Online Banner Advertising: Effect of Different Animation Speeds on Memory Retention of Gender

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ABSTRACT

Nowadays, banner ads have been widely used to advertise various products and services as it generates huge revenues for website owners and became the most popular marketing tool of businesses. However, research shows that these banner ads are often overlooked by users which undermine the main purpose of the advertisement. A previous study determined the optimal banner ad location in order to achieve higher memory retention rate of banner ads using three factors. The factors included were banner ad location (top left, top center, top right, bottom left, bottom center, bottom right), banner ad format (leaderboard, rectangular) and user’s gender (male, female). The determined optimal banner ad location was then compared to user’s location preference which was quantified using the Kruskal-Wallis test. The previous study concluded that the top center is the optimal location to achieve higher memory retention rate considering the user location preference. This study used the top center as a constant location factor in order to determine the optimal banner location considering the animation speed and user’s gender.

The study followed a general factorial design of 4 x 2 general factorial design with six replicates corresponding to the animation speed (static, slow, medium, fast) and user’s gender (male, female). A total of 48 respondents (24 male, 24 female) participated in the experiment. The memory retention was quantified using the recall and recognition test score for the product and brand name. The Analysis of Variance (ANOVA) showed that both the animation speed and gender are significant in terms of memory retention on the product while only the animation speed is significant on the memory retention on the brand name. Moreover, the Fisher’s Least Significant Difference (LSD) method was used for multiple comparisons of the factors. Results showed that the fast animation speed is significantly different than the other levels and has the highest mean memory score. Furthermore, scores of males showed significantly higher memory scores than females.

Keywords: Banner ads, Memory Retention, Animation Speed, Recall Performance, Recognition Performance

1. Introduction

As of 2014, the online advertising is one of the leading forms of advertisements with revenue amounting to 133 billion US dollars worldwide, and is expected to bloat by 2016 [1]. With the online technology, there is an added convenience for the companies in promoting their products and services. However, it is with utmost importance that these companies also ensure the quality of the information dissemination of these online banner ads. The purpose of banner ads devalues when it fails to entice and capture the attention of the users. More importantly, the overall appearance of banner ads must convey the correct information to the users. Thus, online banner ads must be created in a way that conveys the desired message, corresponds the general tendency of users and appeals to their preference.

This study focused on the effect of the different animation speeds on memory retention on males and females. Specifically, this study determined and measured which animation speed has a significant effect on recall performance and memory retention rate on gender. In addition, the user’s preference was collected and quantified in order to determine the most preferred speed among the identified optimal speed.

The study by Kuisma, et al (2010) used banner ad formats (leaderboard, skyscraper) and animation (animated, static) as independent factors. The results suggested that in general animation had little to no effect to attention. Nevertheless, the interaction of the animation and banner ad format suggested that the impact
of animation is dependent on the format. Animated leaderboards had higher scores on recognition and memory retention rates than animated skyscrapers. Grounding on the study of Kuisma, et al, this study further explored the effects of the different animation speeds, given a fixed leaderboard format, on memory retention rates.

A previous study conducted by Betancor et al concluded that leaderboard format placed on the top center location of the screen is the optimal location for higher memory retention rate and generally most preferred by both males and females. This set-up is used in this study in order to have a valid assumption on the preferred optimal location of users on the determination of animation speed impact.

The differentiation of male and female gender as factors is signified by the study of De Goede and Postmat (2007) which investigated gender difference in memory for objects and their locations. The study of De Goede and Postmat concluded that female subjects have better performance in object-location memory retention than male subjects. Thus, it is necessary to consider the male and female as different factors.

2. Method

2.1 Participants

Forty-eight students (24 male, 24 female) participated in the study with α=0.05. The age of the participants ranges from 16 to 23 years old which are university students that comprise the greater portion of internet users according to the study of Biswas and Biswas (2004). The literacy level of the participants was assumed to be equal.

2.2 Banner Advertisements

Fabricated ads were used in the study to eliminate prior associations with known brands. Eight (8) fictitious banner ads were created for each banner ad speed, classified as static, slow, medium and fast. The fast animated ad was made by using a set of images which loop every 0.5 s while the medium loops every 1 s and the slow loops every 2 s. All fabricated ads used in the study have the same color scheme in order to remove possible effects of color difference in memory retention. In addition, distracter ads were also included in the study to act as a neutral factor.

2.3 Website

An online site (iloveergo.github.io) was fabricated for the study containing four articles of different genre. The site was divided into four pages wherein each page contains two fabricated ads. Each page is read through scrolling movement. The top part of the page shows one fabricated ad that later changes into a different fabricated ad after a specified character count. A study of Goldstein, et al (2011) concluded that higher exposure time was correlated with increased recognition and recall. Hence, each page has approximately same number of words to eliminate the effect of exposure time. In addition, the order of the banner ads was randomly chosen. Articles were chosen based on gender-neutrality and easy comprehension. Sample pages are shown below.

Figure 1. Screenshot of the fabricated website

2.4 Questionnaire

After the articles section, a questionnaire is included on the site to test the comprehension of the participants. The questionnaire about the banner ads then followed the comprehension test. The banner ad questionnaire included non-directed recall tests, recognition tests and confidence level meter rating. In non-directed recall test, the users were asked to enumerate all ads they remembered while reading the articles. In recognition test, the users were asked to select all the ads that they remembered seeing while reading. Lastly, the confidence level of each user was asked after answering each of the recall and recognition tests. Another questionnaire about user disposition and attitude was included to account for the user preference. This questionnaire included subjective rating of the effectiveness of banner ads and its influence on the user.

2.5 Design and Procedure

A 4 x 2 general factorial design with 6 replicates corresponding to the eight banner ads in leaderboard format fabricated using four animation speeds (static, slow, medium, fast) and two gender types (male, female) were used in this study.

The study by Calisir and Karaali (2007) concluded that
goal-directed navigation style had higher recognition scores. Thus, goal-directed navigation style was used in the study in order to maximize recognition potential.

Participants were tasked to read four news articles from a designated laptop computer. Upon reading the articles, the participants were asked to answer a survey form containing questions about the articles and a recall and recognition memory tests about the ads.

3. Results

3.1 Effects of Animation Speed and Gender

A two-factor Analysis of Variance (ANOVA) was performed to determine the effects of the two factors namely animation speed and gender, to the memory retention score of the participants. The memory retention score \( (M) \) was obtained by equation (1):

\[
M = R_c + R_g \quad (1)
\]

Where \( R_c \) = recall score
\( R_g \) = recognition score

Two sets of ANOVA were performed to test the effects of the factors on the memory retention on the product being advertised and the brand name.

3.1.1 Memory Retention on the Product

With a significance level of 0.05, the ANOVA results show that both the factors animation speed \( (p = 0.003) \) and gender \( (p = 0.018) \) are significant as shown in the Table 1.

Table 1. Two-Factor ANOVA Results

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>( Adj \ SS )</th>
<th>( Adj \ MS )</th>
<th>F-value</th>
<th>p-value</th>
<th>( Adj \ SS )</th>
<th>( Adj \ MS )</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>3</td>
<td>78.06</td>
<td>26.021</td>
<td>5.47</td>
<td>0.003*</td>
<td>37.750</td>
<td>12.583</td>
<td>4.91</td>
<td>0.005*</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>28.52</td>
<td>28.521</td>
<td>6.00</td>
<td>0.018*</td>
<td>1.333</td>
<td>1.333</td>
<td>0.52</td>
<td>0.475</td>
</tr>
<tr>
<td>Error</td>
<td>43</td>
<td>204.40</td>
<td>4.753</td>
<td>0.90</td>
<td>0.451</td>
<td>4.500</td>
<td>1.500</td>
<td>0.57</td>
<td>0.639</td>
</tr>
<tr>
<td>Lack-of-Fit</td>
<td>3</td>
<td>12.90</td>
<td>4.299</td>
<td>0.90</td>
<td>0.451</td>
<td>4.500</td>
<td>1.500</td>
<td>0.57</td>
<td>0.639</td>
</tr>
<tr>
<td>Pure Error</td>
<td>40</td>
<td>191.50</td>
<td>4.788</td>
<td>0.90</td>
<td>0.451</td>
<td>105.667</td>
<td>2.642</td>
<td>0.57</td>
<td>0.639</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>310.98</td>
<td></td>
<td></td>
<td></td>
<td>149.250</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means that do not share a letter are significantly different.

Table 2 shows that fast animation speed is significantly different from the other levels of speed with a mean score of 5.833.

3.1.2 Memory Retention on Brand Name

Results from Table 1 shows that only the animation speed \( (p = 0.003) \) is a significant factor in retaining memory on the ad’s brand name.

Figure 2. Interaction Plot of Animation Speed and Gender (Product)

The interaction plot showing the effect of gender on the various levels of animation speed are shown in Figure 2. Memory scores following an increasing trend as the animation speed increases. Moreover, males, the level 1 of Gender, displayed higher scores than females on all levels of animation speed.

To determine which levels of animation speed are significant different, a Fisher’s LSD Test was performed as shown in Table 2.

Table 2. Grouping Information Using Fisher LSD Method and 95% Confidence

<table>
<thead>
<tr>
<th>Speed</th>
<th>N</th>
<th>Product</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Grouping</td>
</tr>
<tr>
<td>Fast</td>
<td>12</td>
<td>5.83333</td>
<td>A</td>
</tr>
<tr>
<td>Medium</td>
<td>12</td>
<td>3.16667</td>
<td>B</td>
</tr>
<tr>
<td>Slow</td>
<td>12</td>
<td>2.91667</td>
<td>B</td>
</tr>
<tr>
<td>Static</td>
<td>12</td>
<td>2.66667</td>
<td>B</td>
</tr>
</tbody>
</table>

Means that do not share a letter are significantly different.
Similar to Figure 2, the figure above also shows an increasing trend as the animation speed increases with the fast animation speed garnering the highest mean score on memory retention of brand name. The fast animation speed remains consistent in being significantly different from the other levels as shown in Table 2.

3.2 Participants’ Disposition on Online Advertisements

Participants were asked to rate their disposition on online advertisements from 1 (negative) to 5 (positive). Results show that users have a mean rating of 3.27, leaning a little towards the positive end of the spectrum from the neutral score of 3.

Table 3. User Disposition on Online Ads of Various Animation Speeds

<table>
<thead>
<tr>
<th>Speed</th>
<th>Disposition Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td>2.521</td>
</tr>
<tr>
<td>Slow</td>
<td>1.875</td>
</tr>
<tr>
<td>Medium</td>
<td>1.708</td>
</tr>
<tr>
<td>Fast</td>
<td>1.833</td>
</tr>
</tbody>
</table>

In terms of their disposition on the ads of various animation speeds in the study, the participants were again presented with the ads and were asked to rate the ads from 1 (least pleasing) to 5 (most pleasing). As shown in Table 3, users generally find the static ad most pleasing.

4. Conclusion

The purpose of this study is to examine the effect of animation speeds and gender on memory retention. Analysis of Variance (ANOVA) was performed to determine the significance of the factors and their interaction. Fisher’s Least Significant Difference (LSD) Test was used to compare the various levels of the significant factor(s). Results show that both the animation speed and gender are significant in remembering the product shown in the ads while only the animation speed is significant when it comes to memory retention on the brand name presented in the online ad.

In summary, animation speed has a substantial effect on memory retention. Results of the Fisher’s LSD Test reveal that the fast animation speed is significantly different from the other speeds. Moreover, the effect of static animation speed is not significantly different from slow and medium speeds. The most effective animation speed, therefore, is the fast animation speed. Results also show that males generally have higher memory retention scores than females.

Users generally have a positive disposition towards online advertising. Despite being the most effective animation speed, the advertisement with the fast animation speed was not the most pleasing animation speed found by the users. Rather, users find the static ads most pleasing.

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