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THE IMPACT OF ADVERTISING LOCATION AND USER TASK ON THE EMERGENCE OF BANNER AD BLINDNESS: AN EYE TRACKING STUDY

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The purpose of this study was to explore the emergence of ad banner blindness in the viewing of e-commerce home pages. By using an eye-tracking methodology, the study supported a more granular analysis of user behavior. Building on the literature on inattention blindness and banner blindness, we assess the gaze path of users in goal-directed and free-viewing tasks when viewing pages with advertising banners on the right side of the page or on the top of the page above the main navigation menu. The results support existing literature that banner blindness is strongest for advertising banners on the right side of the page and for goal-directed tasks. The eye-tracking results provide new insight into the cognitive principles underlying these differences.

INTRODUCTION

Advertisers have long faced a challenge to measure the impact of the ads they place. They need to select the appropriate type of advertisement based on their marketing strategy. Selecting the wrong medium can lead to a failure to meet business objectives and an inefficient allocation of marketing budgets (Breuer and Brettel, 2012; Vakratsas and Zhenfeng, 2005). Web-based banner advertisements are a common option that advertisers have available (Papatla and Bhatnagar, 2002). Online advertising has grown into a substantial and vital part of the economy. Businessweek (2010) reported that online advertising increased 11.3% from 2009 to 2010, reaching $12.1 billion. A Forrester Research report predicts that total online ad spending will reach $77 billion by 2016, comprising 35% of total ad spending in the U.S (Forbes, 2011). Of this, $28 billion or 37% will be for display ads.

One significant obstacle encountered in the use of these ads is banner blindness (Benway and Lane, 1998). Stemming from the theoretical construct of inattention blindness (Mack and Rock, 1998), banner blindness is the tendency for users to avoid attending to banner ads or anything that pre-attentively resembles banner ads (Benway and Lane, 1998). Many research studies have investigated banner blindness with the intention of contributing to the theoretical understanding of human attention (Macias, 2003; Pagendarm and Schaumberg, 2001; Rodgers, 2000) and to assist advertisers in the design and implementation of banner ads (Albert, 2002; McCoy, Everard, Polak, and Galletta, 2007; Shen, 2002). This research seeks to contribute to both of these objectives using an eye-tracking methodology to resolve user behavior at an immediate term granular level and compares tasks of different intensity to investigate how banner blindness changes as a result of cognitive load. It adds to similar findings in Owens, Chaparro and Palmer (2011) by looking at different task types. It also adds to the results of Heinz et al (2013) who did not include eye tracking. Further, both of these studies look at information-oriented pages rather than commerce-oriented pages.

THEORETICAL BACKGROUND

Inattention Blindness

Inattention blindness is a concept that has been used to explain the phenomenon whereby an observer fails to notice one stimulus when focusing attention on a primary stimulus (Mack and Rock, 1998). However there have been conflicting results regarding whether this phenomenon truly exists, when it appears, and why (Bredemeier and Simons, 2012).

The cognitive mechanisms underlying inattention blindness were studied by Lavie et al (2004). They proposed two alternatives: perceptual selection and attentional selection. Perceptual selection involves excluding irrelevant stimuli from perception when the primary task requires a high cognitive load. This establishes an early filter in which interference from the distracter is prevented at the source. Attentional selection involves a late filter in which the distracter is perceived but processing is suppressed at the cognitive level. This requires more mental workload, higher cognitive function, and is potentially more fatiguing. The two mechanisms can be differentiated by measuring whether this fatigue occurs. Their study concluded that both mechanisms can occur under the appropriate circumstances, depending on the nature of the primary task and of the distracters.

For example, the observer's attention may be differentially affected by expected and unexpected distracters (Most and Simons, 2001). Knowing a distraction will appear allows the observer to force his or her attention more strongly on the primary stimulus and to inhibit the attraction of the distracter. Without the preexisting inhibition, the observer may be less able to withstand the attraction of a new stimulus that appears unexpectedly. This is the mechanism most likely to emerge in advertising banner blindness.

Another set of explanations is based on the nature of the primary task. Fougnie and Marois (2007) found that a task that taxes working memory increases the likelihood of inattention blindness. When engaged in a high demand task, the newly appearing stimulus is less distracting, suggesting that it is not attended in the first place. This lends additional

evidence to the late filter attentional model. Cognitive load is more likely to tax attention than perceptual pathways.

Banner Blindness

Banner blindness is a term used to describe the inattention blindness that occurs when web page viewers do not notice the presence of an advertising banner on the page. As with inattention blindness in general, there are many explanations for why banner blindness occurs (Blackmon, 2012). The most prevalent is that users know where advertising generally is located on the page, do not expect to get valuable information from the advertising, and purposefully choose not to view it (Albert, 2002, Benway, 1998; Dreze and Hussherr, 2003). In the CoLiDeS model (Kitajima et al, 2000), users' attention begins in the location where they expect to encounter the most task-relevant information and only attend to other sources if the initial source is insufficient. According to this model, users would rarely attend to locations where advertising is expected (Benway, 1998; Benway and Lane, 1998).

Alternatively, users may view the banner but because it contains no information relevant to the current task they quickly forget its contents (McCoy et al, 2007). Both explanations diminish the value of the advertisement to the marketer, but have different implications for banner ad design to overcome it. If the banner is not viewed, marketers can use design techniques such as salience, animation, or other attention-grabbing techniques. They can also contract for ads to appear at locations of the page more likely to be viewed (Bayles, 2002). If the banner is viewed but not recalled, then matching the ad to the user's task through techniques such as user profiling or search query matching would be more helpful and a better use of the marketing budget.

Display Configuration

The location of the banner ad has been proposed as a critical factor influencing whether or not the user notices, attends to, and recalls a banner ad. In general, users parse web pages from top left to bottom right (Buscher, Cutrell and Morris, 2009) and being within this path would increase notice. The CoLiDeS and SNIF-ACT cognitive models (Blackmon, 2012) support this prediction. There is an underlying assumption that users can predict what page locations are more likely to contain relevant information and advertising before fixating (or not) on them. This has been shown previously in studies such as Granka et al (2006) and Masconi et al (2008). Cooke (2008) and Shrestha et al (2009) refined this result further by concluding that users are most likely to assume content on the right side of the page is advertising. Another common advertising location is at the top of the page above the primary navigation.

Task Type

Brajnik and Gabrielli (2010) concluded that it is attentional requirements that have the largest impact on users' visual scan of a page. Users in complex tasks have more trouble dealing with ads, especially intrusive ones. Horvitz (2004) defines further that the scope and path of the visual scan of a web page will depend on the user's "state of interruptability." When the user's main task requires little attention, he speculates that ads that are more interactive and use rich media can be more effective. The user's *need for cognition* (Macias, 2003) would motivate users to look at irrelevant content in easy tasks if it seems interesting or appealing. In contrast, users may be reluctant to spend time parsing these kinds of ads when their main task is more difficult. Limited capacity and limited bandwidth models (Hong et al, 2007; Lang, 2000; Reeves and Nash, 2000; and Sundar and Kalyanaraman, 2004) predict that the user will not have sufficient spare attention when there is more cognitive load in the assigned task.

There are many nuances of task design that could impact banner blindness. Task workload requirements have been studied at length in the general inattention blindness literature as described earlier. For banner advertising, there have been a few studies that investigated task specificity. Lapa (2007) found less banner blindness in a task-free context compared to more specific tasks. Similarly Pagendarm and Schaumberg (2001) found that participants recognized and recalled ads more when browsing aimlessly than when goal-directed.

METHODOLOGY

Eighteen websites were selected using the web traffic site Alexa.com. Sites with traffic ranks of 200 and below and which had a banner ad on the top or right side of the page were identified. Sites of various interests and local relevancy were picked and screenshots of the homepage captured after the ads had fully loaded and its branding displayed.

There were two sets of tasks for each study session. In the free-viewing tasks, participants were shown a screen capture for 7 seconds, and told simply to "get a sense of the web site." The free-viewing task allows users to look at whatever is the most attractive or interesting, which can include the advertising. This was repeated for each of the 18 web sites, including nine with a top ad and nine with a side ad.

In the goal-directed tasks, participants were shown a question that represented a typical task for that website, followed by a screen capture of the site. They were directed to look for the answer visually, without saying it out loud to the moderator. The task was designed to be similar in time, difficulty, and engagement as the free-viewing task so that the only difference was the presence of a specific information target. This was repeated for each web site.

Thirty participants were recruited from a university campus and split randomly into two groups of 15 each. Each group had 10 female and 5 male participants. The age ranges were normally distributed with the median age of 35-44 years. Participants were compensated $10 for their time. The experiment lasted about 15 minutes for each participant.

In both conditions, participants were first calibrated on an SMI iViewX eye tracking system. All participants sat approximately 27" from a 21" wide monitor. After successfully calibrating at values of 1 degree or less, the experiments commenced as described.

RESULTS

The primary objective of this study was to investigate users' visual path, the emergence of banner blindness towards advertising, and how this relationship is influenced by the nature of the user's task. Analyses of Variance were calculated for the total dwell time on the banner and the total number of fixations on the banner. Independent variables entered into the model were ad location (top or side), task type (free-viewing or goal-directed), and advertisement brand. Because the total dwell time and total number of fixations were highly correlated, only total dwell time will be reported.

Primary Variables

The main effects and interaction between the two primary variables of this study were all significant in the final ANOVA model. Ad location had a significant main effect on total dwell time ($F = 21.616$; $p < .001$). The total dwell time on the top ads averaged 465 ms compared to only 313 ms of dwell time for the side ads. Task type also had a significant main effect on total dwell time ($F = 22.346$; $p < .001$). The total dwell time on the advertisements in the free-browsing task averaged 473 ms compared to only 306 ms of dwell time on the advertising for the goal-directed task. Figure 1 illustrates the interaction between the two variables ($F = 6.633$; $p < .05$). Post hoc analysis determined that the key difference was for the goal-directed task and the side ad, which received significantly less total dwell time than either the goal-directed top ad or either of the ad locations in the free-viewing task. None of the other three conditions were significantly different from each other.

The heat maps in Figures 2 and 3 illustrate this difference. Figure 2 presents heat maps of the free-viewing task for the top and side ads respectively. Figure 3 presents the heat maps for the goal-directed tasks for these same two web sites. Figure 3 shows the sharpest absence of any gaze on the banner advertisement when it is located on the side and the user is engaged in a goal-directed task. This trend was consistently observed for all eighteen web pages.

DISCUSSION

User Task Type

Similar to Lapa (2007) and Pagendarm and Schaumberg (2001), there was a higher degree of banner blindness for tasks that required greater cognitive load. In the goal-directed tasks in this study, more of users' attention was required for the experimental task and users needed to focus more intensely on the content. Because of the imposed time constraint, this increased the cognitive load. Users were able to satisfy the task requirements at the expense of attending to page locations that were less likely to contain relevant content.

But in the free-viewing task, when users' attention was not as heavily loaded, typical advertising locations received more visual attention. This supports the conclusions of Lapa (2007) and Pagendarm and Schaumberg (2001). Our hypothesis predicted that gaze towards the advertising locations in the free-viewing task would be less inhibited than in the goal-directed task. The results suggest that when free viewing, users are not biased against viewing known advertising areas. This is encouraging for advertisers who rely on attention to ad locations for their ads to be effective.

Advertising Banner Location

Granka et al (2006) and Marconi et al (2008) reported that users can predict where advertising will appear based on previous experience and intentionally avert their gaze from those areas. In this study, a significant difference was discovered in user gaze patterns towards banner advertisements located at the side of the page and at the top of the page. This effect was strongest on the right side which is reliably dedicated to advertising, confirming the findings in the literature. The top of the page is often advertising but can also be navigation, header information, or other content.

The interaction between ad location and task type demonstrates an important addition to previous research. A significant finding of this research is that users will attend to top banner advertisements when engaged in a goal directed task even though this location is often advertising. This small amount of uncertainty in whether the top will be advertising or content is enough to remove the user's bias against attending to a potential ad location. Even when attention is at a premium, when users are uncertain about where relevant content is located, they will check locations that potentially contain advertising.

Implications for Advertising Strategy

This research has several implications for advertising strategy. One stems from the finding that when in a free-viewing mode, users are not biased against looking at known advertising locations. Marketers can maximize the value of their advertising budget by purchasing banner ads in the right side location that may be less expensive because of the known user bias against this side. They should select ads directed at consumers in the early phase of the research and purchase process, when they are more likely to be browsing openly. In contrast, when marketers want to target consumers who are analyzing product attributes and comparing options, which require much more cognitive load, it would be worthwhile to pay for other locations to increase the probability that their target consumer will view the ad.

Another strategy for marketers is suggested by the equal attention found to the top location in the goal-directed and free-viewing tasks. It seems that users' uncertainty as to whether the top will be advertising or content is enough to eliminate some of the bias against attending to this location. This finding has broader implications for other possible locations. Marketers may be able to purchase banner ads in other locations where users may be uncertain as to what might be there. The extreme right side is the only area that is reliably advertising (Cooke 2008; Shrestha et al 2009). This study suggests that any other location might be a valuable target for banner ads, even when targeting consumers in a goal-directed state of mind.

Study Limitations and Future Research

This research provides several additions to the conceptual framework for understanding user attention and banner blindness. But there are several gaps that remain to be explored. This study looked only at the top and side locations for banner ads. The results combined with insights from Granka et al (2006) and Masconi et al (2008) suggest that the key attribute is the ability of users to predict where advertising will appear. This needs to be further resolved by testing other page locations and modifying the test scenario to vary how well users can predict the locations of advertising in advance. A study focusing on this difference would be very revealing.

This study focused on banner advertising and controlled for the size and visual complexity of the ad design. There may be interesting differences between these results and the text-only ads that are common on search interfaces. Text ads do not require as much attention and may not be avoided as strongly by loaded users. In the other direction, there may be a stronger avoidance tendency with animated or intrusive ads that require more attention to process but have attention grabbing attributes that may make it harder for users to ignore.

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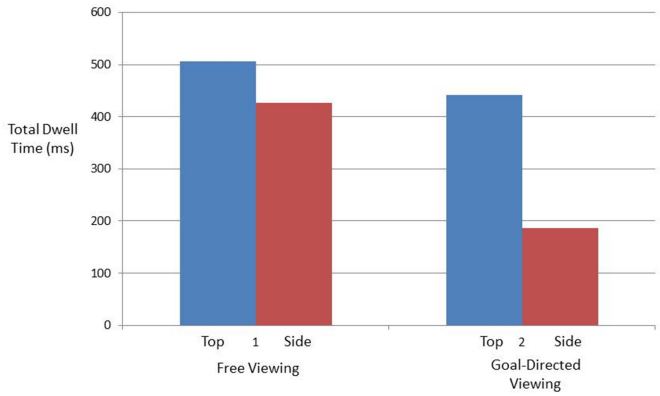

Figure 1. Total dwell time for free and goal-directed tasks viewing the top and right side banner advertisements.

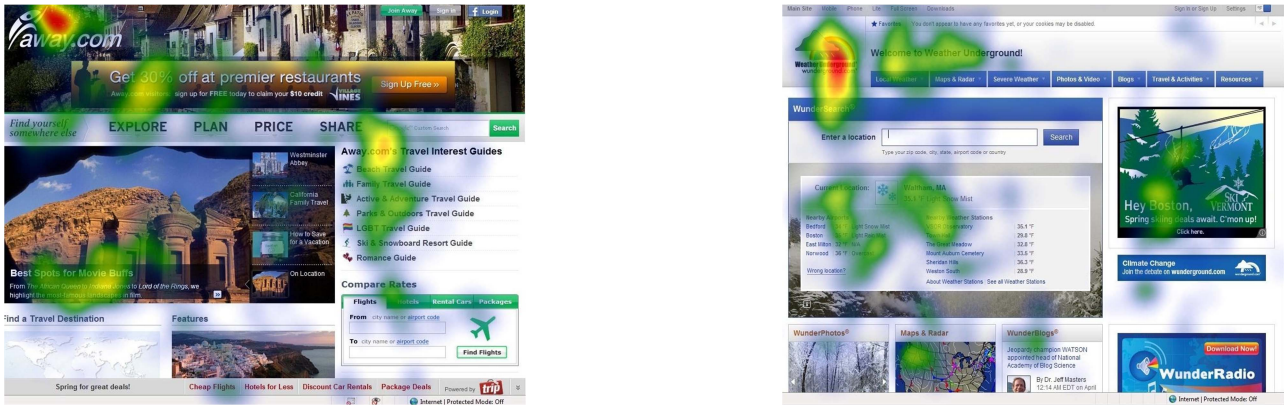

Figure 2: Heat map showing visual attention in the free-viewing condition with an advertisement located at the top of the page (left image) and right side of the page (right image).

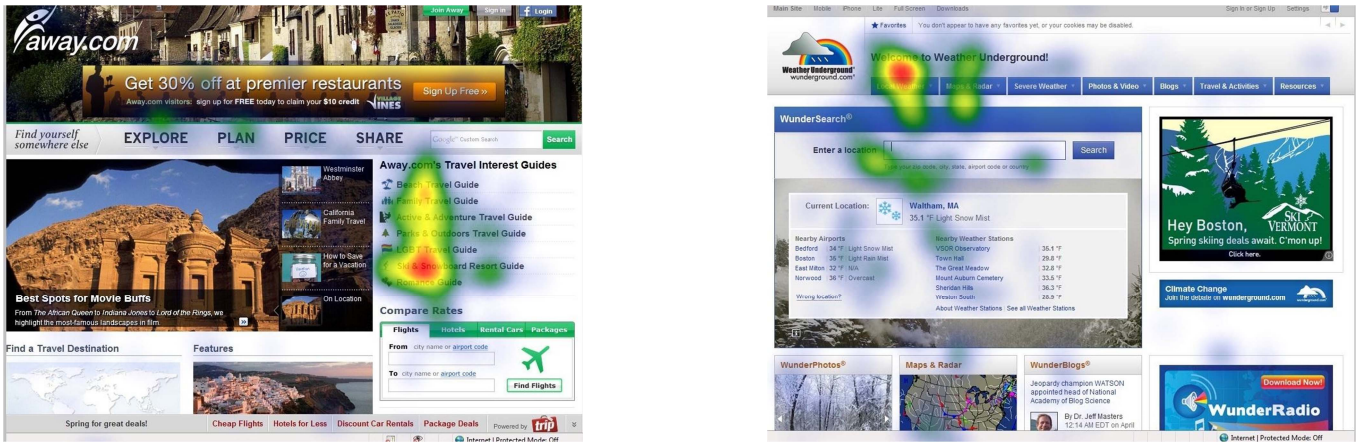

Figure 3: Heat map showing visual attention in the goal-directed condition with an advertisement located at the right side of the page (left image) and top of the page (right image).