

## **An Examination of E-Commerce Homepage Design Guidelines by Measuring Eye Movements**

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### **Abstract**

The homepage is the most visited page of a web site and the first opportunity to attract potential customers. Existing design guidelines have not focused specifically on E-Commerce web sites – and only one has focused on design guidelines for homepages. Moreover, these existing guidelines have been derived from expert heuristic evaluations, apparently without involving the users themselves. The study reported in this paper used eye-tracking to investigate user interaction with E-Commerce homepages. The results indicated that users tended to look initially at the top of the page for cues of the brand identity, but that they were confused by banners and images. Overall, this study corroborated existing design guidelines for homepages, but it also identified potential refinements.

### **INTRODUCTION**

The HCI literature provides of a variety of general design guidelines for web sites, including E-Commerce sites. But few studies concentrate on specific design guidelines for homepages. A detailed study has been reported in Nielsen and Tahir (2002) of heuristic evaluations of 50 homepages. Although these guidelines are on the whole straightforward to implement, the generality of some can make them difficult to interpret for a particular case, and some are specific to a domain other than E-Commerce.

Just as Nielsen and Tahir (2002) relied on heuristic evaluation by designers and HCI experts, most reported guidelines are based on studies using experts (Ivory et al., 2001). There is no reported study, to our knowledge, that studies user responses to E-Commerce homepages.

This paper reports an eye tracking study focused on E-Commerce homepages and involving users.

### **HOMEPAGE EYE TRACKING STUDY**

The role of the homepage of an E-Commerce web site is to ‘anchor’ the site: to identify and introduce the company and its services, and hence to attract and retain customers. Brand identity should be established in first inspection of the homepage as suggested by Van Duyne et al. (2003). It is crucial to communicate quickly and effectively where users are, what the company does and what the users can do within the web site. The study reported in this paper used eye tracking to investigate what users inspect on their first visit to a homepage and whether they can establish brand identity quickly. The study recorded what users looked at first (i.e., position of first fixation) and early scanning behavior. It compared this to users’ responses to questions about company identity and services.

The use of eye tracking in HCI is not a new concept, as Jacob and Karn (2003) illustrated in their review. Eye tracking has been used in previous HCI research to measure the influence of specific design elements on visual attention in a given context (e.g., Goldberg et al., 2002). It has been

established by Renshaw et al., 2003 that specific design features influence eye movements in a predictable way, and they demonstrate that eye tracking metrics are sensitive enough to detect them. More generally, studies in cognitive psychology have established that eye movements give an insight into the cognitive processes a display requires (e.g., Just and Carpenter, 1976). Eye movements in reading and information processing have been studied by Rayner and Pollatsek (1994) and concluded that eye movements indicate how easy or difficult a display is to process.

The study reported here used eye tracking to investigate whether existing design guidelines for homepages correspond to user behavior.

## METHOD

The homepage eye tracking study collected four types of data: a background questionnaire (eliciting internet experience and typical usage), eye tracking data, task responses (performance answering questions about brand and services), and transcripts of post-session interviews (eliciting users' perceptions and expectations about branding on websites) – (see Table 1).

| <b>Homepage Eye Tracking study</b>       |  |  |
|--|--|--|
| <i>Phase 1: Background Questionnaire</i> | <i>Phase 2:</i>                              | <i>Phase 3:</i>  |
|  | <i>Eye tracking session</i>                  | <i>Post-session Interview</i>                            |
| User profile                             | Position of first fixation within given time | Perceptions and expectations of information on Homepages |
| Previous internet experience             | Reading and analysing of scan paths          | Interaction with print-outs of eye tracking session      |
|  | Accuracy of task responses                   |  |

*Table 1. Data collected during eye tracking study*

The principal focus was on the relationship between scanning behavior and ability to identify brand and services (Phase 2 in Table 1). The secondary focus was on the relationship between experience and expectation, and scanning behavior (between data from Phases 1 and 3, and Phase 2).

## Participants

Eleven participants were recruited via personal contact within the postgraduate students and staff of the university. The first participant's session was treated as a pilot session to test the effectiveness of the evaluation material and techniques. Data collected for the remaining ten participants (five male and five female) are presented in this study. Their ages ranged from 23-51. All participants were at least regular internet users. None of the participants had viewed the homepages used in the study prior to their participation.

## Stimuli and Equipment

Five E-Commerce homepages were selected as stimuli for this study: [disney.com](http://disney.com); [petsmart.com](http://petsmart.com); [gm.com](http://gm.com); [fhwa.dot.gov](http://fhwa.dot.gov) (Federal); and [globalsources.com](http://globalsources.com). These 5 were chosen from the 50 homepages Nielsen and Tahir (2002) evaluated as part of their study. The aim was to compare the design guidelines derived by Nielsen and Tahir (2002) to the outcomes of the eye tracking study. Therefore, the homepages were selected according to which retained the same design layout since Nielsen and Tahir's heuristic evaluation in Nielsen and Tahir (2002).

Previous research (Loftus, 1976) showed that 15 seconds is sufficient to capture a complete scan path for first inspection of a display. Therefore, the homepages were presented for 15 seconds each.

Eye movements were recorded using a SensoriMotoric Instruments (SMI)'s Head-Mounted Eye Tracking Device II (HED-II) at a sample rate of 50 Hz (SensoriMotoric, 1999). An MPEG video file was produced with a moving dot representing the user's eye movements.

## Procedure

After a briefing about the study, each participant completed a consent form and a written background questionnaire which collected age, gender, previous internet experience, and frequency and purpose of internet use. The participant was asked to read a set of task questions before starting the eye tracking session.

The eye tracking equipment was then calibrated for the individual. The five selected homepages appeared as a power point slide show during which each homepage was presented for 15 seconds, followed by a blank screen while the participant answered the task questions, followed by the next homepage. The order of presentation of the homepages was varied for each participant, in order to reduce possible order effects. The task questions were: a) ‘What does this company do?’ and b) ‘What can you do in the site?’ The participant’s eye movements were recorded during inspection of each homepage, and the participant’s responses were audio recorded.

A post-session, semi-structured interview followed. During the interview, participants were shown print-outs of the homepages, so that they could indicate on each where they thought they had looked first. They were also invited to comment on the design layouts.

## RESULTS

The four types of data were analyzed and compared. The qualitative data added value to the performance and eye movement data by revealing something of the user’s expectations and perceptions. The overall outcomes of the eye tracking study were compared to Nielsen and Tahir’s (2002) homepage design guidelines.

### Eye Tracking Session

During the eye tracking session each participant’s scan path was recorded (Figure 1). Two measures were used:

1. ‘initial gaze’: where the participant looked less than half a second (100 ms) prior to the homepage appearing on the screen, and
2. ‘entry point’: the first fixation within 300ms of the display of the homepage. 300ms is the duration of a typical fixation and the typical time in which information extraction occurs (Cowen et al., 2002).

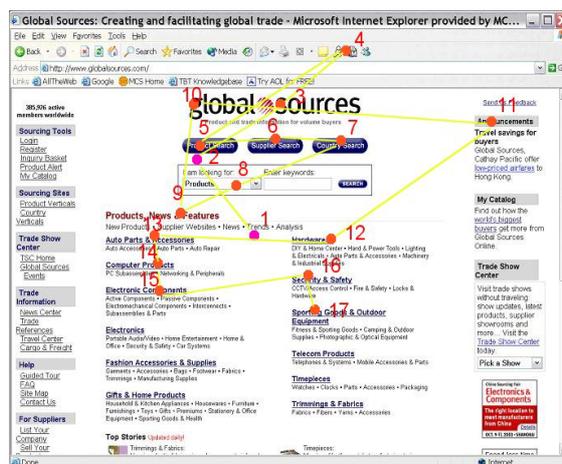


Figure 1. Sample scan path on homepage

A common trend was found for the eight users who classified themselves as ‘regular internet users’ (frequency of internet use 2-3 times per week). Their ‘initial gaze’ was in the middle of the screen across all homepages (on or near the boundary between areas B and E in Figure 2). The two participants who classified themselves as ‘internet literate’ (frequency of internet use more than once per day) looked at the top left corner (area A) or top middle (area B) of the page. Although the small sample means that no firm conclusion can be drawn, this observation warrants further investigation.

|                |                |         |
|----------------|----------------|---------|
| Area A:<br>60% | Area B:<br>40% | Area C: |
| Area D         | Area E         | Area F  |

Figure 2. ‘Entry point’ distribution across all homepages

Figure 2 shows the ‘entry points’, or first fixations when the homepage appeared on the screen. No distinction was evident between the ‘regular users’ and ‘internet literates’.

Responses to the task questions were classified into four categories: correct, incorrect, uncertain, or selective (i.e., partially correct answers). Figure 3 shows the frequency of response types for Task 1 across all homepages and Figure 4 for Task 2.

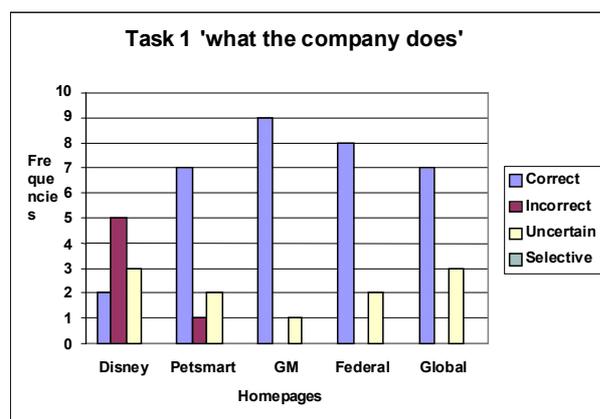


Figure 3. Frequency of responses for Task 1

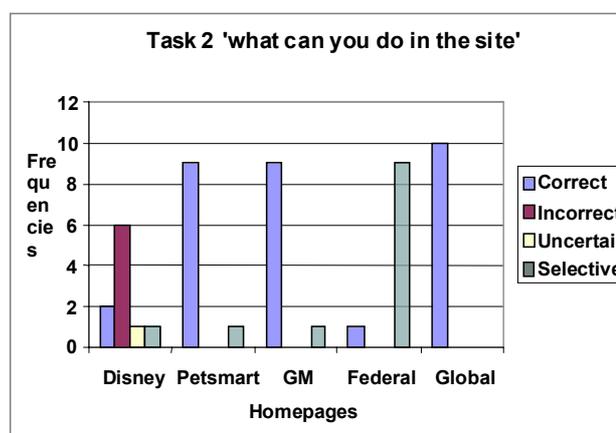


Figure 4. Frequency of responses for Task 2

The GM homepage gathered the highest proportion of correct responses in both task questions, i.e., the site best enabled users to identify what the company does and what can be done within the site. The Disney and Petsmart homepages were the only homepages to evoke incorrect answers.

### Pre-test Questionnaire and Post-session Interview

Based on the completed background questionnaires, we investigated the web sites the participants visited regularly. All placed the logo and name of the company on the top of the homepage, either the top left corner or top middle. This placement corresponds to the ‘entry point’ fixations recorded for the participants.

The participants’ self-reports of where they looked first on each homepage were compared to the ‘entry point’ data. Users were uniformly accurate in their reports. They knew where they looked first.

The participants' comments about design layout were subjected to inductive analysis. Emergent topics, and the design characteristics users associated with them, are summarized in Table 2.

| <b>Emergent topics</b>                          | <b>Associated design characteristics</b>   |
|---|--|
| Annoying/frustrating design elements            | Too much text<br>Product Images<br>Adverts<br>Introduction page<br>Pop up windows<br>Small fonts   |
| General preferred design elements               | Simple/clear links<br>Images<br>Sub links<br>Less text<br>Company's contact details<br>Short description under bold titles<br>'About the company' link<br>Clear structure<br>Easy access to products |
| Expectations of homepages                       | The name of the company/logo<br>Links of the rest of the site<br>The company info<br>Large fonts of company name<br>Title of page<br>Generic information<br>Navigation tool<br>Keywords/phrases      |
| Perceived position of 'entry point'             | Top of the page top middle or top left corner<br>Left side of the page   |
| Perceived first design element to look for      | A peripheral look to confirm it is the site aimed for<br>The name of the company<br>Links to the rest of the sites   |
| Perceived factors that influence first fixation | Information presented on paper documents<br>Natural way of reading<br>Combination of previous experience and cultural aspects<br>Visiting other web sites  |

*Table 2. Post-session responses*

## Existing Design Guidelines and Eye Tracking Study

The main aim of the reported study was to re-examine the existing homepage design guidelines using an alternative, user-centered evaluation technique: eye tracking.

This eye tracking study confirmed the general guideline in Nielsen and Tahir (2002) which is to ‘place important information at the top of the page’. All ‘entry point’ fixations were at the top left or top middle of the homepage. However, this study’s data contrasted with guidelines in Nielsen and Tahir (2002) specific to particular homepages, suggesting refinements.

### *Banner Advertisements*

In the homepage study conducted by Nielsen and Tahir (2002) it is suggested that “*users tend to ignore anything that looks like a banner ad so it is a poor way of promoting site elements*” (p. 125). This study suggests that whether or not a banner ad will be ignored depends on its position and presentation format. For example, the banner on top of Disney page was mistaken for the name of the company, due to its position and size. The ‘entry points’, task responses, and self-reports all confirm this confusion.

### *Product Images*

It is suggested in Nielsen and Tahir (2002) that “*petsmart’s biggest strength is that it shows examples of the products and content offered on the site*” (p. 241). This study suggests that individual dislike for images on homepages may conflict with the images’ advantages in ‘drawing the eye’. All participants fixed on product images, even those who disliked and claimed to ignore them. However, those who disliked the use of product images gave less accurate responses about brand and services. Although this requires further investigation, the use of product images on the homepage could be an obstacle in search efficiency for those who dislike them.

### *Design Layout*

It is argued in Nielsen and Tahir (2002) that designers should use ‘liquid layout’ that allows users to adjust the homepage size. For example, the Federal homepage, using a ‘liquid layout’ that filled the screen, was described ‘*as well defined and easily recognisable*’ (p. 161), whereas the GM homepage, which had a fixed size and did not fill the (1280 by 1024 pixels) display, was described ‘*as one that doesn’t make clear whom it is trying to serve or what users can do*’ (p. 185). However, completeness of inspection and accuracy of brand and service identification in this study ran contrary to the guideline. Users inspected the fixed-size GM homepage fully, whereas their inspection of the full-screen Federal homepage was incomplete, reaching only half way through the homepage. Further, there were more correct task responses for the GM homepage than for the Federal homepage.

## Conclusions

The homepage eye tracking study offers additional data and insights for the design of homepages that complement the guidelines suggested by Nielsen and Tahir (2002). The detailed eye movement information gave insights about which design elements attracted attention and where on the homepage users expected to find specific information about brand identity and website services. The eye movement data confirmed one general guideline, and led to potential refinements of three specific guidelines. Overall, eye tracking, in the homepage study, has proved to be promising to further develop guidelines and for checking whether the guidelines are relevant or not.

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