination and a reduction of their enjoyableness due to the low visibility. This may explain why entertainment cannot boost clicks of banners. Thus, high cost development of entertainment elements for banners is not recommended, because they are too small to display complicated contexts.

Entertainment cannot impact clicks of natives, either. It may be because some ads are overlooked by users. In compliance with the style of the host apps, natives attempt to not look like ads. For example, Facebook inserts native ads between user posts, and apply the post styles to ads. This aims at enhancement of ad tolerance and improvement of user experience, but it can also cause users to neglect ads easily, which may result in the passing of entertainment in ads.

Surprisingly, entertainment cannot boost the effective clicks of pop-ups. Pop-ups as a larger size format can provides more area for advertisers to express abundant and enjoyable contents, which should validate ad enrichment and fascination. However, it does not impact the effective clicks.

Therefore, though extant research showed entertainment could foster users’ positive attitudes, or alleviate users’ negative attitudes towards in-app advertising (Raines, 2013; Le and Nguyen, 2014), the positive attitudes cannot be fully converted to effective clicks, which are followed by actual consumptions. Possibly, many users conducted clicks, but most of them did not make purchases and download
advertised apps. Therefore, though entertainment may foster users' positive attitudes to advertising, it cannot promote the effective clicks for in-app banners and natives.

**Targeting**

Targeting can significantly boost the effective clicks of banners (p-value=0.01) and pop-ups (p-value=0.00), while its impact is suggestive but inconclusive for natives (p-value=0.06).

Unlike in banners and pop-ups, the impact of targeting users on effective clicks of natives is only suggestive. In other words, it either indicates that the targeting algorithms are not significantly effective, or indicates that untargeted users also conducted moderate effective clicks on natives. For the first explanation, targeting can be further examined for each app that applies natives. If the no significant impact on effective clicks happens to major apps, and the underlining algorithms are various, then the second explanation can be considered. The consistent style may equally make targeted users miss ads or make untargeted users notice ads. In other words, the native advertising may not be an effective method to catch targeted users, but it may moderately catch untargeted users. Then natives are suggested for advertisers with wide or generic customers.

**User Control**

Banners rarely apply countdowns due to this limited space. Natives rarely apply all types of user controls, because they need to naturally fit in the app. Thus, in our data sample, banners only apply close buttons, and natives do not apply any user controls. The results in table 1 show that close button negatively affects the effective clicks of banners (coefficient=-0.13, p-value=0.05), while user control at level of close button and countdown simultaneously positively impacts the effective clicks of pop-ups (coefficient=0.93, p-value=0.04). All other impacts are not significant.

Banners usually have the same width as the phone screen and uniformed height. They are either on the top or on the bottom of the screen. During the whole session of an app use, there can be only one banner displayed from beginning to end or multiples in rotation. Thus, a banner occupies a part of the screen while using an app, which can hinder the app use. Some users are eager to break away from the annoyances of ads by hitting the close button whenever a banner appears. That may explain why offering a close button declines clicks.

For pop-ups, there is no significant difference between countdown and close button applied separately. Unlike in banners, the close button in pop-ups does not reduce the effective clicks. It may infer that users can tolerate pop-ups more than banners, which also explains the higher click rates of pop-ups (13.83%) than that of banners (1.02%). Close buttons aim at improving user experience with an ad termination option, but anticipate trading off users’ clicks. However, our results show that it neither decreases nor increases effective clicks for pop-ups. Pop-ups, also called interstitials, appear at “natural transition points in the flow of an app, such as between activities or during the pause between levels in a game” (AdMob2, 2017). In other words, at that moment, users take a break from apps, and may be not hindered by ads. Both the timing and large format enable users to notice pop-ups, but not pass them by immediately closing them. Users will click the ads that they are interested in, even if there is a close option. In contrast, countdown forces users to watch ads, which aims at attracting users to promote clicks. However, the result shows that it does not bring the expected clicks. It may be because the countdown strengthens impressions by trading off users’ tolerances.

The results also show that the combination of close button and countdown can boost the effective clicks for pop-ups. A close button may hint users that they can control the ad. Based on this hint, users may not rush to close ads immediately. An associated countdown tells users the remaining time of an ad synchronously, which may make users be patient and be attracted by the ad. This implies that close button and countdown can complement each other, and may explain why their combination can positively affect clicks of pop-ups.

**Incentives**

The results in table 1 show that incentives cannot significantly promote effective clicks of banners (p-value=0.49), but can marginally promote effective clicks of pop-ups (p-value=0.08), and can significantly promote effective clicks of natives (p-value=0.04). Banners are too small, which could make their
creditability questionable. According to the research, 54% of users do not click banners because they do not trust them (Laura, 2015), which may explain the ineffectiveness of incentives.

Incentives can affect clicks of pop-ups to some extent, but are not conclusive. The literature shows that credibility positively affects users’ attitudes and clicks on ads (Le and Nguyen, 2014). It may infer that incentives with low credibility are often perceived as baits, traps or virus, which users intend to avoid. On the contrary, incentives with high credibility could be the ones that have more clicks due to users’ trust. Pop-up as the bigger size ad format offer the possibility to improve incentive reliability. Larger space enables better ad quality. For example, designers can embed persuasive elements such as touching words and delicately designed graphics, which are hard to achieve in banners.

Natives follow the original style of their host app in order to seamlessly integrate with the app. It is believed that the consistent styles of ads and apps enable natives to leverage the trust on the apps that the users have built, and hence enhance the credibility of ads as well as the credibility of the incentives in ads. App credibility, which leads in trust on ad incentives, may explain the significant impact of incentives in natives.

**Conclusion and Next Steps**
Advertising has long been used to increase the awareness of product and brand. Mobile in-app advertising as a new advertising format, provides the advertiser a new channel to approach consumers. While the findings of this research are initial and exploratory, they can serve as a catalyst to initiate discussion and investigation of in-app advertising research. It is also hoped that this study will not only contribute to the growing literature, but also enable advertisers to improve in-app advertising effectiveness and better convince their mobile advertising marketing strategies.

This research compares distinct features in various in-app ad formats using an empirical sample of mobile in-app advertising data. Since the research sample is from China, national culture may limit its generalizability globally. However, China as the second largest mobile market after the U.S. is one of the critical parts that constitute the whole mobile advertising domain. Therefore, it contributes to the mobile advertising study. Moreover, the findings from this research will enhance our understanding of in-app advertising.

Interactions of the variables are not included in this research for simplifying research results. However, some interactions may not make much sense, but some interactions are well worth studying for further research. For example, can targeted incentives boost clicks for all in-app ad formats?

Additionally, investigated variables are not exhaustive. More crucial variables can be included for further research, such as advertisement content and display sequence. For future research, additional data including the unintentional clicks can be acquired. The ad features which impact the total clicks and impact effective clicks can be compared in order to reduce unintentional clicks for each ad format. The above strategies across different ad formats can be compared to see the moderating effect. The impacts of mobile apps on effective clicks can also be studied for future research. Results robustness should be examined by additional data.

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