Advertising-Funded IS: A Literature Review on Factors Influencing User's Clicking Behavior for In-App Ads

Completed Research

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Abstract

Clicks on in-app ads are the key pillar in financing the development and maintenance of apps. Therefore, the design of apps and in-app ads becomes an important task in the development of an app in order to increase the likelihood that users click on in-apps. To support the design, organizations need to know which factors influence user's clicking behavior. To reveal those factors, we base on the information processing theory and conduct a literature review to reveal structural and semantic factors. We reveal four structural factors (animation, color brightness, location prominence and size), which influence user's clicking behavior. Additionally, we identify seven semantic factors (entertainment value, informativeness, usefulness, personalization, congruity, irritation and privacy concern), which influence user's clicking behavior. Based on these findings, we propose considering additional structural and semantic factors and advise future research to examine the mutual influence of both semantic and structural factors.

Keywords

In-app ads, advertising, clicking behavior, click-through rate (CTR), information processing theory

Introduction

Most apps, such as weather forecasts, Angry Birds or Candy Crush, are free of charge, because users are not willing to pay for these applications (apps). Still, app developing organizations need to finance the initial app development costs and the running costs for maintenance of the apps. For this reason, ads within apps (in-app ads) have become the key pillar in generating cash flows for these organizations and in financing the development and maintenance of apps (Rosenkrans and Myers 2018). According to a recent study, in-app ads generate more than 50 percent of the revenue for most types of private apps (AppFlyer.com 2018b). Revenues related to in-app ads are expected to grow from 38.9 billion globally in 2018 to more than 64.1 billion by 2020 (AppFlyer.com 2018a). The revenue associated with in-app ads thereby mainly depends on the number of clicks on the in-app ads (eMarketer 2016). The more clicks an in-app ad generates the more revenue can be realized by the app developing organization. Therefore, the technical integration, as well as the design of ads in apps is a new and important task for app developing organizations. To increase the revenue, an app generates through clicks on in-app ads and to avoid that in-app ads cause annoyance, organizations need to know, which factors influence user's clicking behavior.

We know from a theoretical perspective, that factors influencing clicking behavior might be context specific (Hong et al. 2014), thus we need specific factors for in-app ads. To reveal factors influencing user's clicking behavior, we ground this research on the information processing theory (Lang 2000; Lang et al. 2002). The information processing theory states that the structural factors, such as the animation of in-app ads, and semantic factors, such as the informativeness of in-app ads, influence users' perception and consequently influence user's clicking behavior. As most private or household apps are nowadays funded by ads (AppFlyer.com 2018b), knowledge on which structural and semantic factors influence user's clicking behavior is important for the design and development of apps. Therefore, we aim to answer the following research question:

What structural and semantic factors of in-app ads influence user's clicking behavior?

To answer this research question, we conduct a literature review within the eight journals of the Association for Information Systems (AIS) Senior Basket and nine marketing and advertising journals. We searched and analyzed those journals for structural and semantic factors, which influence user's clicking behavior. We found 21 articles, which discuss the effect of four structural factors on clicking behavior. The following four structural factors have a positive influence on user's clicking behavior: animation, color brightness, location prominence, size. The results reveal seven semantic factors, which influence individual's clicking behavior. The following five semantic factors are found to have a positive influence on clicking behavior: entertainment value, informativeness, usefulness, personalization and congruity. Additionally, we found two semantic factors, namely irritation and privacy concerns, which have a negative influence on clicking behavior. With this research we provide overview over structural and semantic factors, which can be used to guide the development of apps. Furthermore, we propose different research opportunities for future research.

Research Background

In this section, we will first explain in-app ads and user's clicking behavior. Then, we outline the information processing theory, which is the guiding theory to examine factors influencing user's clicking behavior.

In-App Ads and Clicking Behavior

In-app ads refer to marketing or advertising messages, which are delivered to applications (apps), such as apps for weather forecasts or gaming apps. This includes ads delivered to apps running on various devices, such as tables, smartphones or laptops (Laszlo 2009). As the more and more users prefer free or low-costs apps, in-app ads are an increasing trend for financing the development and maintenance of apps (Rosenkrans and Myers 2018). The most common form of in-app ads are display ads, which refers to a graphical element with a marketing message embedded into the app. Common graphical formats are images, animated images or videos (IAB 2015). Organizations use in-app ads to encourage the user to click on the in-app ad to generate traffic on their websites (Liu et al. 2018), and thus to generate sales and increase profit through the in-app ads. User's clicking on in-app ads is commonly used to measure the success of an in-app ad, as the generated revenue depends on the number of clicks (eMarketer 2016). We define user's clicking behavior in the context of in-app ads as *the user's direct interaction with an in-app ad by clicking on it with the goal of obtaining more information about the organization or its products or services* (Bleier and Eisenbeiss 2015a). Since clicking behavior on an in-app ad is important to finance the development and maintenance of apps, it is important to know which factors influence user's clicking behavior. Although, the usage of in-app ads is an increasing trend, little research has focused on explaining which factors lead to clicking behavior (Wang and Chou 2019). Thus, in this research, we will conduct a literature review on extant and related literature, to explain what factors influence clicking behavior. The knowledge about factors influencing user's clicking behavior will help organizations to design apps and to design the in-app ads, such that users will click them. To structure the literature review and the revealed factors, we next outline the information processing theory, which acts as the guiding theory.

Information Processing Theory Explaining Clicking Behavior

To explain users' clicking behavior, we base on the information processing theory, which has often been used to explain what factors influence user's behavior in regard to online ads (Lang et al. 2002; Tam and Ho 2005, 2006). Extant literature on information processing theory for online ads shows that the factors, which influence user's behavior, can be categorized into two categories (Sun et al. 2013). First, users perceive structural factors, which in this context, refer to elements used to display the in-app ad (Lang et al. 2002; Sun et al. 2013). Examples of structural factors could be the color or the animation of in-app ads. Second, users perceive semantic factors, which, in this context, refer to the information contained in the in-app ad that lead to the semantic perception of an in-app ad (Lang et al. 2002; Sun et al. 2013). Examples of semantic factors are informativeness or the entertainment of in-app ads. A summary of the information processing theory to explain clicking behavior is displayed in Table 1.

Adapting information processing theory (Lang 2000; Lang et al. 2002; Tam and Ho 2005, 2006) to the context at hand (Hong et al. 2014), we understand that users perceive structural factors of a in-app ad, as well es semantic factors of in-app ads and both influence their clicking behavior. The aim of this literature review is to identify those specific structural and semantic factors.

Behavior	Influenced by	Definition
Clicking behavior	Structural factors	Defined as elements to display the in-app ad.
	Semantic factors	Defined as information contained in the in-app ad.

Table 1. Overview of Information Processing Theory for Clicking Behavior

Methodology

In this manuscript we conducted a literature to identify structural and semantic factors influencing user's clicking behavior and follow the recommendation by Vom Brocke et al. (2009) and Webster and Watson (2002).

As recommended by Vom Brocke et al. (2009), we define the scope of our literature research with the following attributes: 1) *focus, goal, 2) organization, 3) perspective, 4) audience and 5) coverage*. Thus, our literature review can be described as follows. 1) As the purpose of this literature review is to gather information about structural and semantic factors, which influence clicking behavior, *focus is on research outcomes* and the *summary of a clear issue is the main goal*. 2) The *organization of the literature review is conceptual*, because we try to find different structural and semantic factors. 3) The perspective of the literature review refers to a *neutral representation* and 4) the a*udience of this literature review are specialized scholars* in the IS field, which are interested how ads are perceived within apps and/or private information systems. 5) The *coverage of the search can be described as representative*, because the literature review was conducted the AIS Basket of Eight and advertising and marketing journals.
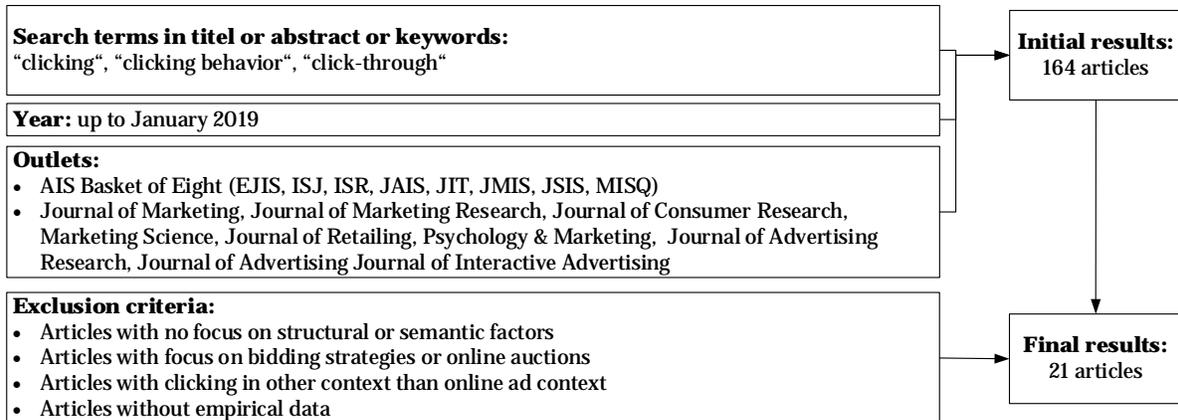

Figure 1. Literature Research Approach

The focus of this study is to understand what structural and semantic factors influence user's clicking behavior in apps. However little research has focused on explaining what factors of in-app ads lead to clicking behavior (Wang and Chou 2019), thus we conduct a literature review in the field of online ads to examine structural and semantic factors. For this we used the following search terms in the literature review which are combined to a search query using the 'or' operator: "clicking" OR "click" OR "clicking behavior" OR "click-through". We used the selected key terms to search in title, abstract and keywords of the articles. We did not limit the publication date, thus all articles up to January 2019 are considered in the literature review.

We selected the AIS Senior Scholars' Basket of Journals[1], as the selection of the best journal in IS research. As the literature review is about perceptions about ads, we follow recommendations of existing literature reviews (Chan et al. 2017) and included the following domain specific journals: Journal of Marketing, Journal of Marketing Research, Journal of Consumer Research, Marketing Science, Journal of Retailing, Psychology & Marketing, Journal of Advertising Research, Journal of Advertising, Journal of Interactive Advertising. We used EBSCOhost Business Source Ultimate data base as the respective search engine to search in all issues from up to January 2019. We additionally searched for the same search terms in each database of the journals website. The initial search resulted in 164 articles. We defined four exclusion criteria, to reduce the initial search results to only meaningful articles. First, we excluded all articles which do not contain empirical data. Second, we removed articles from the initial result list, which focused on clicking in other contexts than online ads. Third, we removed articles which focused on bidding strategies or online auction mechanism. Fourth we excluded articles, which do not focus on structural or semantic factors. Using the means of abstract screening (Webster and Watson 2002), we applied the exclusion criteria. The final results included 21 articles. Next, we analyzed all 21 articles. For this we identified and classified the identified factors into structural or semantic factors, which influence user's clicking behavior. With this we follow recommendations (Webster and Watson 2002) and user the information processing theory, as a classification matrix. The results are displayed in the next section. As recommended by Vom Brocke et al. (2009), we will discuss the implications of the literature analysis in the subsequent chapters.

Results

The literature analysis revealed 21 articles from 2001 to 2019 (see Appendix Table 3). The distribution of these articles across each journal is displayed in Figure 2 and reveals that this topic of structural and semantic factors is still mainly treated in marketing journals. The distribution for each year is displayed in Figure 3, which reveals that most articles were published in the last six years.
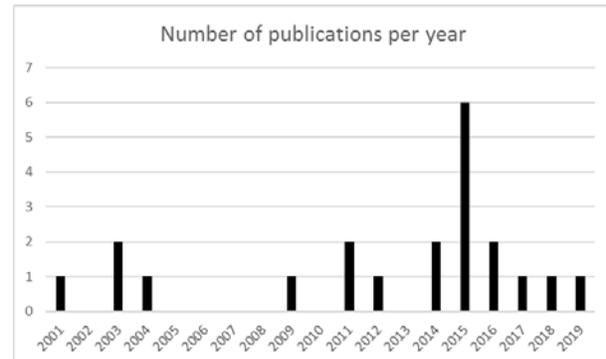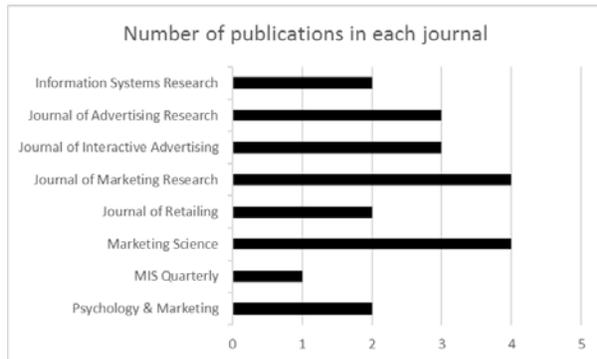

Figure 2. Distribution Across Journals   **Figure 3. Distribution Across Years**

Fifteen articles discuss structural factors influencing clicking behavior. Four of those 15 articles focus on more than one structural factor. Seven articles discuss semantic factors, which influence clicking behavior and only three of those articles examine more than one semantic factor. None of 21 the articles discuss semantic and structural factors influencing clicking behavior simultaneously. Eight of the articles focused on general online ads, whereas three focused specifically on social media ads, nine articles focused on search ads and only one article focused on in-app ads. Next, we will outline the findings about the influence of structural factors on clicking behavior followed by the influence of semantic factors on clicking behavior.

The Influence of Structural Factors on Clicking Behavior

The literature review revealed four structural factors, which influence user's clicking behavior, namely: animation, color brightness, location prominence and size. Extant research focused on the effect of

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[1] *The AIS Senior Scholars' Basket of Journals includes the following journals: European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of AIS, Journal of Information Technology, Journal of MIS, Journal of Strategic Information Systems, MIS Quarterly (see https://aisnet.org/page/SeniorScholarBasket)*

animation on clicking behavior. The research results indicate that ads with animation increase the likelihood that a user clicks (Bruce et al. 2017; Chandon et al. 2003; Lohtia et al. 2003; Rosenkrans 2009; Yoo et al. 2004). Animation of ads is defined as a "programmatically generated display of sequential images, creating the illusion that objects in the image are moving." (IAB 2019). Animation of ads is found to be positively related to user's clicking behavior. Research also found that online ads with brighter color are more likely to be clicked (Lohtia et al. 2003; Sokolik et al. 2014) and that color brightness is to a certain degree positively related to clicking behavior. Additionally, ads which are displayed in the upper part of the screen are more likely to be clicked then ads in the middle or lower part (Abhishek et al. 2015; Agarwal et al. 2011; Agarwal and Mukhopadhyay 2016; Animesh et al. 2011; Chan and Young-Hoon 2015; Gong et al. 2018; Narayanan and Kalyanam 2015; Rutz et al. 2012). Thus, location prominence is positively related to clicking behavior. Furthermore, research examined the effect of the size of the ad on clicking behavior. Research reveals, that users are more likely to click on larger online ads (Bruce et al. 2017; Chandon et al. 2003; Rosenkrans 2009; Sokolik et al. 2014). Consequently, a larger size of an ad is related to a higher likelihood of user's clicking behavior.

The Influence of Semantic Factors on Clicking Behavior

The literature review revealed seven different semantic factors, which influence individuals' clicking behavior. Five of those semantic factors show a positive influence on user's clicking behavior while research also reveals two semantic factors having a negative influence on user's clicking behavior.

The five semantic factors having a positive influence on clicking behavior are entertainment value, informativeness, usefulness, personalization and congruity. Researchers (Zhang and Mao 2016) found that the ads with a high level of entertainment value are more likely to be clicked. Based on extant research, entertainment value refers to whether an ad fulfills the user's need to perceive joy, fun or excitement (Sun et al. 2013; Zhang and Mao 2016). Informativeness of ads was also found to have a positive influence on whether users click on ads. Informativeness refers to whether the ad informs the user about products (Zhang and Mao 2016). Similar to this some researchers (Bleier and Eisenbeiss 2015b) found usefulness of ads to be positive related to individual clicking behavior. Usefulness refers to the degree that an ad is useful to a user, e.g. that an ad makes online shopping tasks easier. Research also found that ads, which are personalized, are more likely to be clicked (Aguirre et al. 2015; Bleier and Eisenbeiss 2015a, 2015b; Tucker 2014). In line with prior definitions, personalization refers to the degree to which an ad is tailored to a user f interests and preferences (Bleier and Eisenbeiss 2015a). Finally, it was found that the congruity positively influences clicking. Thereby, congruity is defined as the degree to which the content of the ad and the editorial content are similar (Wang and Chou 2019; Zhang and Mao 2016).

Behavior	Influenced by	Identified factors
Clicking behavior	Structural factors	• Animation • Color brightness • Location prominence • Size
	Semantic factors	• Entertainment value • Informativeness • Usefulness • Congruity • Irritation • Privacy concern

Table 2. Summary of the Findings

The literature review reveals two factors having a negative influence on clicking behavior. First, research found that irritation of ads reduces the likelihood of user's clicking behavior. Irritation of an ad relates to the feeling of displeasure and annoyance (Bleier and Eisenbeiss 2015b). Second, it was found that privacy concerns reduce the likelihood of clicking behavior (Bleier and Eisenbeiss 2015b). Privacy concern refers to the degree to which an ad causes the user to be concerned that organizations track or use personal information without permission (Bleier and Eisenbeiss 2015b).

Table 2. summarizes the findings of our literature review. Overall, we found four structural factors (animation, color brightness, location prominence, size), which are positively related to clicking behavior. We found four semantic factors (entertainment value, informativeness, usefulness and congruity), which are positively related to clicking behavior. Additionally, we found two semantic factors (irritation and privacy concern), which are negatively related to clicking behavior.

Discussion

The common way to finance the development and the maintenance of apps, such as Angry Birds or weather forecasts, is to embed ads into the app (Rosenkrans and Myers 2018). As those in-app ads need to be designed and integrated into the app, so that a user is more likely to click on them, there is a need to know what factors influence user's clicking behavior. Therefore, this paper conducted a literature review and identifies 21 research articles discussing the influence of four structural and seven semantic factors on user's clicking behavior. The results of this literature research have several implications for future research and the praxis of the design and management of apps.

First, this literature reviews revealed that so far research in IS and marketing journals on user's clicking behavior has considered four structural factors (animation, color brightness, prominent location and size), which all describe the structural characteristics of the ad itself. However, we know from related literature (Duff and Faber 2011; Lavie et al. 2004), that there are structural factors, which describe the relationship of the online ad to the surrounding in which the online ad is embedded in. First, the relationship can be described by the number of other stimuli in the surrounding. For instance, if an app has already a high number of animated graphics, an in-app ad will not be easily distinguished from the surrounding by the user. Thus we know that the number of other stimuli in the surrounding influences user's behavior (Lavie et al. 2004). Second, we know from related literature that online ads can be designed in a similar fashion as the surrounding (Duff and Faber 2011). For instance, if an in-app ad is designed like a news article within a list of news articles, the similarity of the ad to the surrounding is very high, which again influences user's perceptions and behavior. Therefore, future research should examine how structural factors, which describe the relationship of the background and the surroundings (e.g. similarity to background structure), influence user's clicking behavior.

Second, with this literature review we reveal seven semantic factors, which influence users' clicking behavior. With this, future research can quantify the influence of those factors on clicking behavior for in-app ads. We know from related research, which does not focus on clicking behavior, that other semantic factors exist. Research on online ads found that the ad credibility influences user's attitude towards an ad (Brackett and Carr 2001) and towards the brand (Mattke et al. 2019). As we know that attitude influences behavior (Kroenung and Eckhardt 2015), we suggest that future research should examine the effect of in-app credibility and attitude towards the ad on user's clicking behavior.

Third, the results show, that extant research focuses either on structural factors or on semantic factors. Literature on the perception of online ads informs us that the perception of structural factors influences user's perception of semantic factors (Sun et al. 2013; Tam and Ho 2005, 2006). Considering only a set of structural factors or a set of semantic factors, limits the understanding of users' clicking behavior. However, no research has considered the mutual influence of both sets of factors on users' clicking behavior. Therefore, it is important for future research not to purely focus on the effect of either semantic or structural factors on clicking behavior, because only considering one set of factors may be misleading. To gain a full understanding about the mutual influence of structural and semantic factors, research needs to consider both sets of factors, because both sets influence each other (Sun et al. 2013; Tam and Ho 2005, 2006). With using the information processing theory as a guiding theory, mediation effects of structural factors via semantic factors on clicking behavior could be tested. We furthermore suggest to test for moderating effects of structural factors on semantic factors, as related research indicates a complex relationship between structural and semantic factors (Sun et al. 2013).

Fourth, we see that extant research on user's clicking behavior is only examined with a linear paradigm. This means that so far, only linear relationships between the factors and clicking was examined. However, we know from first studies in information systems and marketing that factors of online ads do not always have linear relationship to user's behavior (Mattke et al; Müller et al. 2017; Müller et al. 2018). This could mean that user's clicking behavior is only influenced by a combination of structural and semantic factors

and that different combinations of structural and semantic factors might exist that lead to clicking behavior. Therefore, we call for a pluralism of research methods to examine the combined and non-linear relationship of structural and semantic factors on clicking behavior. More precisely we suggest to use a configurational approach, which is a growing methodical approach in IS research (Iannacci and Cornford 2018; Mattke et al. 2018), to examine configurations of semantic and structural factors that lead to user's clicking behavior.

Finally, this literature review has only considered structural and semantic factors, which influence clicking behavior. Therefore, future research should also consider other factors, such as product characteristics, browsing modes, device type or different quality dimensions (Sun et al. 2015) to examine whether other characteristics influence the perception of structural or semantic factors, which in turn influence clicking behavior.

Appendix

Author	Structural factors				Semantic factors							Context
	Animation	Color brightness	Location prominence	Size	Entertainment value	Informativeness	Irritation	Usefulness	Personalization	Privacy concern	Congruity	
Bleier and Eisenbeiss (2015a)									✓		✓	Banner ads
Bleier and Eisenbeiss (2015b)							✓	✓	✓	✓		Online ads
Tucker (2014)									✓			Social media ads
Aguirre et al. (2015)									✓			Social Media ads
Zhang and Mao (2016)					✓	✓					✓	Social Media ads
Bruce et al. (2017)	✓			✓								Online ads
Chandon et al. (2003)	✓			✓								Online ads
Lohtia et al. (2003)	✓	✓										Banner ads
Rosenkrans (2009)	✓			✓								Online ads
Shamdasani et al. (2001)											✓	Online ads
Yoo et al. (2004)	✓											Banner ads
Agarwal and Mukhopadhyay (2016)			✓									Search ads
Abhishek et al. (2015)			✓									Search Ads
Rutz et al. (2012)			✓									Search ads
Agarwal et al. (2011)			✓									Search ads
Animesh et al. (2011)			✓									Search ads
Wang and Chou (2019)											✓	In-app ads
Chan and Young-Hoon (2015)			✓									Search ads
Gong et al. (2018)			✓									Search ads
Narayanan and Kalyanam (2015)			✓									Search ads
Sokolik et al. (2014)		✓		✓								Online ads

Table 3. Clicking Literature

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