

Chapter 23

Marketing/Advertising

Eye tracking can aid in the assessment of advertising effectiveness in such applications as copy testing in print, images, video, or graphics, and in disclosure research involving perception of fine print within print media and within available television and emerging High Definition TV (HDTV) displays.

A particularly illustrative although fictitious example of eye tracking in advertising can be seen in the movie *Looker* (Crichton 1981). In one scene, the star of the movie, Dr. Larry Roberts, a cosmetic surgeon (played by Albert Finney), is shown a potential advertisement of a beauty product. The ad features an attractive model in a beach scene. The beauty product is displayed while Dr. Roberts' eyes are tracked. When it is obvious that Dr. Roberts' attention is drawn to the attractive model rather than the beauty product, the product is immediately moved to appear much closer to the point on the screen where Dr. Roberts' attention is drawn. Although fictional, the effectiveness of eye tracking is effectively illustrated.

The motivation for utilizing an eye tracker in market research stems from the desire to understand consumer actions. In general, advertisers aim to provide product information to consumers in an efficient manner so that consumers' awareness of the existence of the product is heightened. If the consumer identifies the product as one that can potentially satisfy her or his current need, it is expected that the consumer will be more likely to purchase that particular product than if the consumer had not been aware of the product's availability. Consumer action can roughly be modeled by the block diagram shown in Fig. 23.1. In general, a consumer's actions will be influenced by a combination of external and internal factors. External factors may include marketing actions (e.g., product promotion, distribution, availability), competitive factors (e.g., the desire to possess the latest and greatest product), and environmental factors (e.g., rainy conditions causing the need to possess an umbrella). Based on external influences and internal (perceptual and cognitive) processes, a consumer will make a choice as to whether to make a purchase, and which product to purchase, resulting in consumer action. The human decision-making process may be affected by recognition of one's need or desire, and may also be influenced by external information gathered through research and/or through past memories and experiences.

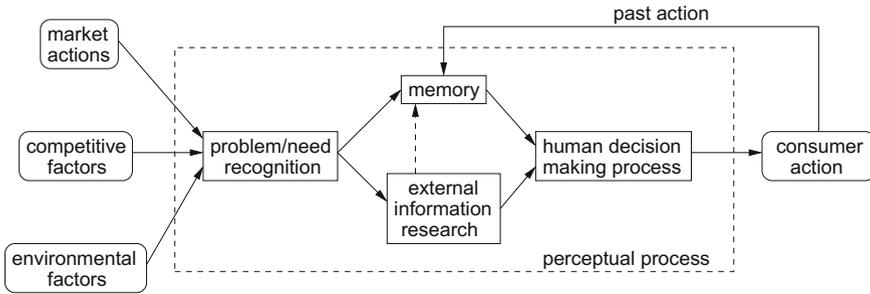


Fig. 23.1 Model of market and consumer actions

It can be argued that external influences and resultant consumer actions are the only relevant and measurable factors to advertisers. That is, one can measure the relationship between marketing action (level of advertising) to the resulting consumer actions (sales of product). In this case, the model of the consumer may be treated as a black box: it is not as important to measure how the consumer functions, but rather just to measure what actions the consumer has performed (i.e., it may be sufficient to measure just the effect of consumer actions, not necessarily the cause). On the other hand, if one understands the cognitive and perceptual processes internal to the consumer, then a model of consumers' internal processes may aid the direction of marketing actions. A primary goal then is an understanding of the type of information that consumers want or use to make their decisions. Thus, if one can measure the perceptual process during the consumer's acquisition of information, it may be possible to tailor the information in a way such that the information the marketer wishes to impart to the consumer is delivered as efficiently and directly as possible. Eye tracking can provide insight into at least one aspect of the internal consumer model: how the consumer disperses visual attention over different forms of advertising. For example, current eye tracking technology can fairly easily provide a glimpse of the consumer's (overt) attentive processes over print media and television advertising, as illustrated above by the scene in the movie *Looker*. Indeed, it is quite plausible that market researchers are aware of eye trackers and utilize them for this purpose. Unfortunately, finding evidence of eye tracking in use by advertising companies is somewhat difficult. It appears that the use of eye trackers is not often well documented or otherwise advertised. Applied research organizations may routinely examine the eye movements of consumers as they look at advertisements, however, this work tends to be proprietary Rayner et al. (2001). Here, only a few examples of published eye tracking work are presented, the rest of this chapter is augmented by examples of students' work and in-class projects.

23.1 Copy Testing

A particularly good example of analysis of eye movements over advertisements in the Yellow Pages™ is given by Lohse (1997). In this experiment, eye movement data are collected while consumers choose businesses from telephone directories. The study addresses (1) what particular features cause people to notice an ad, (2) whether people view ads in any particular order, and (3) how viewing time varies as a function of particular ad features. Based on a review of the literature on attention and a brief survey of prototypical eye movement patterns, the author develops the following propositions.

1. Color: users are more likely to notice color ads before any other type of ad.
2. Graphics: users are likely to notice ads with graphics before ads without graphics.
3. Size: users are likely to notice large ads before small ads.
4. Location: users are more likely to view advertisements near the beginning of the heading than those near the end of the heading.

It is interesting to note some important points of the experimental methodology. To prevent bias toward any recognizable businesses, a completely artificial mockup of a 32-page Yellow Pages directory was created. The pages were virtually indistinguishable from real Yellow Pages in terms of font, ink, and color, but all business entries were fabricated. The 32 directory pages were organized into four books to control for combinations of the following layout and design features: ad type, location of display ads on the page, size of ad, color, use of graphics, whether a listing had a bold typeface, serial position of the ad (alphabetic order), and number of types of information in the ad (hours, years in business, slogan, brand names, specialties). Eye movement analysis revealed that the results from the Yellow Pages study are consistent with previous findings on print advertising in magazines, catalogs, and newspapers. Ad size, graphics, color, and copy all influence attention to advertisements. The author offers the following observations.

1. Color and graphics: color ads with graphics captured attention. Color ads were scanned more quickly, more often, and longer than black and white ads. Subjects noticed more color ads than ads without color (92 vs. 84%) and viewed color ads before ads without color. Subjects viewed color ads 21% longer than equivalent ads without color. Subjects also viewed 96% of ads with graphics. However, unlike color, graphics did not capture initial consumer attention.
2. Size: ad size influenced attention. In general, the larger the ad, the more likely subjects were to notice the ad. Subjects noticed 93% of the large display ads but only 26% of the plain listings. Quarter-page ad displays were much more noticed than text listings.
3. Location: the position of an ad on the page had a large effect on whether people viewed the ad, even though the position says nothing informative about the business. Position matters because people scan ads on a page in alphabetic order and their scan is not exhaustive; as a result, people never read some ads.

Due to the improvement of eye tracking technology (e.g., bite bars are no longer needed), the author suggests that the time has come to reevaluate the importance of eye tracking equipment as a tool for print advertising research.

23.2 Print Advertising

In a study of consumers' visual attention over print advertisements, an eye tracker was used to gain insight into attentive processes over repeated exposure to print advertisements (RWP97). The authors explored the phenomenon of repeated advertising's "wearout"; i.e., the authors investigated consumers' diminishing attentional devotion to ads with increased repetition. Consumers' visual attention was measured to key print ad elements: headline, pictorial, bodytext, and packshot (a closeup photograph of a product). A statistical model was proposed comprising submodels for three key measures of visual attention to specific elements of the advertisement: attention onset, attention duration, and inter- and intraelement saccade frequencies. Analyses show that whereas duration decreases and attention onset accelerates during each additional exposure to the print ad, the attentional scanpath remains constant across advertising repetitions and across experimentally varied conditions. The authors also list their important findings:

- Attention durations differ significantly across ad elements. Parameter estimates reveal that attention duration is longest for the text, followed by headline, and shortest for the pictorial and the packshot. In addition, a progressive decrease in the expected attention duration is observed across exposures. Neither motivation nor argument quality affects the amount of attention paid to ad elements.
- The time until subjects first fixate on an ad element differs among elements. Subjects attend first to the headline followed by the pictorial, the text, and finally the packshot. Although repetition as such has no impact on attention onset, differences in attention onset are not constant across exposures. Less time lies between the expected starts of the first fixations during the second and third exposures than during the first exposure. In other words, the attentional process accelerates during later exposures.

Attention onset is also significantly affected by motivation in the sense that attention onsets are farther apart for highly motivated subjects than for less motivated subjects. However, motivation does not change the order in which ad elements are attended to for the first time nor does the impact of motivation on attention onset differ across exposures.

- Analysis and modeling of scanpaths suggest that the ad's scanpath can be described by a reversible, stationary first-order Markov process. Based on this model, expected transition matrices suggest that:
 1. The amount of attention paid to the text is about three times as high as the amount paid to the pictorial.

2. The amount of attention paid to the ad decreases by about 50% from exposure 1 to exposure 3.
3. The majority of saccades (about 75%) occur within ad elements, in particular in the bodytext.
4. Most interelement saccades start from or end at the packshot.
5. The expected transition matrices are quasi-symmetric.
6. The conditional transition probabilities remain constant across exposures.

Combining the results with the authors' modeling efforts yields the following observations. As the attention onsets show, subjects attend, on average, first to the headline. As indicated by the expected number of saccades between headline and pictorial, attention is then directed to the pictorial. However, attention onsets provide some indication that during later exposures this order may be reversed. Both headline and pictorial receive about one-sixth of subjects' attention. Half of the attention is directed at the bodytext, but subjects focus on the bodytext only after the headline and the pictorial have received some initial attention. Finally, subjects attend to the packshot last, and that, despite the limited amount of attention spent on this ad element, most intraelement saccades start from and end at the packshot. This may point to integration of information in other ad elements with information in the packshot.

In a recent study of eye movements over advertisements, spsciteAWP00 comment that although eye movements are eminent indicators of attention, what is currently missing in eye movement research is a serious account of the processing that takes place to store information in long-term memory. The authors attempt to provide such an account through the development of a formal model. They model the process by which eye fixations on print advertisements lead to memory for the advertised brands. The model is calibrated to eye movement data collected during exposure of subjects to magazine ads and subsequent recognition of the brand in a perceptual memory task. Available data for each subject consist of the frequency of fixations on the ad elements (brand, pictorial, and text), and the accuracy and the latency of memory. It is assumed that the number of fixations, not their duration, is related to the amount of information a consumer extracts from an ad. The accumulation of information across multiple fixations to the ad elements in long-term memory is assumed to be additive. citeauthorspsWP00's model is applied in a study involving a sample of 88 consumers who were exposed to 65 print ads appearing in their natural context in two magazines. citeauthorspsWP00 report that across the two magazines, fixations to the pictorial and the brand systematically promote accurate brand memory, but text fixations do not. Brand surface has a particularly prominent effect. The more information is extracted from an ad during fixations, the shorter the latency of brand memory is. A systematic recency effect was found: when subjects are exposed to an ad later, they tend to identify it better. In addition, there is a small primacy effect. The effect of the ad's location on the right or left of the page depends on the advertising context.

Considering text and pictorial information in advertisements, Rayner et al. (2001) performed a study where viewers looked at print advertisements as their eye movements were recorded. Eye movements were recorded by an EyeLink

headband-mounted tracker from SensoMotoric Instruments (SMI). Although viewing was binocular, movements of the right eye were monitored. Eye positions were sampled at 250 Hz. Half the viewers were told to pay special attention to car ads, and the other half were told to pay special attention to skin-care ads. Rayner et al. (2001) found that viewers tended to spend more time looking at the text than the picture part of the ad, although they did spend more time looking at the type of ad to which they were instructed to pay attention. Fixation durations and saccade lengths were both longer on the picture part of the ad than the text, but more fixations were made on the text regions. Viewers did not alternate fixations between the text and picture part of the ad, but they tended to read the large print, then the smaller print, and then they looked at the picture (although some viewers did an initial cursory scan of the picture). Of the 110 product names that were generated in the free-recall task, 89 (81%) were recalled correctly. Overall recognition performance was excellent. Despite participants' focus on the text in the ads, memory for the product names was not particularly good. On average, participants correctly recalled fewer than four brand names from the 24 advertisements they had studied. In addition, the advertisements that were viewed favorably were often not identified by brand name; those preferred ads were often described to the experimenter in terms of some aspect of the pictorial information or by a generic product label.

Although Rayner et al. report that scan path data from the experiment are difficult to quantify, they note some very striking characteristics of how viewers scanned the ads. The initial fixation on the ad was always located in the center of the ad because that is where the viewer was fixated when the ad was initially presented. Looking behavior was fairly consistent across viewers in that they typically initially made an eye movement to the large print, regardless of its spatial position within the ad. After looking at the large print, participants either made a very cursory scan of the picture, or more typically, they moved from the large print to the small print and then to the picture.

Rayner et al. suggest that the presented data have some striking implications for applied research and advertisement development. Instructions given to participants can influence their eye movements, suggesting that participants' goals must be considered in future research conducted by advertising agencies and researchers in the area. The authors note that the data also indicate that an advertisement captures and holds participants' attention but this may be caused by the instructions given to those participants. If different instructions were used, the evidence of the advertisements' success in capturing attention may be reduced. The authors note that their second main finding, that more time was spent viewing text than viewing pictures in these ads, is inconsistent with how advertising agencies view the relative importance of the visual and text portions of the ads. Early research on print advertisements concluded that an ad is typically well liked during prepublication testing if it has a single illustration, a short headline, lots of white space and very little text. Data presented here indicate that consumers may be paying much more attention to the text in ads than previously thought. Rayner et al. conclude that currently there is no cognitive

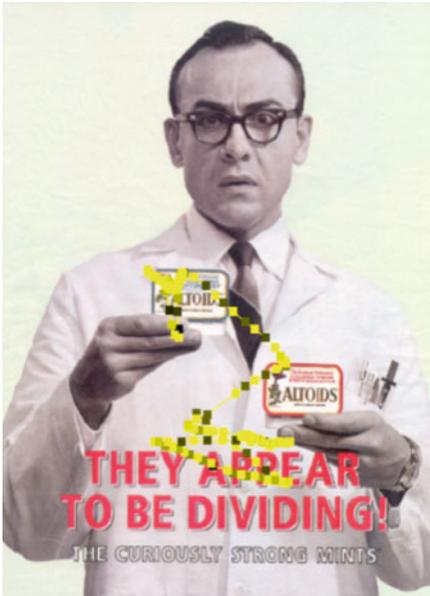
process theory that makes clear predictions about eye movements and attention while viewing print advertising. The data and ideas outlined in this paper have the potential to form the foundation in the search for such a theory.

23.3 Ad Placement

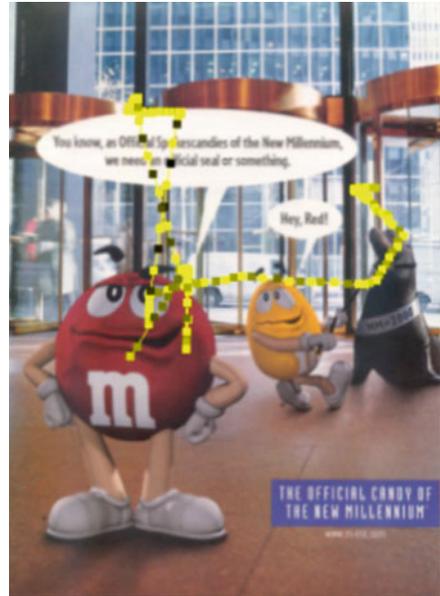
Eye movements recorded over advertisements are particularly informative because scanpaths immediately provide a visual depiction of whether the intended text or object was fixated (or at least scanned over). This was a topic of study of a pair of senior undergraduate students, one from computer science, the other from marketing. Examples of scanpaths recorded over advertisement images are shown in Fig. 23.2. Although formal analyses cannot be offered, the images show fairly typical scanpaths over ads. It can be seen that attention is drawn to fairly conspicuous ad elements, such as faces, textual information, and objects set apart by virtue of being presented in homogeneous color regions.

Another marketing student study was conducted over NASCARTM (National Association for Stock Car Auto Racing) images. The student team consisted of majors from computer science, marketing, and industrial engineering. The distribution of work fell along fairly well-expected lines of specialization: the computer science major provided coding support, the industrial engineer provided experimental design and statistical analysis expertise, and the marketing students provided contextual and background information (motivation for the study, image samples, etc.). The objective of the experiment was simply to find whether any particular regions on the vehicle tend to inherently draw attention. Images from the study are given in Fig. 23.3.

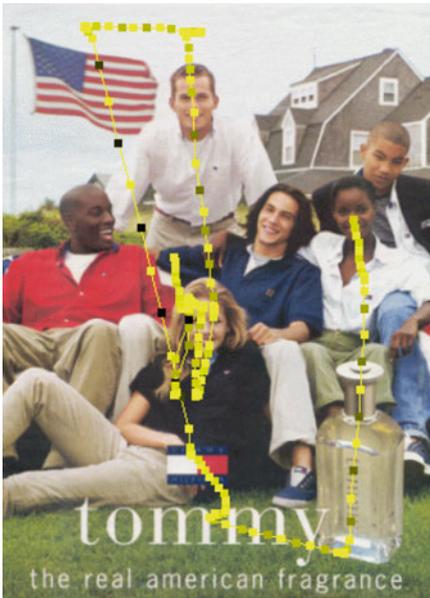
Different views of NASCAR vehicles were evaluated: a front-right view (as shown in Fig. 23.3), a front-left view, and left and right views of the vehicle rears. These images were chosen to represent views of vehicles as may be seen during a televised NASCAR event. Specific vehicle regions were chosen a priori as regions of interest: the hood, middle, rear quarter panel, and trunk, depending on the view of the vehicle. Pictures viewed by subjects were grouped based on the visibility of ROIs. Mean viewing times and number of fixations were compared between groups. The control stimulus was an image of a NASCAR vehicle with the ads airbrushed out (as shown in Fig. 23.3b). The control stimulus was used as an image meant to be unbiased by advertising content. Informal analysis based on the number of fixations within ROIs suggests that the shape of the vehicle alone is responsible for drawing attention rather than the placement of the ads themselves. From images showing the left and right rear views of the vehicles, it was determined that the rear quarter panel draws most of the viewer's attention (the highest number of fixations were counted in this ROI). From images showing the right and front views of the vehicles, the middle section was found to draw most of the viewers' attention.



(a) Altoids ad.



(b) M&M's ad.



(c) Tommy Hilfiger ad.



(d) Hugo ad.

Fig. 23.2 Scanpaths over advertisements. Courtesy of Cristy Lander and Karen Kopp. Reproduced with permission, Clemson University

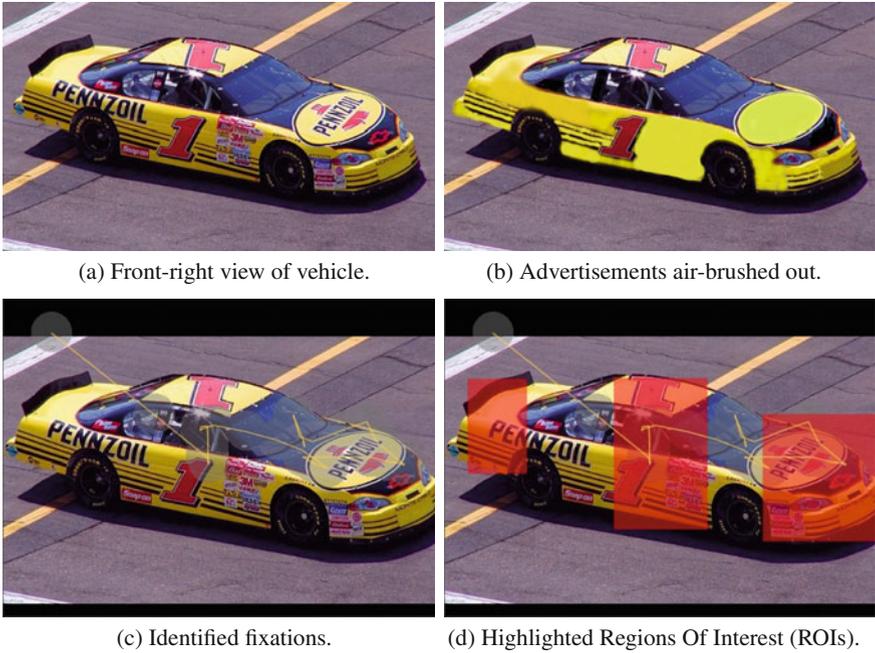


Fig. 23.3 Scanpaths over NASCAR™ vehicles. Courtesy of Melissa Andrews, Laura Boyd, Robyn Bushee, and Amit Joshi. Reproduced with permission, Clemson University

Due to the short, in-class nature of these studies, significance and generalizability of results can only be claimed to be anecdotal. Results reported here are not meant to be conclusive or significant. However, the exercises are excellent examples of potential student-led eye tracking projects in testing advertisement materials.

23.4 Television Enhancements

Thematically similar to copy layout and ad placement design, Josephson and Holmes (2006) studied the addition of on-screen enhancements to TV news broadcasts. On-screen enhancements consisted of a news crawler, or ticker, usually streaming information at the bottom of the screen, titles, headlines, and globe (graphic) information situated just above the crawler. To examine the effect of the presence of these potential distractors, Josephson and Holmes compared scanpaths over news stories displayed on a standard layout (no enhancements), a standard layout with the crawler, and a standard layout with crawler and headline enhancements. As expected, the presence of the crawler drew more visual attention to that portion of the screen, but did not diminish recall of the main story content. However, participants exposed to headline

summaries were less likely to recall other story points, suggesting an information interference effect (e.g., when visual and aural information differed).

Similar studies can be performed to evaluate the effect of advertisements, either over typical commercial spots or during live broadcasts of sporting events, for example. American broadcasts of baseball and soccer incorporate advertisements into the video stream by either virtually compositing ads on green screen elements behind the batter's box, or on the scoreline atop the screen during football matches (e.g., during the FIFA Germany World Cup 2006 broadcasts). Eye tracking data add objective support to recall statistics of the effectiveness of such displays.

23.5 Web Pages

Web page layout design has received a good deal of interest lately, although eye tracking studies have not yet revealed groundbreaking guidelines for optimal design (whether they ever will is a valid question, one that most likely puts an undue expectation on eye movement analysis). However, several marketing-related research directions are worth mentioning.

Banner blindness, related perhaps to the phenomenon of inattention blindness, received a great deal of early attention. It is difficult to suggest a single definitive reference to support, refute, or explain this phenomenon, although it appears to be generally accepted as a tendency of Web visitors to ignore banner ads, even when banners may contain actively sought information. For eye tracking evidence, the study conducted by the Nielsen Norman Group (NN/g) appears to have been given credence on the Internet (Nielsen Norman Group 2006; Nielsen 2006b).

Another of the Nielsen Norman Group's observations to be popularized describes search page scanning behavior. Similar to Eyetools'¹ "golden triangle" (Eyetools et al. 2006), NN/g reports an "F" pattern evident in aggregate scanning behavior and visible in Fig. 23.4 (Nielsen 2006a). The implication of this scan pattern for marketing purposes is that viewers tend to look at the upper-left portion of search results (e.g., Google's) and ignore sponsors' links in the right column. Whether sponsors' links should be moved to the upper left is an open issue. If they are, their placement may disrupt search efficiency by impeding the typical visual search pattern to which users have now grown accustomed.

Whether current Web search results are presented in a manner evoking optimal visual search is an interesting research question. Rele and Duchowski (2005) used an eye tracker to study two different Web page search layouts. The first was a traditional list interface, where the list contained groups of elements delineated by categorical Web page information of title, summary, and URL. The second was a tabular rendition of the same information, where the distinct categorical elements were presented in separate columns instead of above and below each other. Figure 23.5 shows example

¹See: http://www.eyetools.com/inpage/research_google_eyetracking_heatmap.htm, last referenced July 7, 2006.

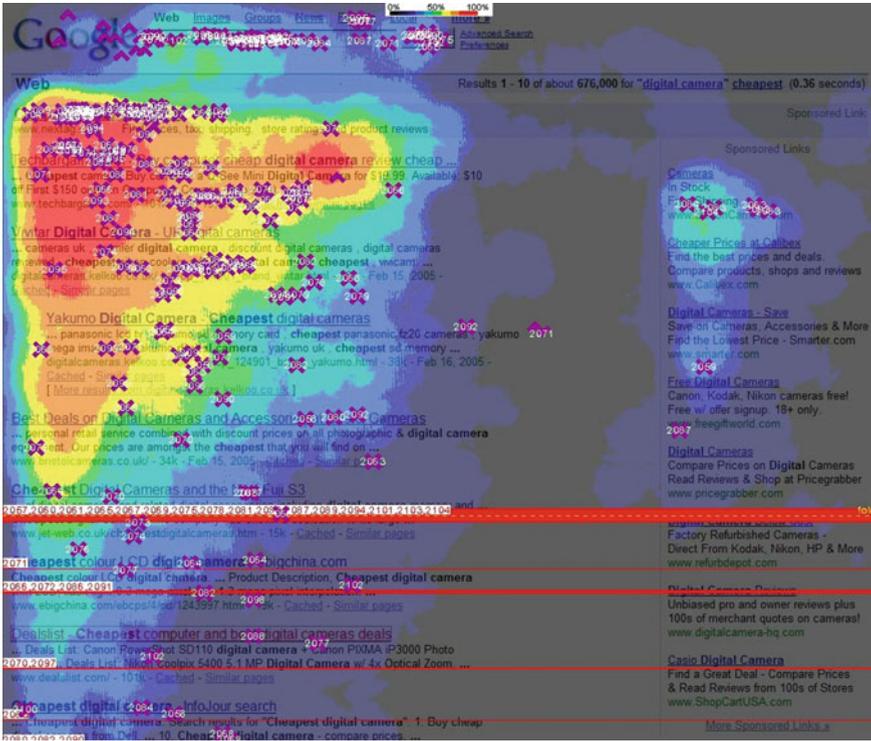


Fig. 23.4 Google’s golden triangle (publicly available on the Internet, e.g., via Google’s image search)

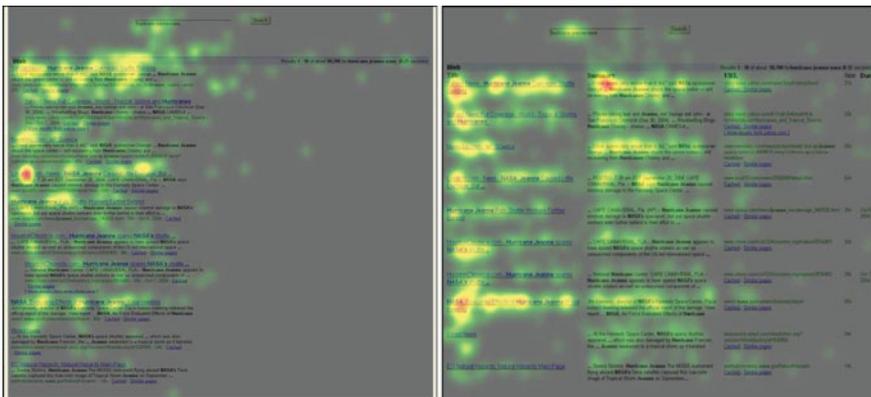


Fig. 23.5 Web search layout “hotspots”: list (at left), tabular (at right). From Rele and Duchowski (2005) © 2005 Human Factors and Ergonomics Society. Reprinted by permission

aggregate “hotspots” from the study. Although there was no significant difference in performance measures of speed (search time for a given item) or accuracy (correct target identification), eye movements provided interesting insights.

Significant and sometimes task-dependent differences were found in the number of fixations over specific elements. Users performed one of two tasks: navigation or information gathering. Information gathering tasks were artificially created with the sought information present on one or more Web pages. In contrast, navigation tasks were designed without the sought information available, rather, it was meant to be inferred to exist on Web pages pointed to by the search results.

A significantly larger number of fixations were devoted to the summary category during navigation than when information gathering. This may suggest that difficult search tasks, in this case navigation that included searching for specific information, may require more careful reading of the link’s summary before selection. A significantly larger number of fixations were also observed over the URL category with the list layout than tabular layout, this time independent of task. This finding would suggest that the URL is not as important to the viewer when it is possible to ignore, that is, displayed far enough away from the more informative title and summary information. However, the significance of this result may be partially tainted by fixation “spillover”. It is difficult to reliably count deliberate fixations made on the URL element in the list layout. Due to the eye tracker’s inherent limited accuracy, fixations intended over the summary element may have been mistakenly counted over the URL.

A cheap alternative to eye tracking visual attention, particularly over Web pages, may be the use of a mouse-contingent viewer such as the Enhanced Restricted Focus Viewer, or ERFV, developed by Tarasewich et al. (2005). The ERFV blurs regions outside a small window surrounding the mouse cursor in a similar manner to gaze-contingent displays (see Chap. 24). By doing so, the approach restricts visual attention to the cursor location. Recording mouse movements can then be used to visualize attention in a similar manner to displaying scanpaths. Tarasewich et al. suggest that such ERFV trajectories provide a good (statistically valid) estimate of the areas that subjects inspect when viewing Web pages.

One should consider the use of ERFV or mouse-contingent trajectories carefully, however, as other studies have raised considerable doubt concerning the method’s validity (see Sect. 24.1.2). Although trajectories recorded by ERFV or similar focus + context displays may appear similar to gaze scanpaths, they may alter performance metrics in a manner analogous to the Think-Aloud protocol. That is, task completion times with the ERFV may be slower, and perhaps more important, the ERFV may miss recording vital attentional behavior such as attention switching (Bednarik and Tukiainen 2004, 2005). That is, the presence of the focus + context display may disrupt natural eye movements.

23.6 Product Label Design

Related to layout design are studies dealing with physical product labeling. Capturing eye movements over products arranged on real or mock supermarket shelves may require a head-mounted eye tracker (Li et al. 2006 *openEyes* project's low-cost head-mounted eye tracker may be very suitable for this purpose). Alternatively, label designs may be compared by viewing different designs on the desktop. Bojko et al. (2005) performed such a study where they tested product label designs, specifically drug labels. Eye tracking data helped explain the noted speed increase during visual search tasks over the newly redesigned labels: lowered search demands or lowered information-processing demands posed by the new design. For example, when searching for a label with the correct generic name (in this case *lutramine HCl monohydrate*), fixation duration was found to be significantly lower for the new designs than for existing designs (see Fig. 23.6). This increased efficiency was attributed to the new labels' improved consistency in name formatting (font type and size). Eye movements helped corroborate increased visual search efficiency of the new label designs under other visual search tasks (e.g., searching for dosage formulation or strength), indicating the benefits of elemental changes such as better text positioning, clearer background, and more consistent font.

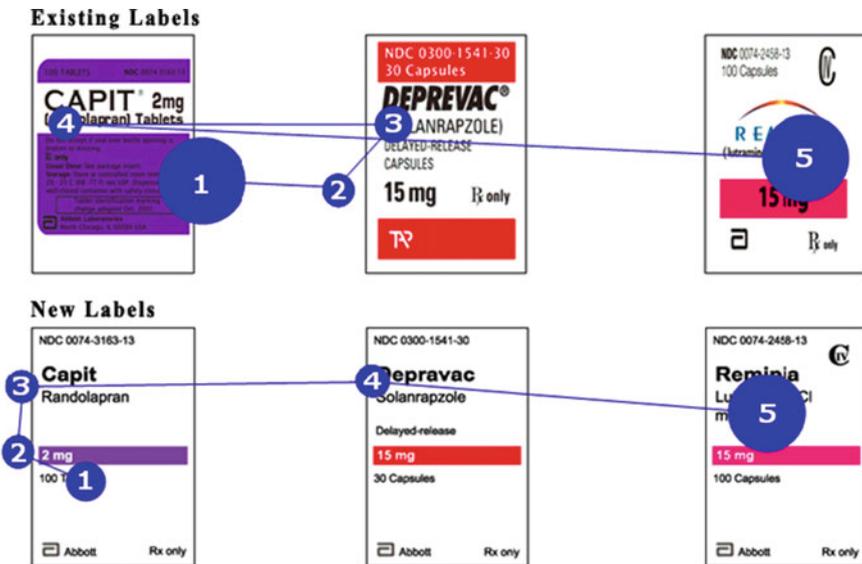


Fig. 23.6 Scanpaths over redesigned drug labels, with given task of finding the generic name *lutramine HCl monohydrate*. Notice the longer fixations on the existing designs compared to the new designs. From Bojko et al. (2005) © 2005 Human Factors and Ergonomics Society. Reprinted by permission

23.7 Summary and Further Reading

There are numerous opportunities for conducting eye tracking marketing studies. Copy testing, print advertising, and ad placement are suitable potential experiments that may be used to improve the impact of advertising materials. Unfortunately, evidence of eye tracking in market research is difficult to find. It may be that advertising companies do not wish to disclose the fact that eye trackers are being used. This may be perceived by the buying public as somehow being devious. Still, it is fairly safe to say that eye trackers are probably well known to marketing researchers and with improvements in technology will continue to be valuable tools in their work.

Possible sources of eye tracking research include scientific journals and professional conferences. One particular source that occasionally contains reports of eye tracking work is the *Journal of Advertising*. Another place to search for evidence of eye tracker use is the World Wide Web. A quick search of the Web reveals the following available reports.

- The Outdoor Advertising Association of America lists the following available research report: “The PRS Eye Tracking Studies: Validating Outdoor’s Impact in the Marketplace” (see <http://www.oaaa.org/>, last accessed 05/31/02).
- The Institute of Behavioural Sciences (<http://ibs.derby.ac.uk/>) offers its eye tracking services for examining printed material (see <http://ibs.derby.ac.uk/research/eye.html>, last accessed 01/03/02).
- A conference announcement by the Advertising Research Foundation (ARF), Week Of Workshops (WOW), October 29–November 1, 2001, lists among its scheduled presentations the following: “New Ad Designs Capture Users’ Eyes: A Case Study of Eye Tracking for CNET”. (See <http://www.thearf.org/webpages/wow-2001/conference-tuesday-marketing.html>, last accessed 01/03/02.)

Thus it appears eye tracking market research is being conducted. The last example is particularly interesting because it shows a fairly new domain ripe for the study of advertising placement: the World Wide Web itself.