

# Master Thesis

The effects of ad-blocking on the online customer behavior.

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## ABSTRACT

**Objective:** In this study, we explored the effects of ad-blockers on online customer behavior. **Method:** In this experimental study fourteen participants, participated in three experiments. The experiments are designed to explore the effects on the three variables: website aesthetics (WA), information searching behavior (ISB) and transaction behavior (TB). Together these variables simulate a customers journey, from visiting a website, liking the aesthetics, finding the necessary information and transacting. To explore the effect on WA, participants were equipped with eye-tracking glasses and went through an A/B-testing experiment. In order to explore the effects on ISB and TB, participants followed a predefined script replicating the respective behavior of searching information and completing a transaction. **Results:** The study suggests that ad-blocking has an effect on the website aesthetics variable. The study did not find evidence supporting that ad blocking has an effect on ISB and TB. **Conclusion:** The model explained that ad blocking effects people only regarding their perception on the aesthetics of a website; the model suggest no effects on ISB and TB. The model is revised by grouping ISB and TB into a new variable: task-oriented behavior. More research is needed to replicate the result in order to verify the validity of the model, preferably on a larger test group using different forms of advertising.

## Keywords:

Online advertising, eye-tracking, ad-blocking, online customer behavior

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# 1. Introduction

Online advertising has come a long way to where it is now, from the very first online advertisement in 1994 by AT&T on the webpage of HotWired web magazine (Kaye & Medoff, 2001). According to The Interactive Advertising Bureau (IAB), the ad-supported Internet ecosystem has generated more than \$1,1 trillion for the U.S. economy in 2016 alone. More than doubling the amount generated in 2012. In 2017, internet advertising surpassed traditional television advertising, becoming the largest advertising medium worldwide<sup>1</sup>. Although the rise in advertising on the Internet is a positive development for users, companies and all kind of organizations, advertising is becoming increasingly problematic for web user but at the same time also problematic on the publisher side. Going back in time to 1995, where only 16 million users actively used the World Wide Web, the landscape was quite different. In 2018, well over 4 billion users surf the Internet, which is 54% of the total world population<sup>2</sup>. In line with this growth, users are exposed to an increased number of advertisements, which negatively affect browsing experience, pose security & privacy breaches and potentially may pose threats to online consumers. Besides the rise of online advertisements, the popularity and the adoption of ad-blocking technologies has also risen exponentially. Especially since the birth of intrusive advertising has led to evolution of ad blocking technologies. According to Clifford & Verdoodt (2016), the main reason being the consumer's need for an improved web experience.

According to the 2017 Global Adblock Report, published by PaigeFair, 615 million devices worldwide are blocking ads. Ad blocking software offers users the solution to prevent advertisements from being displayed on their preferred Internet browser. Ad-blocking software uses open source filter lists incorporated to browser plug-ins (extensions). Within these lists, ad locations, sizes and codes are enlisted, using this information, the blocking software effectively makes the advertisements disappear from the webpage. These list are updated over periods of time in order to keep up with the ever-changing advertisement marketplace. In chapter 2, '*Literature Review*', the different kinds and the most popular extensions are discussed more in depth.

When looking from the perspective of the advertisement industry, ad-blocking software poses as a significant threat to their business models. Current research shows that 18% of US Internet users have ad blocking software installed. Consequently, companies are looking for other possibilities to by-pass these ad blockers. Threats with lawsuits, anti-ad-blocking software and limited access to websites are examples of (potential) solutions. Besides the economic effects of ad-blocking software, the use of ad-blockers also affects online activity tracking and improving the web experience. According to the research of Ajdari, Hoofnagle, Stocksdale & Good (2015), ad-blocking software provided a decrease of 68% in user activity tracking across top 100 ranked U.S. websites. The same variable was tested across the top 100 sites, which collected the largest amounts of browser cookies, ad-blocking software managed to decrease user activity tracking

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<sup>1</sup> <https://www.zenithmedia.com/internet-advertising-expenditure-to-exceed-us200bn-this-year/>

<sup>2</sup> <https://www.internetworldstats.com/stats.htm>

with 84%. In the same research user experience was also tested with and without ad-blocking software, the results show that an average increase of 17% in user experience was appointed to ad-blocking software.

This present report serves as a study to develop a model, which will show the effects of using ad-blocking software on website aesthetics, information searching behavior and transaction behavior. These factors combined will explain online customer behavior. Current literature mainly focuses on the economic effects of advertisements and ad blocking software, while mainly being focused on part of the advertiser perspective (e.g., Gritckevich, Katona & Sarvary, 2018; Shiller, Waldfogel & Ryan, 2018; Shiller, Waldfogel & Ryan, 2017; Wielki & Grabara, 2018). In this paper however, the focus will be on the customer and how advertisement play a role within the behavior of online customers.

## **1.1 Problem statement**

Although there is plenty of literature available on the subject of ad blocking software, the field of research on online customer behavior and the distractions advertising cause is very limited. As mentioned above, the majority of literature in this field is focused on the economical and/or on the publisher sided perspective on advertising.

The attitude of the public towards online advertising has been always been a great field of interest in research, as acknowledged by Meenaghan (2001). According to McCoy, Everard, Polak & Galletta (2007), online advertising would affects the behavior of online customers and their intentions to return to a particular website. They concluded that participants who were not exposed to advertisements were more likely to return to the website or recommend the website to others.

In another research conducted by Ur, Leon, Cranor, Shay, & Wang (2012) asked their respondents what was the first thing that came to mind was after hearing the term 'Internet Advertising'. Among most of the responses, the terms 'distracting' and 'annoying' were mentioned most often. Other respondents mentioned, 'bothersome', 'not needed' and other similar terms, such as abundant, not necessary, tempting etc. The majority of their respondents displayed negative reactions when being subjected to advertising on websites. This is supported by McCoy et al. (2007), in their study one of their conclusion states: "this study provides clear support for an assertion that users will adopt more negative intentions when a site displays advertisements than when the site does not. It is also clear that advertisements interfere with retention of site content and that features of advertisements also have important effects on retaining both site and ad content". Ad blocking may provide the solution for those who choose to like to browse without advertisements. The rise of ad-blocking software is greatly documented. The usage is growing each year. However, the effects of ad-blocking software on online customer behavior have not been a popular field of research yet.

Hence, this study will explore the behavior of online consumers and the role that ad-blocking software may have on this behavior. The study will provide a model containing the aspects regarding website aesthetics and customer behavior regarding information

searching and transacting which will be tested using three experiments. The first experiment will focus on the perception on website aesthetics, using A/B testing combined with eye tracking. In the second and third experiment, participants will follow a predefined script, while the duration of completion will be measured. The experiments are divided into the three aspects of online customer behavior; Website Aesthetic, Information Searching Behavior and Transaction Behavior. Using mixed data collection methods, the study should explain the effects of ad-blocking software on the online customer behavior.

## **1.2 Research question**

To provide the model, the following research question and sub questions are formulated:

**MRQ:** How does ad-blocking affect online customer behavior?

**SQ1.** *How does ad-blocking software affect the online customer perception regarding Website Aesthetics?*

**SQ2.** *How does ad-blocking software affect the online customer behavior regarding Information Searching Behavior?*

**SQ3.** *How does ad-blocking software affect the online customer behavior regarding Online Transaction Behavior?*

## **2. Literature review**

In this chapter, related and relevant work regarding ad-blocking software and online customer behavior are reviewed in order to give pre-study insights and information regarding the subject. Furthermore, important aspects and elements regarding this research are reviewed and/or clearly defined in this chapter in order to start the study with insights about the relevant topics. First the adoption of ad-blocking software is explored, followed for main reasoning to block advertisements. Furthermore, ad-avoidance is defined and literature regarding the three variables website aesthetics, information searching behavior and transaction behavior is explored and described.

### **2.1 Adoption of Ad-blockers**

Ad-blockers are variously defined in the literature. According to Hemmer (2005), ad-blockers are a form of software designed to detect and hide pop-up windows and other advertisement formats. Sandvig, Bajwa & Ross (2011), define ad-blockers in a simpler way. According to Sandvig et al. (2011), ad-blockers are browser add-ons that allows users to block most online advertisement on the Internet. Ad-blockers also help preventing the tracking of data on online user behavior (Gugelmann, Happe, Ager & Lenders, 2015). Ad blockers work in two ways, either by hiding page elements or by web blocking request. Where some difference can occur among ad blocking software, at the heart they are similar. This main mechanism involves subscribing to a list or filter, which then is used to block or automatically hide the advertisement before it is displayed on the screen. These lists are continuously updated by the publisher and contain the set of

rules to engage in the blocking or deleting of ads (Rens, 2017; Mughees, Qian, Shafiq, Dash & Hui, 2016).

The majority of Internet browsers have a form of ad-blocker incorporated or make it possible to add the ad-blocker as a plug-in or add-on. In their report, Nithyanand, Khattak, Javed, Vallina-Rodriguez, Falahrastegar, Powles & Murdoch (2016), refer to the Ad Blocking Report (2015), which contains a study that estimates the number of active ad-block users in 2016 at 198 million unique users. According to the same study, due to ad-blockers total revenue of 22 billion dollars is lost due to eliminating advertisement. From the available ad-blocker alternatives, Adblock Plus, which is a free add-on designed for various Internet browser is the most popular one. Just this add-on has 13 million active users each day. Following Adblock Plus, the second most ad-blocker is a similar add on called AdThwart, designed for Google's Chrome browser (Sandvig et al. 2011). Between 2014 and 2015, the usage of ad-blockers rose with 41% to 198 million (Salvo, 2016). According to the IAB ad blocking report of 2017, the growth continued to a total of 615 million global users across all devices in December 2016.

## **2.2 Reasons to block advertisements**

Why do Internet browsers use ad-blockers? It seems that there is not a clear answer for this question. Multiple sources, which have conducted their research, claim multiple reasons for using ad blockers. However, most answers are alike, although interpreted a little bit different in each report. In order to categorize the multiple answers, similar answers/reasons will be clustered in this section.

The IAB in Australia indicates that the volume of advertisements is the primary driver of annoyance. This causes disruption in browsing experience. Another major influencer is avoiding (potential) viruses. Among the results, consumers also indicated that websites are visually more pleasing without advertising. Similar results are shown in the PageFair 'The state of the blocked web' 2017 Global report. As they enlist interruption, volume of ads, avoiding viruses and disruption in their top five reasons to use ad-blocking software<sup>3</sup>. Regarding UX both reports share more similarities, since they list slower page loading time, in their respectively top three and top five. Other UX reasons worth mentioning are ads distract from browsing experience, ad slow down browsing experience and sites are easier to navigate through without ads. The 2016 Ad blocking report by IAB summarizes the main reasons for consumers in one sentence: 'All users, but especially consumers using ad blockers, want uninterrupted, quick browsing and a streamlined user experience.' This report gives other valuable insights regarding the line of thought of ad blocker users. According to the report, the main reason for consumers that already use ad-blocking software is that websites are easier to navigate through without ads. As these consumers blame advertisements for slow loading pages or websites. Ads that block content, long (forced) videos and ads that follow down the page cause the most annoyance among ad blocker users.

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<sup>3</sup> <https://pagefair.com/downloads/2017/01/PageFair-2017-Adblock-Report.pdf>

## **2.3 Banner Blindness & Ad Avoidance**

In their research, Hervet, Guérard, Tremblay & Chtourou (2011), mention the term banner blindness to define the behavior of avoiding looking at advertisement banners on an Internet page. However, this was based on research, which focused on memorizing ads. Similar to this research paper, Hervet et al. (2011), also aimed to draw conclusions not based on memory but on gaze time and gaze paths. In this study, their research showed that banner blindness does not apply to advertisements (banners) on the Internet. In their research among all their participants, 82% fixated at least to one of four banners. Therefore, their conclusion is that banner blindness does not exist for browsing the Internet. Another topic is banner avoidance, or defined by Speck & Elliott (1997) as “all actions by media users that differentially reduce exposure to ad content”. In their paper, almost 950 respondents were part of an experiment to examine the levels of ad avoidance. However, in 1997, the amount of online advertisement was limited compared to the present. Although the result of this experiment is not relevant anymore, it provided the groundwork for later research in ad avoidance. Further research showed that ad avoidance in the online environment differs from traditional media. According to Li et al. (2002), consumer behavior in relation to online advertising is far more goal or task-orientated. In their paper, Cho & Cheon (2004) tested their model in examining and explaining why ad avoidance exists. They found that online ad avoidance could be explained by three variables, perceived ad impediment, perceived ad clutter and prior negative experiences.

In 2013, Tang et al. (2013) researched the behavioral responses from ad avoidance approaches in relation to the design of ads. In their report three types of ad avoidance approaches are defined, being: behavioral, cognitive and mechanical. Within these three, the mechanical approach embodies the usage of ad blocking software. Where the behavioral and cognitive approach is a temporal choice made every time, the mechanical approach is a long-term preference.

## **2.4 Website Aesthetics**

According to Constantinides (2004), website design is one of the main building blocks of the online consumer behavior. In his paper the researcher classifies website design as a ‘content’ factor regarding the aesthetics of a website. In their 2012 study Cho & Youn-Kyung (2012), concluded that the success of an online retailer without a high degree of brand recognition, needs to have their website to be as aesthetically pleasing as possible in order to entice customer into conversion. In that same study, Cho & Youn-Kyung (2012), opts for further research into the emotional responses to website design.

Website design is regarded crucial in shaping the online customer experience and influential in the buying decision making process. These claims are reinforced by other researcher who state that website design is an important aspect in order to attract, entertain and an influencer of overall customer satisfaction (Lee & Lin, 2005; Ganguly, Dash, Cyr, & Head, 2010). A study done by Stanford University, which included 2.440 respondents, revealed that website aesthetic is regarded the most important cue when it

comes to website credibility (Fogg, 2002). Furthermore, in their report, Constantinides, Lorenzo-Romero & Gomez (2010) suggest that future research is needed in analyzing the consumers' perception on aesthetic aspects to understand the role of good or bad design regarding the consumers' online behavior. Website design consists of four elements, being: content, structure, interaction and presentation (Ganguly et al, 2010). This study will focus on the placement of advertisements, which embodies all four aspects of the website aesthetic elements.

*H1. Ad-blocking has an effect on the perception of website aesthetic.*

## **2.5 Information Searching Behavior & Transaction Behavior**

According to Statista, in 2023, 22% of all global retail sales will be done through e-commerce. Whereas in 2018, an estimated 1,8 billion people worldwide purchased goods online<sup>4</sup>. The transaction is last step in the online customer journey. According to Goldsmith & Bridges (200), Internet consumption includes three steps: (1) gathering information, (2) shopping and (3) selecting and buying specific goods, services and information. In this current study we will focus on steps 1 (as the information searching behavior) and 3. For this study we will define the third step as 'transaction behavior'.

According to Porter (2001), there is a growing dependency on the Internet to search information. Through low transaction costs, easier access to relevant price and or product information and the ability to pool volume compared to traditional search this dependency is expected to grow. Research by Chen (2009) supports that line of thought, according to his study, online behavior is fundamentally different from the traditional shopping behavior. Bei, Chen & Widdows (2004), add that collecting information through human contact is relatively costly and time consuming. The Internet provides online consumers a broader base, where consumers are not restricted by their own personal networks. Furthermore, Chen (2009) claims that resources on the Internet have changed the consumer decision process entirely. According to his study, 87,5% of respondents incorporated information search in their online shopping decisions. Online consumers hope that finding the correct information will help making a wiser purchase decision (Bei, Chen & Widdows, 2004). According to Constantinides (2004), average Internet users spend limited amount of time browsing pages searching for information. With this in mind, websites should attract the attention of online consumers in a short time. Without exposing the online consumer with distractions along his or her information search followed by the transaction. However, little is known about the distractions consumers may experience during the two phases as described above.

Hence this study will explore the effects of advertising during a consumer information searching and transaction process. Using ad-blocking software, the appearance of a website will be simulated in their original form (including advertising, with ad-blocking software turned off) and without advertising (with active ad-blocking). The following hypotheses are developed:

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<sup>4</sup> <https://www.statista.com/topics/871/online-shopping/>



- H2. Ad-blocking has an effect on the information finding behavior  
H3. Ad-blocking has an effect on the transaction behavior.

## 2.6 Proposed model

The research is conducted in order to understand the effect of ad-blocking software on the online customer behavior by constructing the model as defined in figure 1. This model uses three variables in order to explain online customer behavior. The variables are website aesthetics, information searching behavior and transaction behavior. The reasoning for these variables is due to the complete simulation of a customers journey from visiting a (appealing) website, searching for the relevant information and finally converting into a transaction. Among this journey, the effects of having advertisement among all three phases, and abundance of advertising (simulated through ad-blocking software) will be explored. The dependent variable in this study is the ad-blocking software being activate or deactivated.

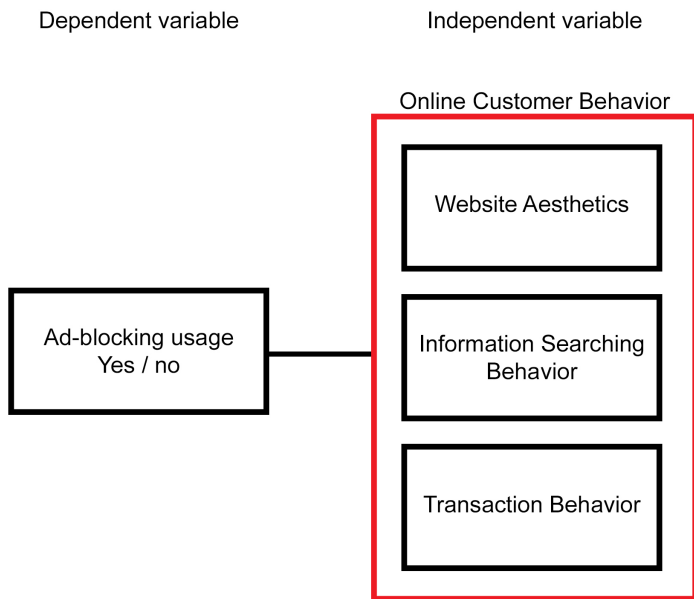


Figure 1: Model to explore the effects of ad-blocking software on OCB.

## 2.7 Variables and Hypothesis

Variables	Hypothesis
Ad-blocking software	
Website Aesthetics	Ad-blocking has an effect on the perception of website aesthetic
Information Searching Behavior	Ad-blocking has an effect on the information finding behavior
Transaction Behavior	Ad-blocking has an effect on the transaction behavior.

Table 1: Variables and hypotheses

## **3. Research Methodology**

The following section will give an in-depth view on the research design. In different subsections participants, data analysis, apparatus, procedures are explained and discussed. Finally, the experiments and their set-up are also discussed in this chapter, divided per experiment.

### **3.1 Participants**

This research is based on experiments conducted on 14 participants who took part in the experiments. Their ages ranged between 20 and 34 years old (mean age=23, SD=3.36). Eleven participants were male with the three other participants were females. In a pre-test conversation, the participants mentioned being known with online advertising and ad-blocking software.

The participants went through three experiments and afterwards all filled in the same questionnaire. These experiments will be discussed furthermore in subsection 3.5.

### **3.2 Data analysis**

Most of the collected data will be quantitative, collected over the three experiments and a questionnaire, the data will be analyzed using IBM SPSS. Using SPSS the data can be processed further. Using statistical analysis methods, one can interpret and verify the data based on different ways. The data from this experiment will use multiple tests provided by the software. For the statement questions in the questionnaire containing the Likert-scale, a reliability analysis will be conducted to analyze the internal consistency of the questions.

Quantitative data collected from the statement questions, will be can be backed up with statistical proof, this data will ask for other methods. In the first experiment regarding website aesthetics, a Chi-Square test will be done to test the difference in perception and if the results are significant or not. The collected recordings from the eye tracking glasses are analyzed using the Tobii analyzing software. Using the software, gaze plots, heat maps and gaze paths can be generated. The heat maps will be analyzed using the fixation time of the participant, the longer a participant fixates on a singular point, that point will be displayed in a concentrated red spot. The gaze path follows the movements the eye of the participant makes, creating a step-by-step numbered path.

For the second and third experiment, a paired sample t-test will be conducted in order to test the means of the two test groups. With this test we can conclude if there is a difference in information searching behavior (experiment 2) and transaction behavior (experiment 3).

### 3.3 Apparatus and materials

The technique where a person's eye movements are followed and measured is called eye tracking. The method is considered an important and objective technique used in human computer interaction studies (Poole & Ball, 2006). Using this technique, the researcher can gain insight to where a person is looking at, how long a person is focused on a particular point, but can also explain the sequence of the eyes when they shift from spot to spot. Within this way of measuring, there are multiple techniques that can be used. The most common commercially available eye trackers, measure the so-called point of regard by using the corneal reflection/pupil-center method as described by Goldberg & Wichansky (2003).

In order to track eye movement, all participants were equipped with the Tobii eye tracking glasses. The Tobii eye-tracking glasses use a small camera to record the movement of the eye. The technique is called video based eye tracking. Before using this method, each participant needs to calibrate the eye tracker accordingly to his or her eyes. This calibration process consists of fixating at a designated spot for a short period of time (Poole & Ball, 2006).

Besides the glasses, a small recording pack is necessary to capture the footage to a SD-card. Before performing the experiment, the participants need to calibrate the glasses to make sure the recording is accurate. After the calibration, the software accurately calculates the eye movement based on fixation points.

The glasses are made available by the BMS-lab at the University of Twente. The participants were asked to look at a 15,6-inch laptop screen (an Apple MacBook Pro), which was located approximately 50 centimeters in front of the participants (set up is presented in figure 1). The recording is processed afterwards using Tobii software, the output is a video file, which shows a (colored) circle representing the fixation point. Using these fixation points, an analysis can be conducted. The participants are presented with stimuli, in the shape of multiple Internet pages or screenshots of these pages. The presented pages are not linked to each other and are widely diversified.

### 3.4 Research procedure

This research consists of three different experiments. *The first experiment has to answer the question: does website aesthetics affect the online customer behavior and what is the role of ad-blocking software?* This experiment focuses solely on the aesthetics of the website. In this section, A/B-testing and a questionnaire are the tools, which will be used. The participants will be subjected to two different versions of a range of websites. The order is randomized every test. In the first version, the website will be displayed without ad-blocking software, while the second version, ad-blocking software will be disabled. This ensures that the participants are subjected to the same page with and without advertisements (see figure 1, in appendix 1). This will be simulated through ad-blocking software. After being subjected to the different versions, the participants are asked to fill-in the questionnaire.

The second experiment of the research focuses on one of the elements of the online customer behavior, being the searching and finding information aspect. This experiment has to answer the following question: *does ad-blocking software affect the information searching and finding behavior?* The experiment will involve the groups being subjected to web pages with and without ad-blocking software active. The participants are divided into two groups and will be subjected to two versions of a website. The first group (n=7) will have ad-blocking software active. The second group (n=7) will have the ad-blocking software disabled. While performing the task, the participants are timed in order to determine if the presence of advertisements affect the speed of finding information. Afterwards, the participants are asked if they saw one or multiple advertising banners. The predefined task, which the participants are asked to complete, is described in the next subsection (see experiment 2).

The third experiment of the research focuses on the transaction behavior, which is the last part of the online customer behavior model. The third experiment should answer the following question: *does ad-blocking software affect the transaction behavior of online customers?* Similar to the second part of the research, participants will be divided into two groups. Both groups will be subjected two separate versions of a website, one with and one without an ad-blocking software active. The research set up is similar to the second experiment. The participants will be timed and monitored, in order to see if there is a difference in time used, while performing the task of transaction. Using these methods, we can analyze if and if so, how much attention is given at advertisements and if the participants who are subjected to advertisements need more time to complete a purchase. The predefined task, which the participants are asked to complete, is described in the next subsection (see experiment 3). Figure 2 below shows the research design in one clear overview.

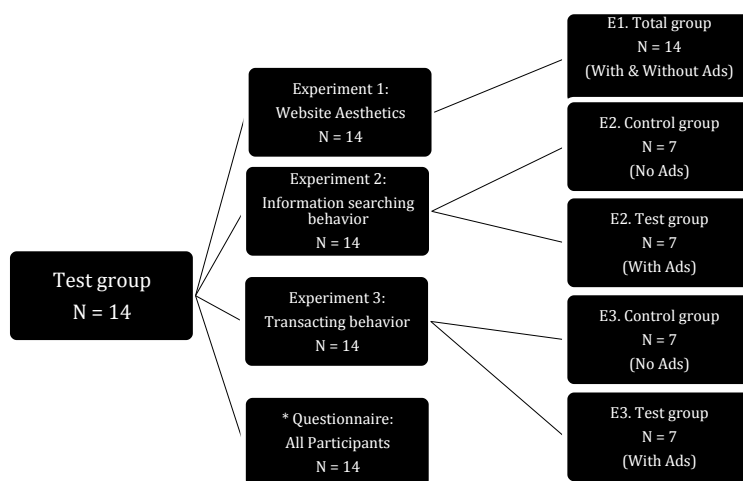


Figure 2: Research design overview

### 3.5 Experiments

In this section, the experiments conducted in this research are described in depth. Furthermore, a couple of examples are displayed of the pages that were presented to the participants. The participants are instructed briefly about the experiments. They are instructed that their eye movements would be recorded using eye-tracking glasses. Beforehand, the purpose of the research is not mentioned in order to gain organic reactions and insights. The experiments are conducted in a neutral room without other distractions. The participants went through the experiments one by one. Before undergoing the experiment, the participants are instructed to read through the predefined scripts comprehensively. After calibrating the glasses, the experiments could begin.

#### 3.5.1 Experiment 1: A/B-testing

The first experiment focused on the design of websites. In this experiment the participants are presented with two images of an Internet page. In the first image, the ad blocking software is activated, while in the other image the software turned off. This simulates a page with and without advertising. In this way, participants can browse through a string of pages and chose the page they prefer. In the example below, we can see the website of a Dutch news website called Nu.nl. In the first figure, we can see the website with the ad blocking software active. In the second figure, we can see the same exact page, but without the ad blocking software. In the second figure, the website's design is altered to put three advertisement blocks on the page. The first one is by the NS (Nationale Spoorwegen), the principal passenger railway operator in the Netherlands. The ad is located in the top segment besides the first content. The other advertisements placed on this page are by a clothing website and are located on the left and right side halfway on the page. As we can see from this example, advertisements do alter the website design quite a bit. How much and how do the participants respond to these advertisements is analyzed in this experiment. All the other pages used in this experiment are included in appendix 1.



Figure 3: changes in website aesthetics caused by ad blocking software.

### *3.5.2 Experiment 2: Information finding task*

In the second experiment focused on the process of finding information, which is one of the elements within the web experience. In this experiment the participants are presented with a predefined script (see appendix 2) In this script, the participants are asked to search for information about the new iPhone 8. The test group is divided into two groups, the first group needs to follow the script without ad blocking software, while the other group will do the same but with active ad blocking software. This will give insights into how much attention the advertisements attract from the participants. Furthermore, the participants will be timed while performing the task, in this way; an analysis can be made if the participants are slowed down in their task by advertisements. The pre-defined script is presented below, although this report is written in English, since we are dealing with exclusively Dutch participants the task is also presented in Dutch to make the process easier. Afterwards, the participants will be asked if they remember seeing one or multiple advertisements.

### *3.5.3 Experiment 3: Transaction completion task*

The third experiment will have a similar set-up as the second experiment. Transaction is one the elements within the web experience. Participants are presented with a predefined script, where they are asked to search, compare and purchase on of two products on Dutch comparing website, called Kieskeurig. The group is divided in a test and a control group. The test group will be exposed to advertisement, while the control group is not. During the experiment both groups are timed in order to analyze the amount of time it takes to complete a task and if advertisements have an impact on these results. So the goal of this experiment is to analyze if and how advertisements interfere with the process of completing a purchase. The pre-defined script is included in appendix 3, although this report is written in English, since we are dealing with exclusively Dutch participants the task is also presented in Dutch to make the process easier.

### *3.5.4 Questionnaire*

This report is based on the three experiments explained above. In order to also gain quantitative results, a questionnaire is held among the respondents used in the experiments. All participants are asked to fill after completing the experiments. The questionnaire is divided into three sections. The first section starts with a general question whether the respondent is using any kind of ad blocking software on a daily basis. The second section focuses on the preferation of the users and the third section is to gain insights on the opinions on online advertisements. To make it easier for the respondents, the questionnaire is presented in Dutch and English.

## 4. Results

The results of the experiments are presented in this chapter. The chapter follows the same order as defined in the research design. Using statistical analysis Where possible, statistical evidence is added to ensure the results are valid. Using the results from this chapter, chapter five is going to serve as a summary of all results and will include discussion where needed.

### 4.1 Study into website aesthetic perception through A/B testing and eye-tracking

The first element of the Online Customer Behavior was defined as Website Aesthetics, the results of the experiments regarding Website Aesthetics are presented in the first section. The research design as presented in figure 2 (section 3.4), show that the participants (N=14) went through A/B testing. They went through this experiment while being equipped with the eye tracking glasses. The results of this experiment are described in the following subsection.

#### 4.1.1 A/B testing

In the first part of the experiment, the participants were seated in front of the laptop screen one by one. All participants were equipped with the Tobii eye tracking glasses and then were asked to go through an album containing screenshots of various websites, ten in total. This experiment altogether, generates 140 observations, being 14 respondent's multiplied by the number of pages used in the experiment (10).

These ten websites are presented two times, once with and once without advertisement placements. In each sequence, the participants have to choose the website they prefer based on website aesthetics, in other words, which they like the most. From the 140 observations, 79% (111) prefers websites without advertisements. Out of the 140 observations, 29 preferred the website with advertising. Using the Chi-Square test, it is possible to test if there is a significant difference between two binary variables.

The hypotheses for this experiment were defined as follows:

*H<sub>0</sub>: Ad-blocking does not have an effect on the perception of website aesthetic*

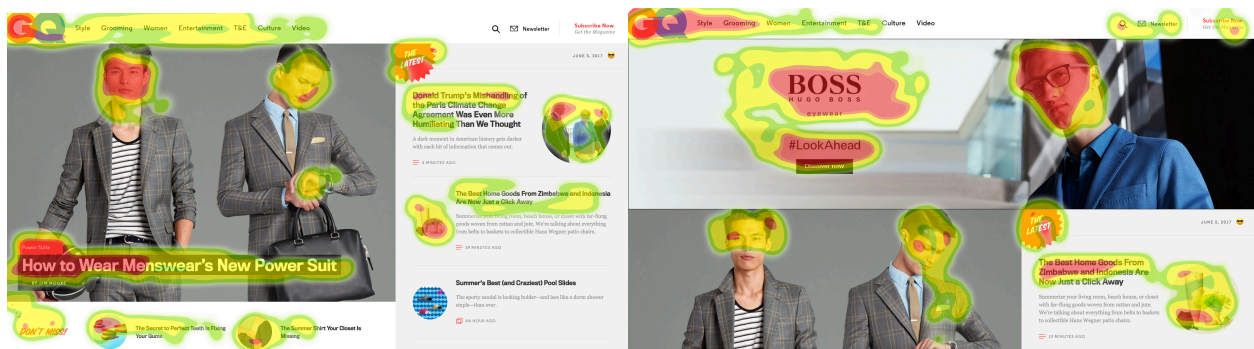
*H<sub>a</sub>: Ad-blocking has an effect on the perception of website aesthetic.*

A chi-square test of was performed to determine if there is a difference between the two groups, and if one is more preferred. The results show that perception between the options was not equally distributed,  $\chi^2(1, N = 140) = 48.03, p < .05$ .

Using the  $\chi^2$  table, one can find the score to test the significance. For an alpha of 0.05, the value is 3.84. In this case our computed value is 48,03, which exceeds 3,84. So the results suggest that there is statistical evidence to accept the alternative hypothesis H<sub>a</sub> (Ad-blocking has an effect on the perception of website aesthetic).

## 4.1.2 Eye-tracking

As before mentioned during the A/B testing part of the experiment, the participants were also equipped with eye tracking glasses in order provide insights on eye fixation and fixation length, while being presented with the sequence of websites. In this part of the report, a total of four pages from four respondents will be presented below. The other pages are included in appendix 5. The pages are presented with heat maps, which show the fixation of the eyes. The longer the fixation, the darker red the heat spot is. The first two heat maps show the same page, being the homepage of GQ. The first page is without advertisements, while the second GQ page has advertisements on the page. In this example, it is clear that the advertisement by Hugo Boss draws much of the attention as displayed by the big red spot on the ad. On the other two pages, Yahoo and Nu.nl, the ads are a bit smaller. As one can see from the heat maps, the website contents draws most of the attention displayed by the clustering of red spots on the website content. On Yahoo, besides the main picture and the website name, the ad by Forever 21 is also subject of interest. The page of Dutch news website Nu, shows multiple ad placements surrounding the website content. Besides the main headline and a few news bullet points, the advertisements seem to attract a fair amount of attention of one's eyes. Beside these examples, all heat maps have a similar pattern. The websites are designed in a way that the most important aspect gets the first attention. However, when advertisements are included, the ads they capture the attention of the website browser. By comparing the heat maps, we can conclude that advertisements draw the attention away from the actual content. A disclaimer to this conclusion is that this can alter per website. As we can see in the examples below, on the website of GQ Magazine, the ad is displayed in a prominent way, severely altering the design of the page. With such a big alteration of the webpage, the effect distracting effect by the ad is amplified. Other pages, such as Dumpert for example, has a just one small billboard format display available for ads, this makes the chance and the severity of distraction less likely.





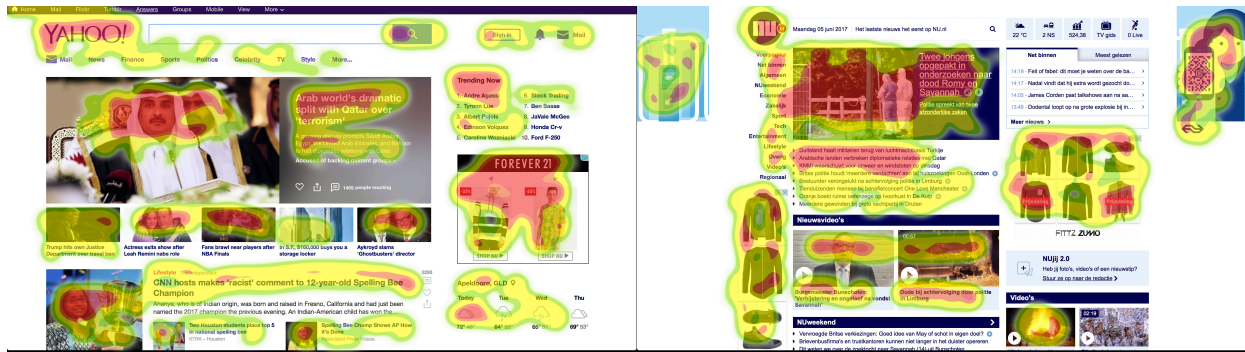


Figure 2: Heat map examples

## 4.2 Study into information searching behavior through defined task

The second element of the Online Customer Behavior framework focuses on the Information Searching Behavior. By the definition described by Constantinides (2004) the information searching task consists out of the following tasks: searching, browsing, finding, selecting, comparing. During the experiment, participants were asked to follow a predefined script (see appendix 2 for the script). The participants were timed while completing the task. In appendix 6, the timings per group are displayed.

The hypothesis were defined as follows:

*H0: Ad-blocking software does not have an effect on Information Searching Behavior.*

*HA: Ad-blocking software has an effect on Information Searching Behavior.*

A paired-samples t-test was conducted to compare time duration with and without active ad-blocking software. There was no significant difference in the scores for 'with ad-blocking' ( $M=03:04$ ,  $SD=0:12$ ) and 'without ad-blocking' ( $M=02:55$ ,  $SD=0:27$ ) conditions;  $t(6)=.620$ ,  $p = 0.558$ . These results suggest that ad-blocking software does not have an effect on information searching behavior.

Post completion, the 'without active ad-blocking group, were asked if they remember seeing one or multiple advertisements. Out of the seven participants, two remember seeing advertisements. While performing a task, participants seem to give their full attention towards completing the task and (subconsciously) avoiding distractions, in this case the ads. Among the test group, the results show that banner blindness and (unaware) avoiding of banners do exist. We can conclude that that there is no statistical proof to accept the HA hypothesis (*HA: Ad-blocking has an effect on the information searching behavior*).

## 4.3 Study into transaction behavior through defined task

The third and final experiment had a similar set up as the second experiment. The participants went through the experiment to test the Transaction Behavior, which is defined as the final element of online customer behavior.

Within this experiment, participants searched for two predefined products, compared them and finally chose the one based on the given criteria. It was expected that the

participants that were exposed to advertising would 1. Need more time to complete the task. The expectation was that advertising would distract, or make the participants spend more time searching for the needed information.

The hypothesis were defined as follows:

*H0: Ad-blocking software does not have an effect on Transaction Behavior.*

*HA: Ad-blocking software has an effect on Transaction Behavior.*

A paired-samples t-test was conducted to compare time duration with and without active ad-blocking software. There was no significant difference in the scores for 'with ad-blocking' ( $M=03:57$ ,  $SD=0:28$ ) and 'without ad-blocking' ( $M=04:12$ ,  $SD=0:22$ ) conditions;  $t(6)=-1.093$ ,  $p = 0.316$ . These results suggest that ad-blocking software does not have an effect on transaction behavior. The results suggest that ad-blocking software does not affect the transactional behavior. Therefore, the HA hypothesis (Ad-blocking has an effect on the transactional behavior) cannot be accepted.

#### **4.4 Questionnaire study into website aesthetic perception**

All respondents, which went through the experiments above, also participated in the questionnaire. After finishing their experiment, the questionnaire was filled in. Out of the fourteen respondents, nine of them are using any kind of ad blocking software. The five other participants were not using ad blockers. An important insight gained from the Website Aesthetics section was that (13 out of 14) of the respondents prefer websites without advertisements. While one respondent does not mind if there are advertisements on the page. Websites look more appealing without ads for of the respondents. A single respondent finds websites more appealing with advertisements. While for three respondents it does not matter whether a page has ads or not. Furthermore, the participants are asked if websites look more professional with or without advertisements on them. The results show a unanimous preferation for 'without ads'. So, we can conclude that websites appear more professional without advertisements.

In the last section, respondents are presented with seven statements about the advertisements they saw in the conducted experiments. The statements altogether have an overall Cronbach's alpha score of 0.93, which is an excellent score. This tells us that the statements used in the questionnaire measure what we want to measure. In appendix 8, figure 1 shows the reliability statistics per question.

Using a seven-point Likert scale, respondents gave their opinion about the statements. The scale runs from: *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree* and *strongly agree*. In the majority of the results, opinions were spread over all answers. In order to interpret the results in a more efficient manner, the seven-point scale is brought back to five points. This is also improves the readability of the results. The new points are: disagree (strongly disagree & disagree), somewhat disagree, neither agree nor disagree, somewhat agree and agree (agree & strongly agree).

The following statements are used within the questionnaire:

1. The advertisements on the websites are noticeable.
2. The advertisements improve website design.
3. A few advertisements on a website is fine.
4. I'm used to seeing advertisements on websites.
5. The advertisements on the websites are distracting
6. If I could, I would remove all advertisements.
7. I do not mind the advertisements on the websites.

When looking at the three aspects that explain the Online Customer Behavior, the questionnaire gave insights with the following outcomes. The majority of the statements shows relevancy with the first element of Online Customer Behavior being, Website Aesthetics. Statements 1, 2, 3, 4, 6 and 7, show outcomes that support the outcomes of experiment 1, that when participants just are browsing a webpage without a task or goal of some kind, they all prefer websites without advertisements. Statements: 1, 3, 4, 5, 6 and 7, show relevancy with the second aspect of the model, being the Information Searching Behavior. The outcomes of the questionnaire support the results in experiment 1, 2 and 3. Whereas, participants prefer websites without advertisements while casually browsing, however while performing a task like experiment 2 and 3, the participants don't notice the advertisement. Although there are no questions within the questionnaire specifically on the Transaction Behavior, the results of statement 4, 5, 6 and 7 do apply on the third element of the model. All statement results are presented in appendix X in the form of tables.

## 4.5 Revised model

After conducting the experiments the model is revised. The online customer behavior aspects are no grouped under 'Task oriented behavior'. Outcomes in the experiments regarding information searching behavior and transaction behavior show the same results. According to this study, this is can be explained due to respondents being aware of the fact that they are assigned a task. Being assigned a task, the respondent's ability to register advertisements seems to disappear, by the shifting focus. The revised model is presented in figure 3.

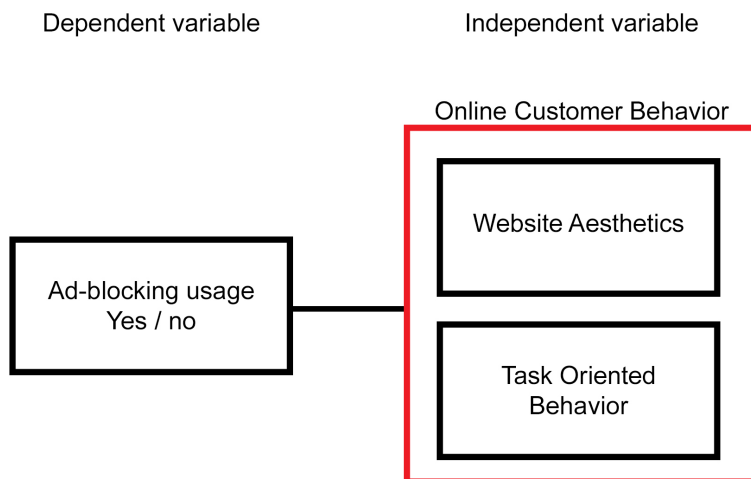


Figure 5: Revised model to explore the effects of ad-blocking software on OCB.

## 5. Conclusion & Discussion

The main research question that this study had to answer, questions if and how ad-blocking software affects the online customer behavior. To explain online customer behavior three criteria were selected being, website aesthetics, information searching and transaction behavior. These aspects were defined based on the literature within the same field of work. The factors together form a possible journey an online customer may follow. The research design contained three experiments using A/B testing, eye tracking and contained a closing questionnaire.

The first experiment was designed to explore the effects of ad-blocking software on website aesthetics. Simulating the first visit of a customer on a website. The experiment consisted out of A/B testing and eye tracking. The first group was subjected to the website containing regular advertising. The second group was subjected to the website without advertising, ad-blocking software simulated this by removing the ads.

A Chi-square test was conducted in order to test if the results were evenly distributed. The analysis provided that there was a significant difference within the results:  $\chi^2(1, N = 140) = 48.03, p < .05$ . The results provided statistical evidence to accept the  $H_a$  hypothesis (*Ha: Ad-blocking has an effect on the perception of website aesthetics*). When interpreting the results, the test group showed a strong preferation for websites without advertising within the A/B testing part. The eye tracking experiment showed that the participant definitely acknowledged the advertising on the websites.

The second experiment was designed to simulate an online customer searching for information. A scripted task was defined. Ad-blocking software was used to test the difference between with and without advertising on the information searching behavior. During the experiment the participants were timed. A paired T-test was conducted to test if there is a significant difference between the groups. The results for 'with ad-blocking' ( $M=03:04, SD=0:12$ ) and 'without ad-blocking' ( $M=02:55, SD=0:27$ ) conditions;  $t(6)=.620, p = 0.558$ . These results provided no statistical evidence to suggest that ad-blocking software has have an effect on information searching behavior. Therefore the  $H_a$  (*Ad-blocking software has an effect on Information Searching Behavior*) is rejected.

An interesting observation made during the experiments was that when participants are asked to complete a task, they tend to not notice any of the advertisements.

The third experiment had a similar set-up as the second experiment, however this experiment was more focused on completing a transaction, being the final step in the customers journey. Again the participants were asked to follow a predefined script, this time focusing on comparing two products and completing a purchase. The groups were divided into two groups, one with activated ad-blocking software and the other group without. A paired T-test is conducted to test if there is a significant difference among the groups. The results for 'with ad-blocking' ( $M=03:57, SD=0:28$ ) and 'without ad-blocking' ( $M=04:12, SD=0:22$ ) conditions;  $t(6)=-1.093, p = 0.316$ . Provided us that there is no

statistical evidence to accept, the  $H_a$  hypothesis (Ad-blocking has an effect on the transactional behavior).

Participants are focused on the task of searching for information or finding, comparing and purchasing (transaction behavior), therefore the proposed model is revised, a new variable is developed in the form of 'task oriented behavior'. The results from the second and third experiment support what Li et al. (2002) mentioned in their research: *consumer behavior in relation to online advertising is far more goal or task-orientated*. Although Hervet et al. (2011) concluded that banner blindness and ad avoidance does not exist; the result from this study suggest otherwise.

### **5.1 Implications for advertisers**

This study provided us with insights regarding the perception of online customers on website aesthetics. Between the groups there was a significant preference for websites without advertising. Ad-blocking software simulates the website without advertisements, however many websites thrive through income generated by advertisers. Advertisers should consider different forms of advertising in order not to be perceived negatively by consumers. Forms such as native advertising, or in the form of paid advertorials pose much less intrusive way of presenting ads. An assumption could be made that these forms of advertising should cause less annoyance on online customers. However this is a subject needs further research. Using the revised model as developed in this study, these forms of advertising could be tested.

### **5.2 Research limitations**

There are some limitations to be found in this study. First, the sample size was relatively small. A larger sample size could provide more accurate results and more reliability. Besides the sample size, the research took place in the Netherlands, and the behavior of the respondents might be limited with Dutch customers. The age distribution in the sample used in this study could also be more diversified and more towards the older ages. Behavior could differ between age groups. Lastly, different forms of advertising should be investigated to explore the model on a larger (and more complete) scope.

## 6. References

Ajdari, D., Hoofnagle, C., Stocksdales, T., & Good, N (2015). Web Privacy Tools and Their Effect on Tracking and User Experience on the Internet.

Bei, L. T., Chen, E. Y., & Widdows, R. (2004). Consumers' online information search behavior and the phenomenon of search vs. experience products. *Journal of Family and Economic Issues*, 25(4), 449-467.

Chen, C. A. (2009). Information-oriented online shopping behavior in electronic commerce environment. *JSW*, 4(4), 307-314.

Cho, C., and Cheon, H. J. 2004. "Why Do People Avoid Advertising on the Internet," *Journal of Advertising* (33:4), pp. 89-97. Ajdari, D., Hoofnagle, C., Stocksdales, T., & Good, N (2015). Web Privacy Tools and Their Effect on Tracking and User Experience on the Internet.

Cho, C., and Cheon, H. J. 2004. "Why Do People Avoid Advertising on the Internet," *Journal of Advertising* (33:4), pp. 89-97.

Cho, E., & Youn-Kyung, K. (2012). The effects of website designs, self-congruity, and flow on behavioral intention. *International Journal of Design*, 6(2).

Clifford, D., & Verdoodt, V. (2016). Ad-blocking-the dark side of consumer empowerment: a new hope or will the empire strike back?

Constantinides, E. (2004). Influencing the online consumer's behavior: the Web experience. *Internet research*, 14(2), 111-126.

Constantinides, E., Lorenzo-Romero, C., & Gómez, M. A. (2010). Effects of web experience on consumer choice: a multicultural approach. *Internet Research*, 20(2), 188-209.

DIS, I. (2009). 9241-210: 2010. Ergonomics of human system interaction-Part 210: Human-centred design for interactive systems. *International Standardization Organization (ISO)*. Switzerland.

Fitts, P. M., Jones, R. E., & Milton, J. L. (1950). Eye movements of aircraft pilots during instrument-landing approaches. *Aeronautical Engineering Review* 9(2), 24-29.

Fogg, B. J. (2002). Persuasive technology: using computers to change what we think and do. *Ubiquity*, 2002(December), 5.

Ganguly, B., Dash, S. B., Cyr, D., & Head, M. (2010). The effects of website design on purchase intention in online shopping: the mediating role of trust and the moderating role of culture. *International Journal of Electronic Business*, 8(4-5), 302-330.

Garrett, J. J. (2010). *The elements of user experience: user-centered design for the web and beyond*. Pearson Education.

Goldberg, J. H., & Kotval, X. P. (1998). Eye movement-based evaluation of the computer inter- face. In: S. K. Kumar (ed.), *Advances in Occupational Ergonomics and Safety* (pp. 529–532). Amsterdam: ISO Press.

Goldberg, J. H., Stimson, M. J., Lewenstein, M. Scott, N., & Wichansky, A. M. (2002). Eye tracking in web search tasks: Design implications. In: *Proceedings of the Eye Tracking Research & Applications Symposium 2002* (pp. 51–58). New York ACM.

Goldberg, H. J., & Wichansky, A. M. (2003). Eye tracking in usability evaluation: A practitioner's guide. In J. Hyönä, R. Radach, & H. Deubel (Eds.), *The mind's eye: Cognitive and applied aspects of eye movement research* (pp. 493-516). Amsterdam: Elsevier.

Goldsmith, R. E. & Bridges, E. (2000). E-Tailing VS Retailing: Using Attitudes to Predict Online Buying Behavior. *Quarterly Journal of Electronic Commerce*, 1(3), 245-253.

Graham, D. J., Orquin, J. L., & Visschers, V. H. (2012). Eye tracking and nutrition label use: A review of the literature and recommendations for label enhancement. *Food Policy*, 37(4), 378-382.

Gritckevich, A., Katona, Z., & Sarvary, M. (2018). Ad Blocking. Columbia Business School Research Paper, (18-11).

Gugelmann, D., Happe, M., Ager, B., & Lenders, V. (2015). An automated approach for complementing ad blockers' blacklists. *Proceedings on Privacy Enhancing Technologies*, 2015(2), 282-298.

Haddadi, H., Nithyanand, R., Khattak, S., Javed, M., Vallina-Rodriguez, N., Falahrastegar, M., ... & Murdoch, S. J. (2016). The Adblocking Tug-of-War. ; *login: The USENIX Magazine*, 41(4), 41-43.

Hemmer, J. L. (2005). The Internet Advertising Battle: Copyright Laws Use to Stop the Use of Ad-Blocking Software. *Temp. J. Sci. Tech. & Envtl. L.*, 24, 479.

Hervet, G., Guérard, K., Tremblay, S., & Chtourou, M. S. (2011). Is banner blindness genuine? Eye tracking internet text advertising. *Applied cognitive psychology*, 25(5), 708-716.

Jacob, R. J., & Karn, K. S. (2003). Eye tracking in human-computer interaction and usability research: Ready to deliver the promises. *Mind*, 2(3), 4.

Jaspers, M. W. (2009). A comparison of usability methods for testing interactive health technologies: methodological aspects and empirical evidence. *International journal of medical informatics*, 78(5), 340-353.

Just, M. A., & Carpenter, P. A. (1976a). Eye Fixations and Cognitive Processes. *Cognitive Psychology*, 8, 441–480.

Kaur, S., Kaur, K., & Kaur, P. (2016, March). Analysis of website usability evaluation methods. In *2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom)* (pp. 1043-1046). IEEE.

Kaye, B. K., & Medoff, N. J. (2001). *World Wide Web: a mass communication perspective*. McGraw-Hill Higher Education.

Khattak, S. (2017). *Characterization of Internet censorship from multiple perspectives* (No. UCAM-CL-TR-897). University of Cambridge, Computer Laboratory.

Kohavi, R., & Longbotham, R. (2015). Online controlled experiments and A/B tests. *Encyclopedia of machine learning and data mining*, 1-11.

Kohavi, R., Longbotham, R., Sommerfield, D., & Henne, R. M. (2009). Controlled experiments on the web: survey and practical guide. *Data mining and knowledge discovery*, 18(1), 140-181.

Law, E. L. C., Roto, V., Hassenzahl, M., Vermeeren, A. P., & Kort, J. (2009). Understanding, scoping and defining user experience: a survey approach. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 719-728). ACM.

Lee, G.G. and Lin, H.F. (2005) 'Customer perceptions of e-service quality in online shopping', *Journal of Retail and Distribution Management*, Vol. 33, No. 2, pp.161–176.

McCoy, S., Everard, A., Polak, P., & Galletta, D. F. (2007). The effects of online advertising. *Communications of the ACM*, 50(3), 84-88.

Meenaghan, T. (2001). Sponsorship and advertising: A comparison of consumer perceptions. *Psychology and Marketing*, 18(2), 191-215.

Mughees, M. H., Qian, Z., Shafiq, Z., Dash, K., & Hui, P. (2016). A First Look at Ad-block Detection: A New Arms Race on the Web. *arXiv preprint arXiv:1605.05841*

Nielsen, J. (2005). Putting A/B testing in its place. *Useit. com Alertbox*.



Nithyanand, R., Khattak, S., Javed, M., Vallina-Rodriguez, N., Falahrastegar, M., Powles, J. E., & Murdoch, S. J. (2016, May). Ad-blocking and counter blocking: A slice of the arms race. In *6th USENIX Workshop on Free and Open Communications on the Internet (FOCI 16)*. USENIX Association.

Poole, A., & Ball, L. J. (2006). Eye tracking in HCI and usability research. *Encyclopedia of human computer interaction*, 1, 211-219.

Rens, W. (2017). Browser forensics: adblocker extensions. Sandvig, J. C., Bajwa, D., & Ross, S. C. (2011). Usage and perceptions of internet ad blockers: An exploratory study. *Issues in Information Systems*, 12, 1-59.

Salvo, M. T. (2016). Social media engagement: identifying the predictive anatomy of organic social content (Doctoral dissertation).

Sandvig, J. C., Bajwa, D., & Ross, S. C. (2011). Usage and perceptions of internet ad blockers: An exploratory study. *Issues in Information Systems*, 12, 59-69.

Shiller, B., Waldfogel, J., & Ryan, J. (2018). The effect of ad blocking on website traffic and quality. *The RAND Journal of Economics*, 49(1), 43-63.

Shiller, B., Waldfogel, J., & Ryan, J. (2017). Will Ad Blocking Break the Internet? (No. w23058). National Bureau of Economic Research.

Speck, P. S., and Elliott, M. T. 1997. "Predictors of Advertising Avoidance in Print and Broadcast Media," *Journal of Advertising* (26:3), pp. 61-76

Tang, J., Zhang, P., and Wu, P. F. 2013. "Passive or Active: Understanding Consumers' Behavioral Responses to Online Advertising," *PACIS 2013 Proceedings*, 188

Ur, B., Leon, P. G., Cranor, L. F., Shay, R., & Wang, Y. (2012, July). Smart, useful, scary, creepy: perceptions of online behavioral advertising. In *proceedings of the eighth symposium on usable privacy and security* (p. 4). ACM.

Wedel, M., & Pieters, R. (2008). A review of eye-tracking research in marketing. In *Review of marketing research* (pp. 123-147). Emerald Group Publishing Limited.

Wielki, J., & Grabara, J. (2018). The Impact of Ad-Blocking on the Sustainable Development of the Digital Advertising Ecosystem. *Sustainability*, 10(11), 4039.