

# Eye Tracking as a Complementary Usability Evaluation Technique for E-Commerce Sites

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**Abstract:** As part of our Doctoral Research we are measuring eye movements as indicators of the user's cognitive processes while interacting with the user interface. We aim to suggest eye tracking as a complementary usability evaluation technique by comparing it to other traditional usability evaluation techniques such as expert inspections and user based observations.

**Keywords:** Usability evaluation techniques, Eye tracking, E-Commerce

## 1 Introduction

There are several usability evaluation techniques which are broadly applied for the evaluation of E-Commerce sites. There is a distinction between user based observations, which involve the real end user, and expert inspections, which involve a group of people, such as usability experts, who try to identify possible usability problems typical users would have faced as part of the user experience.

Review studies of the effectiveness of different evaluation techniques fail to meet a standard criterion to make valid comparisons. Nevertheless a majority of comparative studies (Nielsen and Phillips, 1993, Dutt et al 1994, Borges et al 1997, Law and Hvannberg ,2002) focusing on the effectiveness of heuristic evaluations when compared to other usability evaluation techniques suggest that expert inspections identify a larger number of usability errors than other techniques.

The question that becomes important is which usability evaluation technique can reveal information about the customer's behavior which is different and more effective than information revealed by other techniques.

## 2 Eye Tracking

### 2.1 Background

Due to the growth of the use of computer based systems and the internet in recent years, an

increasing number of researchers have focused on the use of eye movements as a usability evaluation technique.

Eye movements are thought to provide an indication of the amount of cognitive processing a display requires and hence how easy it is to process (Rayner and Pollatsek, 1994) which leads to the potential use of eye tracking to contribute towards the assessment of the usability of user interfaces. Eye movements can provide a record of scan patterns while the user is navigating a site. The scan patterns are represented by a number of fixations and their connecting saccades. Fixation is the focusing of the eye on a user interface design feature, such as a menu item, the search box, the shopping cart etc. A fixation lasts approximately 300-400 ms during which cognitive process is required for the understanding of the feature. Thus information can be extracted during a fixation whereas a saccade is a ballistic eye movement which lasts only 100-200 ms. No information is retrieved during a saccade.

An increase in the number of fixations indicates the difficulty in extracting information or the frustration of the interaction with the user interface. Many saccades being grouped near each other indicate the difficulty of the user to focus on a particular feature of the user interface.

### 2.2 Previous Research

Previous research has focused on the use of eye tracking on web sites.

Ellis et al., (1998) evaluated a series of web sites by measuring eye movements as an evaluation

technique. The results of their study suggest that users perform better on text based websites and look less on images online. Cowen et al., (2002), compared eye movements to performance measures in terms of time to complete given tasks on world wide web pages. They found that different usability errors were identified by each evaluation technique they applied for their websites evaluation. Goldberg et al., (2002) asked users to freely navigate on a series of portal websites. They identified similar trend patterns different users apply. Josephson & Holmes (2002) recorded eye movement data of users who repeatedly viewed three web sites each belonging to a different domain. They suggest that some users tend to develop a habitually preferred visual path, scan path, across the visual display of user interfaces.

The eye tracking studies that have used web sites as the apparatus of their study all have one thing in common. They aim to suggest eye tracking as a useful evaluation tool for the usability of user interfaces of websites. They have revealed information such as specific searching trends users apply when navigating websites, their preference towards specific user interface elements, such as text opposed to images. This information is not revealed by user based observations where the researcher does not have an insight of the user's visual attention across the user interfaces or the cognitive processes they apply during information retrieval. For example, when a researcher asks the user to think aloud during an observation session of him completing a task online, the user might answer in way that he believes the researcher expects him to. His answer might be biased due to the presence of the researcher, whereas the eye tracker can indicate the actual user behavior in a natural way without influencing the user behavior.

### 2.3 Current Research Activities

We are exploring the factors which influence the way people look on user interfaces of E-Commerce sites: What are the factors that influence the user's visual attention on the user interface. Precisely, where do users expect to find specific information on the user interface? It has been noticed from preliminary studies we have conducted that experienced internet users tend to develop a specific trend of visual attention due to design similarities they have been

exposed to on sites they regularly visit. We are also looking at the features and design elements of the user interface that attract the user's attention. This information is useful for designers as they can improve the usability of E-Commerce sites by placing important information where users expect to find it and in the form it will attract more attention.

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