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CURRENT ISSUES IN TOURISM LETTER

Investigation of the use of eye-tracking to examine tourism advertising effectiveness

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Abstract

Previous studies of printed marketing stimuli have used self-report measures to determine the relative preference for one advertisement among several different versions. This study uses Tobii™ eye-tracking hardware and software along with self-report measures to compare the relative effectiveness of two versions of a tourism magazine advertisement. Data was collected from 25 respondents in a laboratory-based study. Analysis of data shows significant differences between the two advertisements tested with agreement between the eye-tracking and self-report results. These results indicate that eye-tracking methods are useful for analysis of tourist advertising.

Keywords: advertising effectiveness; eye-tracking; heat map; fixation time.

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Abstract

Previous effectiveness studies of printed marketing stimuli have used self-report measures to determine the relative preference for one advertisement among several different versions. This study uses Tobii™ eye-tracking hardware and software along with self-report measures to compare the relative effectiveness of two versions of a tourism magazine advertisement. Data was collected from 25 respondents in a laboratory-based study. Analysis of data shows significant differences between the two advertisements tested with agreement between the eye-tracking and self-report results. These results indicate that eye-tracking methods are useful for analysis of tourist advertising.

Keywords: advertising effectiveness; eye-tracking; heat map; fixation time.

INTRODUCTION

Many local and national tourism agencies spend large sums of money to advertise the attractiveness of their destinations (Mok, 1990; Ruhanen, McLennan, & Moyle, 2013). Development of advertising objectives, programmes, and the advertising material itself is a complex and expensive process requiring specialist expertise and collaboration of multiple stakeholders (Fyall & Leask, 2007; Morgan, Pritchard, & Piggott, 2003). The involvement of public sector agencies in destination marketing means that expenditure on advertising must be, like other forms of government expenditure, subject to public scrutiny and evaluation for its effectiveness (McWilliams & Crompton, 1997; Morgan, Hastings, & Pritchard, 2012; Perdue & Pitegoff, 1990; Woodside, 1990; Woodside & Sakai, 2011). Evaluation of tourism advertising effectiveness is a complex task and Morgan et al. (2012) identifies five possible approaches including customer enquiries or conversion studies, financial/response, advertising awareness/impact, website usage and brand development. The type of studies discussed by Morgan et al. (2012) essentially seek to examine the effect of an advertising programme after it has been designed and implemented. This approach has generally focused on evaluating responses to advertising campaigns through measurement of advertising impact, or destination awareness, visitation, and visitor expenditure after the advertising material has been developed and the programme implemented (Kim, Hwang, & Fesenmaier, 2005).

An alternative approach to improving the effectiveness of tourism advertising is diagnostic instead of summative, and is based on evaluation of advertising material prior to their use in market. Such an approach has the advantage that it can identify ineffective advertising material prior to its use in market and also can be used to improve an advertisement through identification of its weak elements using experimental design methods. Such diagnostic advertising research has been used to study destination brochures to diagnose the effect of particular copy elements such as an endorser (Chang, Wall, & Lai, 2005; Van der Veen & Song, 2014), the effect of including images (Laskey, Seaton, & Nicholls, 1994), and to

examine co-operative (multi-destination) or independent (mono-destination) format promotional material (McKinney, Hazeldine, & Chawla, 2009). Another use of such diagnostic studies has been to examine travel agency brochure advertising, including the effect of images of tour leaders (Wang, Hsieh, & Chen, 2002). There are however problems in use of such diagnostic techniques as for many destination marketing organizations, the high cost of developing television or film advertisements means that once an ad is produced there are no funds available for its further refinement through market testing. This may be why the existing literature has focused on brochure advertising where it is possible to make incremental changes to the advertisements relatively cheaply.

Another noticeable characteristic of diagnostic brochure studies in particular and advertising effectiveness studies in general is the use of self-report preference or attitude scales (Chiou, Lin, & Perng, 2011; Walters, Sparks, & Herington, 2007). In self-report methods, individuals are asked to express their responses to advertisements through open-ended questions, rate their emotional state on a set of affective items (verbal) or cartoon-like figures (visual), or use a 'paper-and-pencil' technique (moment-to-moment rating). Although alternative methods have an equally long history, self-reports remain the most popular choice for reasons including easy interpretability, richness of information, motivation to report, causal force, and sheer practicality (Paulhus & Vazire, 2009). On the other hand, self-report suffers from many measurement artefacts and in particular, standard written copy tests do not perform well for emotional advertising (Hazlett & Hazlett, 1999) as is commonly found in tourism. Verbal or written response measures are limited in their ability to tap a person's emotional experiences. In addition, verbal measures are retrospective, the respondent needs to think back to remember what they felt, and are susceptible to social demand influences. The Self-Assessment Manikin (SAM) seeks to avoid some of these issues by using scales containing cartoon-like figures rather than words (Bradley & Lang, 1994) but only provide a summative evaluation of the whole advertisement.

In the last decade, high precision and low cost commercial infrared eye-tracking equipment has been developed to record consumers' eye movements when viewing large amounts of stimuli under quasi-natural conditions (Pieters, 2008). This equipment records the position of the focus of the eye's fovea 60 times per second and can therefore distinguish between fixations and saccades. Saccades are rapid eye movements typically lasting around 20–40 milliseconds whereby the foveal focus is moved to a new fixation point. During a fixation the eye is relatively still, typically for around 200–500 milliseconds (Rayner, 1998). Analysis of eye-tracking data can indicate attention and interest to both the overall advertisement and to components of an advertisement (Lee & Ahn, 2012; Pieters, 2008). For example, Babin and Burns (1997) have found that concrete imagery of a product was more effective in stimulating vivid visual imagery processing and favourably influencing attitude toward the advertisement and brand than either an ad containing a considerably less concrete picture or one without a picture. This study uses eye-tracking technology as a means of evaluating tourism print advertising effectiveness.

METHODOLOGY

This study evaluated two A4 magazine ads using a combination of a self-report questionnaire and eye-tracking methods. Participants were university students who received credit for participating in this study. The study took place in April and May 2014. Respondents provided informed consent. Eye-tracking data were collected using Tobii T60 Eye Tracker (Tobii, 2013) technology, which requires that the respondent sit in a chair and view a computer monitor in front of them. The computer monitor displays the advertising stimuli and the respondent views it as they would any other type of document on a computer. Eye-tracking technology allows the measurement of fixations, an objective measure of attention, which occurs when an individual's eye pauses to examine or interpret a component of an advertisement (Rayner, Rotello, Stewart, Keir, & Duffy, 2001). A fixation is an indicator of cognitive processing, with a greater number of fixations representing a greater amount of cognitive processing (Just & Carpenter, 1980).

Twenty-five participants viewed two static tourism advertisements for the City of Melbourne, Australia. These were alternative creative executions prepared by an advertising company to be used in a magazine as a full page ad (see Figure 1). Each participant's eye movements were calibrated and then the participant was instructed to look at each advertisement for as long as they wanted, at which point they clicked the mouse to move to the next advertisement. Once the pair of advertisements had been viewed, participants were asked to answer a series of questions on ad likeability.

FIGURE 1 ABOUT HERE

The variable analysed from the eye-tracking data collected included total time on a page, total fixation length, and total fixation count. Total time was calculated for time spent viewing each advertisement. Measures of fixation length, the length of time a person stops to examine or interpret items was also used as it represents the duration during which information acquisition and processing for a particular advertising element can occur. The number of fixations or times a person stops to examine or interpret an element (fixation count) were also obtained (see Table 1). It is also possible to divide an advertisement into Areas of Interest (AOI) and obtain these statistics for each AOI. Similar attention measures have been used in previous research (Wedel & Pieters, 2008; Yang, 2012).

TABLE 1 ABOUT HERE

Tobii Studio software produces statistical reports for total time viewing a page (or an AOI), total fixation length, total fixation count. In addition, this software is able to produce visual representations of aggregate data for all respondents showing for example the superimposed scan paths for all respondents or a heat map – a graphic that shows different colours superimposed on the advertisement to report the number of fixations in an area. Analysis of variance (ANOVA) was conducted using SPSS 22 to test if there were statistically significant differences in the data recorded for different AOIs or the whole advertisements.

RESULTS

The two advertisements were compared in terms of the number of saccades and average fixation time per advertisement. The block ad received 12.0 saccades on average across the 25 respondents while the text advertisement received 36.9 (Table 2). The analysis of variance reveals advertisements had significant differences in saccade count ($F=10.3$, $p<0.002$, $MSE=89$). Participants had more saccades on the block ad than the text ad. Since the saccade count is related with task difficulty (Pan et al., 2004), this finding shows that the block ad demanded less efforts from viewers than the text ad.

The block ad had an average fixation time across the 25 respondents of 10.52 while the text ad received 7.64 (Table 3). The results also show a significant effect of ad type on average fixation time ($F=10.302$, $p<0.05$, $MSE=88.859$). This demonstrates that block ad has significantly longer mean fixation time than the text ad. Fixation time on an AIO group is positively related to attention and reflects the time available for information acquisition and processing (Pan et al., 2004). Therefore we may conclude that the block advertisement attracted more attention than the text advertisement.

TABLES 2, 3 ABOUT HERE

Self-report data collected

A self-report questionnaire was conducted to compare the two advertisements. The questionnaire involved respondents comparing the two ads immediately after viewing them and indicating the one they like best. A frequency analysis shows that the majority of the participants like the block ad better than the text ad as shown in Table 4. The block advertisement also scored better in perceived engagement and believability.

TABLE 4 ABOUT HERE

Scan path and heat map

First fixation data and gaze duration heat maps provide a way to summarize viewing patterns and in this study some striking difference in the characteristics of how participants view the ads can be seen. Figures 2 and 3 show the initial first fixations for the block ad and text ad respectively. For the block ad, the first fixation was primarily located in the center while it was the large print headline on the text ad. In Figures 2 and 3, the initial scan path is shown by a line between a circled 1 and circled 2 of the same colour. This line represents the first saccade.

A heat map displays gaze data in an aggregated view of the results where the overall gaze time in each area is represented by opaqueness and colour. A red opaque area represents the highest values and a clear area with no colour represents no gazes recorded. The heat maps (see Figure 4) demonstrate when the text was quite short (1-4 lines), participants typically read all of the text. When it was quite long, no one read all of the text.

FIGURE 2, 3, 4 ABOUT HERE

DISCUSSION

Overall these results demonstrate the usefulness of the eye-tracking method for evaluation of tourism advertising. A number of analysis techniques such as statistics of average duration time, number of saccades, heat maps and first fixation path displays have been used to evaluate the two advertisements tested here. The results indicate that the block ad performs better in attracting and retaining attention compared to the text ad. Further, these results are supported by self-report scores which show significant preference for the block ad.

The results are also diagnostic and provide guidance as to how to improve the text ad. It appears that textual information should be presented in more concise and terse form to promote comprehension. The eye is attracted to large print and short lines of text, regardless of its position in the ad. If there is a lot of text in an ad, viewers seem to read large print text and little else. This finding is supported by significant literature (Fox, Krugman, Fletcher, & Fischer, 1998; Murphy, Hofacker, & Racine, 2005; Velazquez & Pasch, 2014; Yang, 2012).

This study does have limitations. First, the artificial laboratory setting may not reflect the way respondents read ads in their daily life and some participants might have looked at the advertisements for longer or shorter times than they would normally. Second, the sample size, although comparable to many eye-tracking studies, is relatively small compared to normal brochure effectiveness studies. This is justified as, due to the paucity of literature on this technique, the study provides a useful example of eye-tracking data it may be used to provide actionable management information. Thirdly, the student population used in this study may process visual stimuli differently to other age cohorts. Despite these limitations, this study has several strengths. To date, much of the destination marketing literature has focused on self-reported and subjectively documented responses to exposure to advertising stimuli. By including objective measures of attention, based on use of new techniques such as eye-tracking, researchers may overcome problems of self-report and also better diagnose problems with brochures.

The same technique is also able to be used for diagnosis of other marketing stimuli such as websites which may use changing displays and pop-ups rather than static pictures. It may also be used to examine other types of visual stimuli such as videos of streetscapes or service environments. The technique is also able to be used in conjunction with psychophysiological data collection methods such as skin conductance measures (see Li, Scott, and Walters (2014) for a review), providing some measure of how arousing or exciting a particular stimuli may be. Eye-tracking provides a useful addition for evaluation of advertising and researchers interested in tourism marketing are encouraged to use it.

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Table 1: Eye tracking measures

Area of Interest (AOI)	A specific delineated area analyzed and compared in eye-tracking software.
First Fixation Duration – seconds	Measures the duration of the first fixation on an AOI or an AOI group.
Fixation duration-seconds	Measures the duration of each individual fixation within an AOI.
Total fixation duration-seconds	Sum of the duration for all fixations within an AOI.
Fixation count	The number of times the participant fixates on an AOI or an AOI group.
Saccade count	The number of times the participant saccade on an AOI or an AOI group. A saccade is defined as the interval of time between the first fixation on the AOI and the next fixation outside the AOI.
Saccade duration-seconds	Measures the duration of each individual saccade within an AOI.

Table 2: Differences between numbers of saccades per advertisement

Group	Mean N=25	Std. Deviation
block	11.9936	7.83590
text	36.8164	32.68637
df (1), Mean Square (89), F(10.3), Sig (0.002)		

Table 3: Differences between average fixation time per advertisement

Group	Mean N=25	Std. Deviation
block	10.52	2.400
text	7.64	3.487
df (1), Mean Square (83), F(9.9), Sig (0.003)		

Table 4: Comparison of the two ads

Response	Frequency (N=25)
Block ad much better	14
Blocks ad a little better	5
Both the same	1
Text ad a little better	3
Text ad much better	2
Total	25

 109 <small>SHIRT KEMELLED</small>	 41 <small>CONVERSATIONS WITH BEARDED MEN</small>	 4 <small>BURGERS CONSUMED</small>
 1 <small>JOB INTERVIEW CRASHED</small>	 28 <small>COFFEES CONSUMED</small>	 205 <small>HI-FIVES & HUGS</small>
 158 <small>COUNTRIES PARTICIPATED</small>	 21 <small>EXOTIC ANIMALS SPOTTED</small>	 103 <small>PEOPLE ASKED 'WHAT'S THIS ABOUT?'</small>

For 5 days the world explored Melbourne's best restaurants, quirky shops, hidden cafes and attractions like never before through the Melbourne Remote Control Tourist. Now it's your turn to explore and discover Melbourne for yourself at remotecontroltourist.com

**melbourne
remote
control
tourist**

Block Advertisement

How we went from the grip of a giant gorilla to a girl on a rooftop in a chicken suit.

Our Remote Control Tourists did a lot. They delved deep, uncovering and exploring the best of Melbourne. They stood frozen in the shadow of King Kong, then ascended a skyscraper for themselves. After shopping a selfie on the 88th floor, they penned a self-portrait in the NGV. As you do, Art led to music and before long they'd strummed on guitars, plucked a Chinese violin and performed with a band. Delivering a song was quickly followed by cupcakes. Twenty-four to be precise - donated to people on Degraus Street. The sweetness didn't end there. They then found a home for a broumie in the hands of a smiling girl. She wasn't half as happy as the six perfect strangers who

our Remote Control Tourists gave flowers to. Random acts of love. And talking of random, they tried on all sorts of things - from kangaroo suits to pizza necklaces. Not surprisingly, food (the non-jewellery related kind) was at the heart of their adventures. They ate Pho, Mexican, Italian, Greek and even kissed a fish at the Queen Victoria Market. Then there were celebrity chefs. They hugged three - none of whom had beards. Interesting, considering we spoke to over forty men with facial hair. They cut hair too, plus cut quite a look trying on a dress. One of our male Remote Control Tourists, Tom, looked sensational in it.

As did the T-shirt he designed and made for someone online. They pretty much did anything the world wanted them to do. They went by tram, bike, boat and foot. So, one minute they were getting a bird's-eye view of the city from a helicopter, the next they were talking burgers with a girl in a chicken suit on a rooftop. For five days they showed Melbourne off in a way that has never been done before. Now it's your turn. To go and see what they discovered and start exploring Melbourne for yourself, go to remotecontroltourist.com

**melbourne
remote
control
tourist**

Text Advertisement

Figure 1: Advertising evaluated

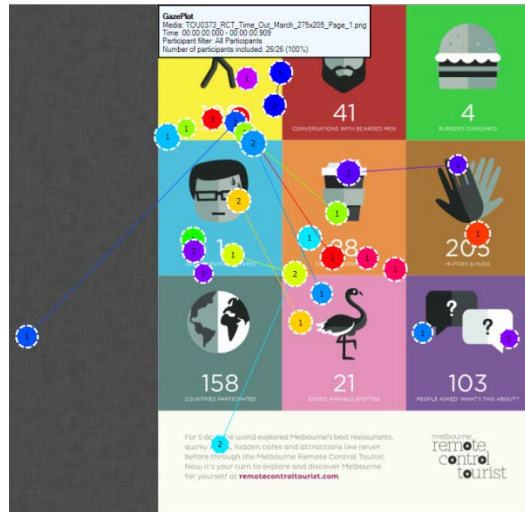


Figure 2: First fixations on block ad

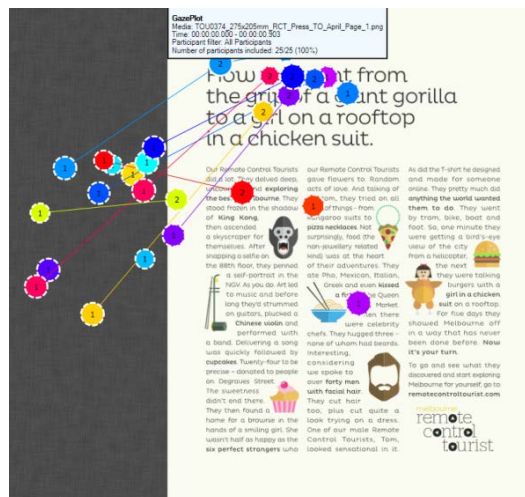


Figure 3: Scan paths on text ad

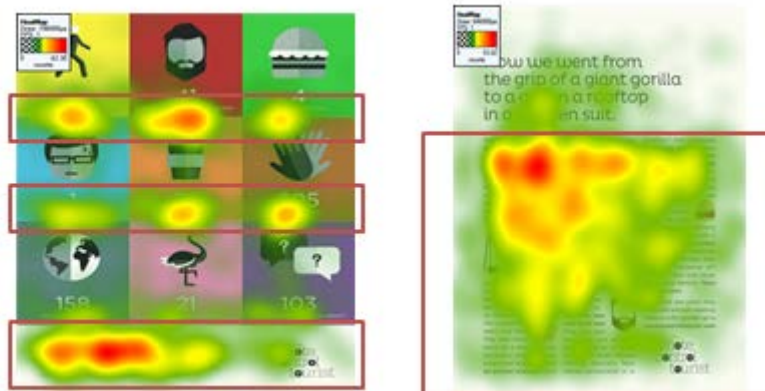


Figure 4: Heat maps for each advertisement