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Giovanni C. Porzio
Francesca Greselin
Simona Balzano
Editors



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EVALUATION OF THE WEB USABILITY OF THE UNIVERSITY OF CAGLIARI PORTAL: AN EYE TRACKING STUDY

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ABSTRACT: A web portal is one of the main tools used by companies, institutions and individual citizens to make information available to anyone. Designing a portal that has good usability means allowing an average user to find the information he needs as soon as possible. The objective of this work is to evaluate the web usability of the portal of the University of Cagliari, using the eye tracking technology. High school and university students were asked to perform specific tasks within the portal. The results were evaluated through a quantitative analysis of the time and number of fixations required to complete each task, as well as a qualitative analysis of heat maps and gaze plots representing participants' fixations. The analysis has allowed to (i) detect a high efficiency for most of the web pages, (ii) highlight the most critical elements of the portal and (iii) suggest the most appropriate changes to be made.

KEYWORDS: eye tracking, web usability, heat map, gaze plot.

1 Introduction

Nowadays a web portal is one of the main tools used by companies, institutions and individual citizens to make useful information available to anyone. Designing a portal that has good or excellent usability means allowing an average user to find the information he/she needs as soon as possible. In order to assess whether the interface of a web portal is intuitive and easy to use, most studies use a measure defined as web usability, which is often evaluated exclusively through the administration of questionnaires to users. The use of the eye tracking technology allows to define web usability in a more objective way through the analysis of ocular movements during visualization of images, texts or other visual stimuli (Jacob & Karnet, 2003; Goldberg & Kotval, 1999). The eye tracking technology has been increasingly applied to the study of web usability in different fields such as tourism (Scott et al., 2017) and e-commerce (Bach, 2018; Hwang & Lee, 2017).

The main objective of this study is to evaluate the web usability of the web portal of the University of Cagliari (www.unica.it) using eye tracking technology, in order to improve the user experience, including the experience of future students using the site for the first time. The new portal of the University of Cagliari was launched in 2017 and has been the first portal of an Italian university to meet the requirements of the Agenzia Italiana digitale del Consiglio dei ministri (Agid).

2 Materials and methods

We carried out a study to assess the efficiency of the web portal of the University of Cagliari through the execution of ten different tasks (e.g. find the library section, WiFi instructions, deadline for enrolment, university fee regulations and so on). The tasks were executed by two groups of participants: high school students and university students. Objective of the analysis was to collect information about the behavior of a group of experienced users (students already enrolled in the University) as well as of non-experienced users (high school students). In light of the exploratory nature of the study, for the first group we randomly selected a group of students present in group study rooms of different departments (choosing different days of the week and different times). For the second group we randomly selected students from Sardinian high schools who attended the Unica University Fair. For each participant, we collected information on age, gender, high school institute and university course. These characteristics were compared between the two groups using chi-squared test or Student's *t* test.

Throughout the execution of the tasks, the exact position of the eyes has been detected through a Tobii X2-60 Compact eye tracker. Different eye movement classification algorithms can be used to identify various types of eye movements (Komogortsev et al., 2010). The fixation is the most commonly studied type of eye movement in human research since fixations are usually connected to the moment in which information are registered by the brain (van der Lans et al., 2011). Among available fixation classification algorithms, the Velocity-Threshold Identification (I-VT) algorithm classifies eye movements based on the velocity of the directional shifts of the eye (Salvucci and Goldberg, 2000). We applied this filter to extract fixations using the Tobii studio software version 3.3.1. Data for different metrics, including time to completion of the task and number of fixations for the whole page, as well as for specific areas of interest (AOI), were collected. These data were also used to produce two main typologies of graphical outputs: heat map (a graphical representation of the data where the individual values contained in a matrix are represented as colors) and gaze plot (a map showing gaze fixations on a webpage in the order in which they occur) (Dong et al., 2014). The tasks have been defined as efficient or not efficient. Specifically, relative efficiency in terms of different metrics (e.g. time to completion, number of fixations) has been assessed comparing each task to a threshold value established through evaluation of all the other tasks executed by the two groups of participants. The tasks defined as not efficient in both groups were further evaluated through a quantitative analysis of the main efficiency indicators as well as a qualitative analysis of heat maps and gaze plots representing participants' fixations. Analyses have been conducted using R v. 3.5.0 (R Core Team, 2018).

3 Results

Data for 100 participants (Group 1: 46 high school students and Group 2: 54 university students) were analyzed. The two groups did not differ in terms of gender

(chi-squared: $p = 0.45$) or high school institute (chi-squared: $p = 0.46$), while mean age was higher in the group of university students (t-test: $p < 0.001$).

The analysis allowed to detect a high efficiency for most of the evaluated pages. In particular, the tasks classified as efficient for both high school and university students allowed to highlight how the site is easily accessible even by those who have used it a few times. However, the tasks classified as less efficient in both groups allowed to highlight some aspects that might be improved. For instance, the quantitative analysis of the number of fixations in the different AOIs as well as the qualitative analysis of heat maps and gaze plots showed that the large majority of observations was focused on the upper part of a web page (Figure 1). Therefore, information that needs to be noticed by a large number of users should not be placed at the bottom of a page.

Moreover, we observed that in some cases the participants were not able to understand the meaning of specific links at first sight or failed to retrieve the information required to complete the task even after reaching the correct page.



Figure 1. Heat map (on the left) and gaze plot (on the right) of the Home Page of the web portal of the University of Cagliari

4 Conclusions

The objective of this work is to evaluate the web usability of the portal of the University of Cagliari, using the eye tracking technology. The analysis has allowed to (i) detect a high efficiency for most of the web pages examined, (ii) highlight the most critical elements of the portal and (iii) suggest the most appropriate changes to be made. The identified critical aspects would have been difficult to detect without the eye tracking, which allowed to highlight the areas of the pages that received the greatest number of fixations. These results could help to further improve the web usability of the University of Cagliari's website.

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