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An Integrative Approach to Determinants of Pre-Roll Ad Acceptance and Their Relative Impact: Evidence from Big Data

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ABSTRACT


Skippable ads are known to provide better advertising experiences by giving viewers a sense of control with the ability to skip an ad after watching it for a few seconds. Despite the growing interest, few studies have investigated factors that influence skipping or viewership of pre-roll skippable ads. This study examines the determinants of pre-roll ad acceptance by using clickstream data of 2,078,090 users' ad and content viewing behaviors on a popular online video content platform in South Korea. We found that skippable ad acceptance is impacted by personal, situational, and contextual factors that influence the level of goal impediment in online video consumption contexts. We conclude with theoretical and practical implications of the findings.

Ad spending on digital media accounted for over half of the advertising market worldwide for the first time in 2019 (Cramer-Flood 2020). Advertisers focus on digital video advertising given the rapid growth of video-based social media platforms such as YouTube, as shown in recent statistics that 85% of American Internet users watch online video monthly on any device (Statista 2019). Traditionally, digital video advertising has been non-skippable. Pre-roll skippable advertising is a relatively new online advertising format that allows users to skip an ad after watching it for a few seconds before a skip-ad button appears. First introduced as TrueView on YouTube in 2010, this interactive online advertising format has been implemented in many video-based social media platforms. In South Korea, pre-roll skippable ads have been used in major video-sharing platforms (e.g., NaverTV and KakaoTV) which are gaining popularity among South Korean media users (Korea Communications Commission 2018, p. 113).

Compared to non-skippable ads, skippable ads provide greater user control, which improves viewers' ad experiences and increases their satisfaction (Pashkevich et al. 2012). However, ad-skipping behavior is known to reduce advertising effectiveness such as brand recall and search for advertising-related terms (MAGNA 2017). The low ad completion rate is also concerning: The completion rate of skippable pre-roll ads is 52% worldwide, with the US showing 5% lower than the global average (Statista 2018). On mobile devices, two-thirds of users skip video ads at or before half of ad time (Marvin 2014). These numbers show how much consumers choose to skip the ads when they have an option to do so, which may eventually harm advertisers.

Despite the growing interest in pre-roll skippable ads and the practical need to increase their completion rate, there has been scant literature on pre-roll ad-skipping behavior. Existing studies suffer from the following shortcomings: (1) Most studies conduct either experiments or surveys that do not directly

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 Supplemental data for this article (Appendix Tables A1 and A2) are available online at <https://doi.org/10.1080/00913367.2021.1932643>.

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observe viewers' pre-roll ad skipping *behavior*. (2) Previous literature assumes that Internet usage is highly goal-oriented, treating ad skipping as one way to reduce ad intrusiveness caused by goal impediment, which may not be always the case depending on what "mode" or situation a viewer is in (Seyedghorban, Tahernejad, and Matanda 2016). (3) Existing research provides us with an understanding of each determinant of ad skipping but seldom takes an integrated approach to examine the relative importance of these determinants.

To address these gaps, this study uses a large-scale individual-level time-stamped behavioral data from one of the global top 10 portal companies in South Korea to test which factors drive pre-roll ad acceptance. Using such large-scale secondary data including individuals' real-time ad- and video-watching behaviors enables researchers to identify determinants of pre-roll ad acceptance and precisely measure their effects. Another strength of our data set is that the focal platform did not use ad targeting in skippable video ads during our sample period, allowing us to estimate the impact of various factors on ad acceptance while minimizing biases. By incorporating these determinants of ad acceptance in a single model with real-world data from a major video-sharing platform other than YouTube, we expand our understanding of the relative importance of each determinant of ad acceptance and provide practical implications.

Determinants of Pre-Roll Ad Acceptance

Existing literature on pre-roll skippable ads considers ad acceptance—operationalized as (1) the decision to keep watching skippable ads and/or (2) skippable ad viewing time—as one indicator of skippable ad effectiveness (Belanche, Flavián, and Pérez-Rueda 2017a) and examines the determinants of pre-roll skippable ad acceptance. Most studies view ad skipping as a specific type of ad avoidance strategies (Fransen et al. 2015) given the goal-oriented nature of the Internet as a medium (Cho and Cheon 2004). They examine factors that reduce ad intrusiveness, assuming that decreasing ad intrusiveness will lower goal impediment and ultimately increase ad acceptance.

We question the assumption that Internet usage is highly goal-oriented given that there is a variation in the level of goal-directedness depending on what content viewers intend to watch and which gratifications they seek from their viewing experience. Relatedly, individual characteristics such as age and gender may influence the level of goal-directedness when users are

online. Last, situational/contextual factors such as time of day, day of week, and devices can impact the level of goal impediment given how our daily activities are bounded in a temporal dimension or how different media devices create different consumption experiences. While extant research focuses on the characteristics of skippable ads or the arousal or emotions elicited by the ad, we pay more attention to less explored factors such as viewer characteristics and situational/contextual elements. Methodologically, we employ a secondary analysis of clickstream data, while most studies used surveys or experiments. We list these similarities and differences between existing research and our study in Table 1. In the following sections, we introduce personal and situational/contextual factors of pre-roll ad acceptance, develop our hypotheses and research questions, and address the methodological limitations of extant research.

Personal Factors

Motivations for Online Video Consumption

The Web Motivation Inventory provides a framework to understand various motivations for web usage. Rodgers et al. (2007) extend their original conceptual model and confirm four motives (communication, research, surf, and shopping motives) for Internet usage. People have different goals when consuming online video. For example, people watch drama, movies, comedy, or music shows to get entertained or pass time (i.e., surf motive). The same people seek out news and information to be informed (i.e., research motive) or communicate better with others (i.e., communication motive). This suggests that different motives of video consumption, which are associated with different content genre of the video content, influence the level of goal-directedness, which then influences skippable ad acceptance. Thus, we hypothesize the following:

H1a: Content genres associated with low goal-directed motives (e.g., surf motive) are more likely to increase skippable ad acceptance.

H1b: Content genres associated with high goal-directed motives (e.g., research motive) are more likely to decrease skippable ad acceptance.

In addition, we explore whether the characteristics of pre-roll advertising moderates the impact of content genre. Previous research shows that arousal (Belanche, Flavián, and Pérez-Rueda 2017a), emotions (Campbell et al. 2017), or ad appeals (Joa, Kim, and Ha 2018) influence pre-roll ad acceptance. Given that more than half of users choose to click the skip

Table 1. Positioning of this paper in the literature.

Papers	Personal factors			Ad/content/situational/contextual factors			Dependent variables			Methodology		
	Demographics	Psychological factors (e.g., motivation, involvement, intrusiveness)	Previous exposure or habit	Ad or content element	Situational factors (e.g., device, time of day)	Contextual factors (e.g., temporal elements, congruence)	Ad skipping (completion)	Ad viewing time	Other ad effectiveness measures	Experiment	Survey	Field data
Belanche, Flavián, and Pérez-Rueda (2017a)		✓		✓		✓			✓	✓		
Belanche, Flavián, and Pérez-Rueda (2017b)			✓	✓		✓			✓	✓		
Belanche, Flavián, and Pérez-Rueda (2020a)									✓	✓		
Belanche, Flavián, and Pérez-Rueda (2020b)		✓							✓		✓	
Campbell et al. (2017)												✓
Jeon et al. (2019)		✓		✓		✓	✓		✓	✓		✓
Nam, Lee, and Jun (2019)		✓		✓			✓		✓	✓		✓
Pashkevich et al. (2012)				✓					✓	✓		
This paper ^a				✓		✓	✓		✓	✓		✓

^aContent genre was used as a proxy for motivation.

button when it appears (Statista 2018), the first few seconds of skippable ads will play a crucial role in viewers’ decision to skip or view the pre-roll ads (MAGNA 2017). It would be difficult for viewers to fully appreciate the emotional appeals from the ad content in such a short amount of time. This time pressure reduces viewers’ ability to process the ad message and make them use heuristics instead of judgement-related information to determine whether they will continue watching the ad or not (Petty and Cacioppo 1983). Among others, ad brand category contains basic information about the brand portrayed in the ad and thus can be used as one of the heuristics that viewers can quickly and easily access. We expect that these cues from ad brand category are more likely to moderate the impact of low goal-directed content because viewers do not have an urge to watch the content and may continue watching the skippable ad if they find it emotional or appealing. Thus, we pose the following hypothesis:

H2: Ad brand category will moderate the impact of content genre on skippable ad acceptance in case of content with low goal-directed motives (e.g., surf motive).

Viewer Characteristics

Individual characteristics such as age and gender also influence the level of perceived goal impediment. Previous research suggests that younger people are less tolerant of online advertising (Southgate 2017). The study conducted by MAGNA (2017) is also consistent in that older consumers tend to skip the skippable ads less than younger consumers. Regarding gender, males have more positive beliefs about and favorable attitudes toward web advertising than females (Wolin and Korgaonkar 2003). However, Okazaki (2007) notes that gender differences found in the early days of Internet disappeared once Internet and mobile usage became widespread. Contrary to previous findings, his study shows that females show higher levels of trust in and positive attitudes toward mobile advertising and the brand in it. Based on the findings on age and gender, we pose the following hypotheses:

H3: Older viewers will exhibit a higher level of skippable ad acceptance.

H4: Female viewers will exhibit a higher level of skippable ad acceptance.

Situational and Contextual Factors

Situational and contextual factors refer to the environment where an advertising viewing session takes place

(Bauer and Strauss 2016). They are closely related to the structural factors of media choice that typically describe markets, media delivery systems, or audience population such as media coverage in a given market, content options, and audience availability by time of day, day of week, or season (Webster, Phalen, and Lichty 2014). Media users are known to be more available during primetime and weekends and less so during working hours and weekdays, suggesting that their goal-orientedness will vary depending on the time of day or day of week. Regarding contextual factors, we focus on viewing devices (i.e., PCs vs. mobile) given the interactive nature of mobile devices (Wang, Kim, and Malthouse 2016). Because mobile devices prompt immediate and automatic reaction to the content shown in the device, we predict that they will create a condition where users' overall reaction to the ad skip button becomes faster. Previous research shows that pre-roll ads shown on IPTV are considered as more credible, more useful, and less intrusive than those shown on mobile devices (Nam, Lee, and Jun 2019), indicating the poor acceptance of pre-roll ads on a mobile platform. Thus, we hypothesize:

H5a: Skippable ad acceptance will be lower during working hours and weekdays.

H5b: Video consumption on mobile devices will decrease skippable ad acceptance.

Last, we examine the relative importance of each determinant of skippable ad acceptance. Previous research on media consumption has repeatedly found that situational or structural factors play a bigger role than individual factors (Kim and Viswanathan 2015). We incorporate personal and situational/contextual factors in a single model to analyze which determinants are more crucial in predicting skippable ad acceptance. This leads to our final hypothesis:

H6: Situational/contextual factors are more influential in explaining skippable ad acceptance than personal factors.

Methodological Imitations of Previous Research

Another limitation of previous research on pre-roll ad acceptance is that most studies employ surveys and experiments that may limitedly or inaccurately estimate the relationships between the determinants and ad skipping behaviors. Given the immediate nature of pre-roll skippable video ads, using real-time data that electronically record ad and content viewing can provide a more accurate and holistic picture of when viewers are exposed to skippable ads in their natural

setting. Although Campbell et al. (2017) use real-world data, they have no information on viewers or video content, which limits the interpretation of their findings.

One empirical challenge of using observed behavioral data is the selection bias. Advertisers know which content their target customers are watching and select pre-roll ad slots to reach them based on their past behaviors or individual characteristics, challenging the estimation of unbiased effects of various determinants due to unobserved ad targeting. To circumvent this issue, we carefully selected a video platform where pre-roll skippable ads were randomly assigned to content clips during our sample period. We also control for some of the variables used for targeting (e.g., content genre, age, gender) in the model so that we use observed behavioral data while also having the advantage of experimentation (i.e., internal validity).

Methods

Data

We obtained data from one of the global top 10 portal sites, which provides a video platform for its users and content providers such as broadcast networks. One of the most popular video content formats is short clips of television programs produced by major terrestrial and cable networks. When a user clicks on a short clip of a television program, a skippable video ad plays for five seconds and the "Skip" button shows up, making the user decide to keep watching or skip the ad. Our data set includes individual-level ad viewing records of 7,982,663 observations from 2,078,090 users who watched 15-second skippable video ads from July 1 to 28, 2019.

Variables

Our predictors include eight variables that influence ad acceptance. We include content genre (seven program genres), ad brand category (13 ad brand categories), and the interaction between them to see how the influence of viewers' motivations for online video consumption is moderated by the characteristics of skippable ads that precede the video clips. We use age and gender for individual characteristics and time of day, day of week, and devices used to watch ads (PC, mobile web, and mobile app) for situational and contextual factors. Mobile app indicates a separate app for the focal portal, while all other accesses via mobile devices (e.g., mobile browsers or other apps) are

recorded as mobile web. We include a lagged dependent variable to account for viewers' previous pre-roll ad skipping/viewing habits, clip duration, and clip age as control variables in the model. Clip age is the number of days from the date on which a clip was available for the first time during the study period.

Our outcome variables include two measures of ad acceptance: (1) an indicator variable for completing an ad to measure the probability of ad completion and (2) a continuous variable measuring ad viewing time. We note that the raw data recorded ad viewing time at each quarter of the displaying time (0–3.75, 3.75–7.5, 7.5–11.25, 11.25–15 seconds) and 15 seconds (or completed watching ads). Thus, to compute ad viewing time as a continuous variable, we convert the five categories into five middle points of time intervals (1.875, 5.625, 9.375, 13.125, and 15 seconds). Table A1 in the supplemental online appendix reports the descriptive statistics of the variables.

Analysis

To quantify the effects of the determinants on ad acceptance, we estimate two multiple linear regression models including all the independent variables for each of two dependent variables. The model is specified by

$$Y_{is} = \alpha + \sum_{j=1}^{11} \beta_j \cdot X_{j,is} + \varepsilon_{is} \quad (1)$$

for user i ($= 1, \dots, 2,078,090$) at time $s = 1, \dots, t_i$ (t_i = the last time stamp for user i). Y is the dependent variable representing users' ad acceptance, either (D_1) indicator variable for ad completion or (D_2) ad viewing time. X_1, \dots, X_{11} are independent variables (see supplemental online appendix Table A2 for details). Note that Equation (1) for D_1 is a linear probability model to estimate the impact of each factor on the probability of ad completion. α is the intercept term and $\beta_1, \dots, \beta_{11}$ are the regression coefficients of X_1, \dots, X_{11} , respectively, measuring the effect of each variable on ad acceptance. ε is the random error term.

Results

Table A2 in the supplemental online appendix presents the results of our regression models. All the considered models are highly significant (p -value for F statistic $< .001$) with R^2 ranging between 0.18 and 0.32, meaning that a substantial portion of variation in the dependent variables is explained by independent variables. The estimation results are consistent in

terms of the direction and significance not only across the two dependent variables but also across the two model specifications of which one includes all independent variables and another excludes ad viewing habit because it may be tautological, adding robustness to our findings.

To measure the impact of viewers' motivations for watching online videos on ad acceptance (H1a, H1b, and H2), we focus on program genre (X_1), ad brand category (X_2), and the interaction between them ($X_3 = X_1 \times X_2$). Users who choose to consume content associated with the surf motive (e.g., drama, music, and entertainment) are more likely to complete ads and view ads for longer duration, supporting H1a. However, users who choose to watch clips associated with the research motive (e.g., information and current affairs) do not show any decrease in ad acceptance, rejecting H1b.

Regarding H2, we find many significant estimated interactions between program genre and ad brand category, indicating that ad brand category moderates the impact of content genre on ad acceptance. In the regression models, the baseline categories for program genre and ad brand category are sports and corporate ads, respectively, as they are frequently exposed to viewers (43% share for sports content and 16% share for corporate ads). Specifically, we find that the interaction is mostly significant for content associated with the surf motive and insignificant for content associated with the research motive, supporting H2. Another interesting finding is that we observe different patterns of moderating effects of ad brand category between drama and entertainment. Most interaction terms are negative for entertainment (i.e., more skipping), but when certain ads (e.g., food, health food, animated movies) are placed before drama, we see positive interactions. We speculate that higher ad acceptance in low goal-directed content is subdued in general, but optimal sequencing of certain brand categories and a genre such as drama can further increase ad acceptance.

Regarding viewer characteristics (H3 and H4), we find that older users tend to complete ads more and watch ads for a longer time as shown in the increasing effect size of older age groups (Age (X_4)), supporting H3. However, we do not find consistent patterns as male users are more likely to skip ads but tend to spend more time watching them (Gender (X_5)), not supporting H4.

With respect to situational/contextual factors (H5a and H5b), we observe that ad completion and ad-watching time decrease during working hours (9 am

to 1 pm) (Time of day (X_6)) and increase during weekends (Day of week (X_7)), supporting H5a. Users who watch video content with their mobile devices instead of PCs and who access content with the focal platform's app tend to skip ads more and view ads for a shorter duration (Device (X_8)), supporting H5b.

Finally, to test H6, we measure the relative importance of each factor by computing its partial sum of squares (the variation explained by each factor). We exclude three control variables in the calculation of total partial sum of squares to focus on main variables. Figure 1 visualizes each factor's relative proportion with F test results from analysis of variance of partial sum of squares for ad completion probability and viewing time. All factors are significant (p -value $< .001$), and the interaction between content genre and ad brand category (about 65%) is most influential for ad acceptance, followed by device type (about 13%), time of day (about 11%), and age (about 8%), showing a larger influence of personal factors than situational/contextual factors on skippable ad acceptance, not supporting H6.

Discussion and Conclusion

Theoretical and Practical Implications

This study examines the determinants of pre-roll skippable ad acceptance using individual-level ad skipping/viewing records of 2,078,090 users from a global major portal site in South Korea. By questioning the assumption that Internet usage is highly goal-oriented, which makes online advertising intrusive due to perceived goal impediment, we investigate personal and situational/contextual factors that are expected to influence the level of goal-directedness in online video consumption and impact pre-roll skippable ad acceptance. We use two measures of ad acceptance (ad completion and viewing time) to have a broader understanding of ad acceptance. We also examine each determinant's relative importance in explaining ad acceptance.

Our results show that personal and situational/context factors are significant predictors of pre-roll skippable ad acceptance. First, watching low-goal-oriented-content genres such as drama and entertainment increases ad acceptance, although we do not find evidence that high-goal-oriented-content genres decrease ad acceptance. This implies that not all Internet usage is highly goal-oriented, contrary to some of the initial studies on Internet advertising. With more and more people using an online video platform as a place to casually consume video content,

which mode viewers are in matters when it comes to perceived goal impediment and ultimately ad acceptance (Seyedghorban, Tahernejad, and Matanda 2016). We also find that ad brand category, combined with content genres with the surf motive, can further influence pre-roll skippable ad acceptance and explain the largest variation in it. These results suggest how optimally displaying certain combinations of ad and content can promote skippable ad acceptance. This optimal sequencing can be extended to the congruence among content characteristics, ad appeals, and viewing motivations, which helps advertising scholars reconceptualize and reoperationalize the meaning of congruence in the context of skippable video ads.

Regarding individual characteristics, we observe that age positively influences pre-roll skippable ad acceptance, which is consistent with the previous finding (MAGNA 2017). This may be because older viewers are usually under less time pressure than are younger viewers. They have also become more familiar with advertising as they are more used to watching non-skippable ads compared to younger generations. Another possible explanation is that older viewers have slower cognitive and physical skills, making it difficult them to quickly react to skippable ads (i.e., recognizing the ad, deciding to skip it, and finding the skip button). Thus, for these people, skipping ads is less worthy because the effort does not compensate the waiting time.

Situational and contextual factors also impact ad acceptance. Day of week and time of day significantly influence ad skipping or viewing behaviors. Previous research showed that users with time urgency reduce ad viewing time (Belanche, Flavián, and Pérez-Rueda 2017b). Our findings expand the applicability of time urgency to a bigger context of audience availability during the day or week (which can influence people's time urgency). Using a mobile device prompts people to skip pre-roll ads and spend less time watching them. Given the immediate nature of mobile media and the constraint of small screen on mobile devices, watching pre-roll ads on a mobile device may create an irritating viewing experience, driving users to skip them (Nam, Lee, and Jun 2019).

From a theoretical perspective, we show that how and when viewers watch online video content influence the level of perceived goal impediment while they are online. By investigating personal and situational/contextual factors that have been less investigated in previous research, we discover that it is not just the appeal or arousal created by ad content but viewers' individual characteristics and the surroundings where the viewers

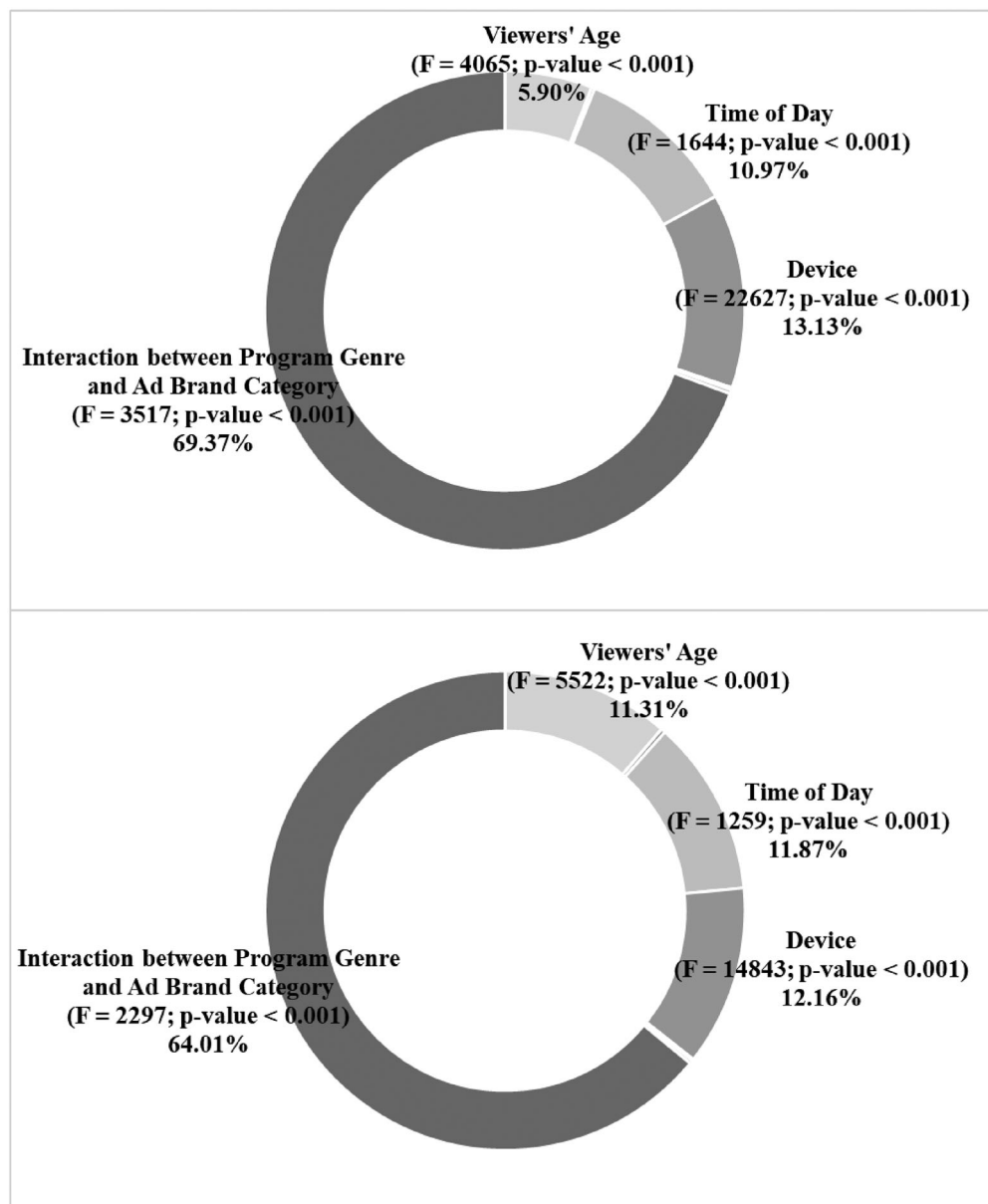


Figure 1. Pie charts with analysis of variance results for partial sum of squares for probability of ad completion (top) and ad viewing time (bottom). Control variables are excluded in the calculation of total partial sum of squares.

are situated at the time of online video consumption that creates a condition in which they decide to skip or view the ads. We also estimate these factors in a single model and derive their relative importance, demonstrating which factors influence ad acceptance. Specifically, ad platforms and advertisers can develop ad targeting rules for skippable ads, prioritizing the fit between advertised product category and content genre, device type, time of day, and viewer age in descending order.

Practically, our findings suggest important strategies for media planners, advertisers, and ad agencies regarding how to monetize their display of pre-roll skippable

ads. They need to keep tracking users' individual characteristics to find user segments who will be more likely to complete or spend a longer time with skippable ads. Such segments include users who watch low goal-directed content genres such as entertainment and drama and who are older. They may also want to display pre-roll skippable ads during weekends rather than weekdays and when viewers use PCs rather than mobile devices to watch video content. If target customers do not belong to these segments associated with high ad acceptance, advertisers can alternatively consider non-skippable or bumper ads.

Our findings on skippable ads also provide valuable implications for ad platforms that have to balance skippable and non-skippable ads. Skippable ads are associated with high but uncertain revenue, while non-skippable ads bring low but guaranteed revenue (Chakraborty et al. 2021). Moreover, skippable ads are preferred by users, while non-skippable ads cause high disutility to them. As our results help predict the probability of ad skipping/completion, ad platforms can make informed decisions on how to balance non-skippable and skippable ads to attain target levels in revenue and user satisfaction.

As we find that content genre interacting with ad brand category is the most important determinant of skippable ad acceptance, advertisers need to carefully select ad slots when they use content-based targeting schemes as well as find out content genres that fit well with their products and services. While video ad platforms usually provide ad targeting services based on viewer demographics and/or content themes, our results suggest that ad targeting services based on situational/contextual factors can also be effective because these factors substantially explain ad-skipping behavior, along with viewer demographics and content genre.

Among our control variables, ad viewing habit (X_9) turns out to positively influence ad acceptance, indicating that users who have the habit of completing skippable ads are less likely to skip the ads. Given strong habit persistence, advertisers and ad platforms need to develop strategies to overcome users' ad skipping habits.

Limitations and Future Research

Although this study offers a broader understanding of the determinants of pre-roll skippable ads, we do not have other ad effectiveness measures such as brand recall, eWOM behaviors, or purchase intention (e.g., Belanche, Flavián, and Pérez-Rueda 2020a, 2020b; Nam, Lee, and Jun 2019), which can show how ad skipping or acceptance further influences consumers' information searching and purchase decision processes. In addition, given that ad skipping is a very quick behavior that could be influenced by many situational or personal factors, other factors affecting ad skipping or viewing are still not considered in this study. Future research needs to incorporate these variables to complete the understanding of the process of skippable ad acceptance.

This study only examines one video-based content platform; thus, we do not claim to generalize our findings to other platforms. Future studies should




consider expanding the scope of platforms and provide which elements of platforms (e.g., design elements, technological affordances) either foster or hamper users' pre-roll skippable ad acceptance behavior. We only consider skippable ads in this study, but future research can incorporate non-skippable ads in the same study to find the optimal mix of skippable and non-skippable advertising in online video consumption platforms (Chakraborty et al. 2021). In non-skippable ads, viewers cannot skip ads and thus abandon ads and the content they choose to watch. Future studies need to investigate ad abandonment in non-skippable ad viewing contexts. Moreover, to the best of our knowledge, there have been few empirical studies on mid-roll and post-roll ads even though such formats have expanded in practice (e.g., Facebook).

Previous studies have documented the importance of congruence between ads and content in ad acceptance. To partially capture this, we incorporate the interaction between ad brand category and content genre. However, a deeper-level congruence needs to be measured using ads and video clips. Most extant studies have relied on a coding-based approach in measuring congruence. Given the high quantity of content and ads on video ad platforms, such an approach is not practical and thus cannot be implemented in practice. Future research to tackle this challenge based on machine learning and artificial intelligence can be fruitful. Finally, this study does not focus on ad viewing habit but, given its strong influence in explaining ad acceptance, future research on ways to address viewers' ad skipping habit will have high practical relevance.

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