It's all in the eye of the User

How eye tracking can help answer usability questions

BY AGNIESZKA BOJKO AND ABIGAIL STEPHENSON

You conducted a usability study and found that users did not click on the only task-relevant link on the page. Did they not notice the link? Were they distracted by other elements? Did they see the link but not read the label? Did the label but not understand its meaning? What will you recommend? Increasing link visibility, decreasing page clutter, or changing the link label?

Eye tracking can help answer these questions, filling the gaps left by conventional data collection methods.

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Partnership of Eye Tracking and Usability: Achieving Added Value

While interacting with user interfaces, people are rarely fully aware of the cognitive processes that impact their performance. Hence, the traditional self-report measures employed with usability testing often produce incomplete or biased explanations of user behavior. Other measures, such as task completion rates and times, identify the user interface areas that are causing problems, but often do not offer specific directions for redesign.

Eye tracking supplements the behavioral and preference measures of usability testing with physical measures that offer insight into how users process visual information. Using this data, we can determine how users scan displays, which areas they focus on and for how long, and which elements they miss. Combined with self reports and performance data, eye movements provide a deeper insight into the origins of certain usability problems and offer more precise answers to questions concerning layout effectiveness, information organization and clarity, and appropriateness of graphical treatment.

Application of Eye Tracking

At User Centric, our consultants have conducted several studies in which conventional methods were supplemented with eye tracking. We found that the eye tracking procedure did not interfere with the testing (we use a non-intrusive camera-based eye tracker integrated into the monitor), and the insights that it provided greatly enhanced the projects, allowing us to give recommendations that were more specific than if no eye movement data had been available.

Mobile Device Accessory Package

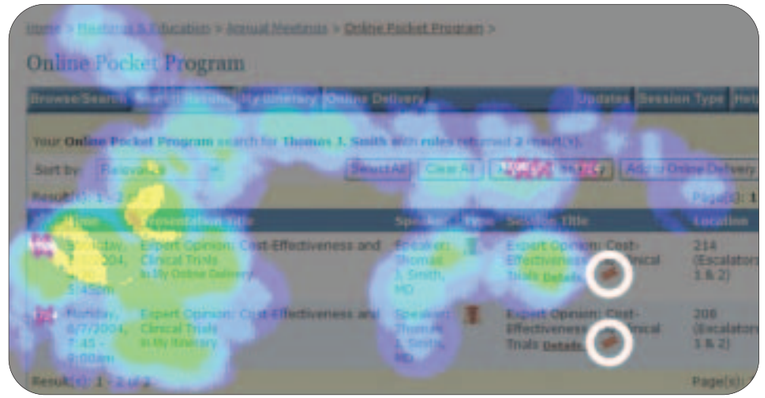
In a usability study involving product packaging for a mobile device accessory, we showed users a package, but did not give them a specific task. After viewing the packaging for ten seconds, only 20 percent of participants knew what product was in the package.

The origin of the problem would be difficult to determine without any additional measures. Users may have simply missed the name of the product among other elements on the packaging. If this were the case, the size, color, or location of the product name and the other elements would have to be adjusted. Users may have noticed the name but failed to read it, perhaps due to excessive wordiness or the use of an illegible font. Or they may have read it without fully comprehending the text, which would suggest that the text should be rewritten. Without a way to understand what caused the problem, choosing a remedy would have to involve trial and error.

The eye movement data indicated that the product name and two-line description right below it received a great deal of attention—significantly more than most of the other package elements. All users noticed the product name and description and most looked at these items before examining other elements. The recorded scan-paths showed that users not only noticed the text, but also read it. The data indicated that the users did not know what was in the package because the name and description were difficult to understand. As a result, we recommended rewriting the text.

Travel Web Site

A travel company asked us for help redesigning a "special deals" area on their home page. The click-through rate was low and the company had already begun to increase the personalization of the area to improve the perceived attractiveness of the offers. A usability study confirmed that users did not click on the special deals, even if the links were the only task-relevant targets on the home page. The eye movement data showed that users never fixated on the deals area before making their selection. Based on these results, we recommended that instead of rewriting content, the travel company should increase the visibility of special deals on the page.



Conference itinerary page with "hot spots" illustrating the combined gaze activity of all users. The colors represent the percentage of users fixating in the area. The warmer the color, the higher the percentage; no color indicates elements or areas that received no fixations, such as the ticket icons (circled).

Conference Web Site

In a study of a conference website, all users successfully added several sessions to their personalized itinerary. One of the sessions required a ticket, which was indicated by an icon. When asked to purchase a ticket for the session, users did not understand what was being asked of them. If the users did not notice the icon, its saliency or location would have to be improved. However, if the users noticed the icon but did not understand its meaning, modifying the icon or supplementing it with a label would have to be the recommendation.

The eye movement data indicated that users never fixated on the ticket icon while creating their conference itinerary (Figure 1). Instead, users primarily focused on the session titles. In addition, when the icon was pointed out, most users did not understand what the graphic represented. Based on these results, we made two recommendations: to redesign the icon and label it (or even replace it with a link), and place it in closer proximity to the session titles where the users were allocating most of their attention.

Lessons Learned

Literature on the practices of using eye tracking for usability studies is scarce, forcing us to learn from our own mistakes. Here are a few things to keep in mind:

Plan, then Track — When conducting a usability study involving eye tracking, we are often tempted just to prepare for the usability test and hope that the eye movement data, when analyzed later, will add value to the study. However, we learned that failing to thoroughly plan the eye-tracking component can make it difficult to formulate any conclusive results and recommendations.

It is essential to first determine the issues that eye tracking data can help address, and then create the context within which the eye movement data can be obtained. The testing protocol needs to include appropriate tasks and follow-up questions designed specifically to help interpret the eye tracking data. And finally, it is necessary to identify the measures that will answer the research questions. For example, the percentage of users who fixate on an area can provide information on the visibility and importance of the area but not on the clarity of information or the users' workload.

Avoid Thinking-Aloud Protocols — Often usability practitioners use eye tracking while simultaneously prompting users to speak. When explaining what is going through their minds, users focus more than usual on the elements they are talking about. They also tend to keep turning toward the moderator. The resulting scan patterns are not representative of the scan patterns that would occur if the tasks were performed outside of the lab (Figure 2). We now ask participants to complete each task in silence and comment on it afterwards, while the eye tracker is paused or when the display changes to a blank screen.

Use High-Fidelity Prototypes — How users allocate their attention on a low-fidelity wireframe could be radically different from how they would allocate it after color and images were added. In one of our studies, the prototype we received was complete in terms of graphical treatment except for one detail: all company logos had been replaced with white squares. The blank areas looked so different from the rest of the image that they were the main focus of users' attention. Filling the blanks with sample logos reduced the impact of these areas and we were able to continue with the study.

Remaining Challenges

There are two main limitations related to the interpretation of eye-movement data. First of all, the fact that users fixated on an element does not necessarily mean that they processed it. For example, while searching for an object on a busy display, users may look at the target without registering it.

The second limitation involves peripheral vision, which can be used to register larger objects without directly looking at them. For example, during a test of marketing emails, very few users fixated on a large "25% off" graphic, but all were later able to recall this information. These two limitations can be overcome, to a degree, by combining the data from several users rather than looking at individual data and by asking appropriate questions during and after the test.

Until recently, eye tracking has been underused by the usability community because of hardware limitations and the need for extensive data analysis and specialized training. However, with every study, we have discovered new ways in which eye tracking—its insight into user attention—can augment usability testing. For this reason, we believe that the improved reliability and accuracy of remote eye trackers, as well as the increasing number of software packages that streamline data processing, will allow eye tracking to become a standard supplement to traditional user interface assessment techniques. UX

Gaze paths of users looking for information on how to iron linen on Google. Some users were encouraged to think aloud (example on the top), while others were asked to complete the task silently (example on the bottom). The circles represent fixations. The larger the circle, the longer the fixation.

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