A Usability Study of a Research Institute Website with Eye-Tracking Devices

Sabine Wehnert[1,2] , Erasmo Purificato[1,2(✉)] , and Ernesto William De Luca[1,2]

[1] Otto von Guericke University Magdeburg, Magdeburg, Germany
{sabine.wehnert,erasmo.purificato,ernesto.deluca}@ovgu.de
[2] Leibniz Institute for Educational Media, Georg Eckert Institute, Braunschweig, Germany
{sabine.wehnert,erasmo.purificato,deluca}@gei.de

Abstract. In this paper, we present the results of our study conducted at the Leibniz Institute for Educational Media | Georg Eckert Institute to assess the usability of the institute's website before the re-design of the same and the subsequent development of the new version. In particular, four specific pages are evaluated, i.e. *Home*, *Institute*, *Departments* and *Publications*. The aim of the presented usability studies is to uncover positive and negative usability findings in order to properly plan the potential corrective actions for the upcoming restyling. The experimental outcomes are displayed in form of aggregated heat maps and mainly focus on the ease of use of the different analysed sections.

Keywords: Usability · Human-Centred Design · Eye Tracking

1 Introduction

The Leibniz Institute for Educational Media | Georg Eckert Institute (from now on "GEI" or simply "the institute"), member of the Leibniz Association and sited in Brunswick, Germany, conducts international, application-oriented and multidisciplinary research into educational media, focusing on approaches drawn from cultural and human-centred studies.

To improve the overall user experience of its tools and websites, the institute initiated a series of actions to this end. One of the measures taken is the re-designing of the GEI website, taking into account user experience (UX) and usability aspects, which are often overlooked. For this, the version of the website in place in June 2022 has been assessed via multiple usability studies in order to derive positive and negative findings for guiding the future design process, which was completed in August 2022, when the new version of the GEI website[1] was released.

In this work, we describe the conducted usability studies for the main website's sections, namely the *Home* page, the *Institute* section, the *Departments* section

---

[1] https://www.gei.de/en/.

and the *Publications* page. In particular, four different in-lab usability tests were carried out. All the tests shared a standard structure: a briefing and pre-session interview questions, followed by the actual usability test tasks and ended with post-session interview questions. The participants in the tests made use of screen-based eye-tracking devices, i.e. Tobii Pro Nano[2]. The tasks were designed considering specific usability goals [2], including intuitive design, ease of use, ease of learning and subjective satisfaction. Both quantitative and qualitative evaluation approaches [4] have been used. For the former, success rate and time to task completion were employed. In contrast, gaze plots, heat maps, recorded pathways and answers to pre- and post-session interview questions were considered for the latter.

In this paper, we specifically present the usability findings derived from the qualitative analysis of heat maps and gaze plots. The methods shared in our paper and the insights gained from the analysed results can serve as a basis within the HCI community for future similar usability studies.

In the following, we will first describe the analysed sections of the institute's website (Sect. 2), and then we carefully explain the performed usability tests and the resulting findings (Sect. 3).

2   The Analysed GEI Website

In this section, we briefly introduce the main sections of the GEI website, which are subjects to the usability evaluation, in view of the re-design of the entire

Fig. 1. GEI website - *Home* page (before the re-design)

---

[2] https://www.tobii.com/products/eyetrackers/screen-based/tobii-pro-nano.

website. In particular, the usability studies presented in this paper consider the four main pages (i.e. *Home*, *Institute*, *Departments* and *Publications*) from the latest version of the institute's website before the release, which was in place until August 2022.

The *Home* page (Fig. 1) displays in its central part the latest and/or most important news concerning the institute's activities. Links to all the other sections of the website are present.
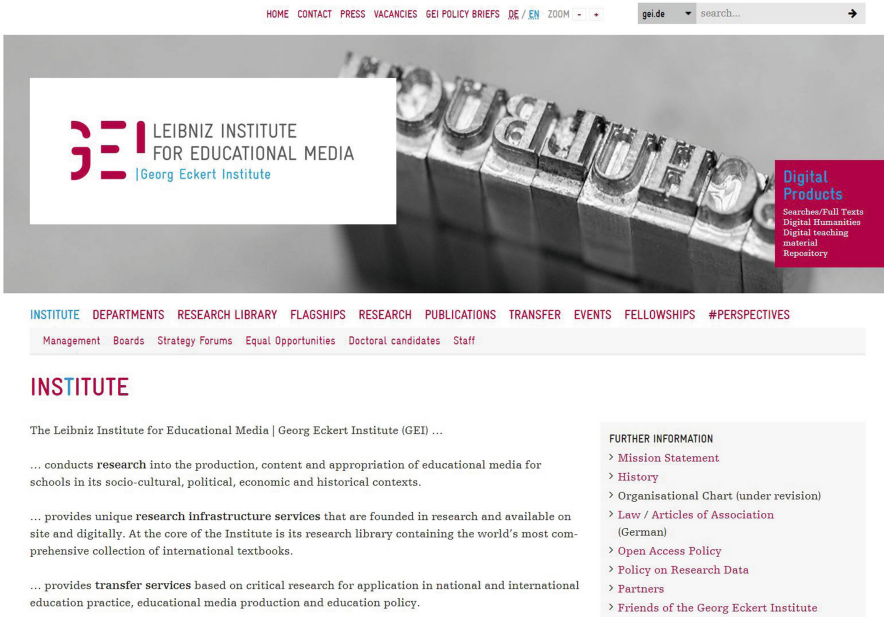

Fig. 2. GEI website - *Institute* page (before the re-design)

The *Institute* page (Fig. 2) displays all the information about the history, objectives and mission of the GEI. It also provides references to the institute's board and academic partners.

The *Departments* page acts mainly as a container for the individual pages of all the institute's departments. Every department page (such as the example in Fig. 3 displaying the department "Digital Information and Research Infrastructures") includes the description of the department and the list of its members in their own different roles.

Fig. 3. GEI website - *Departments* page (before the re-design)
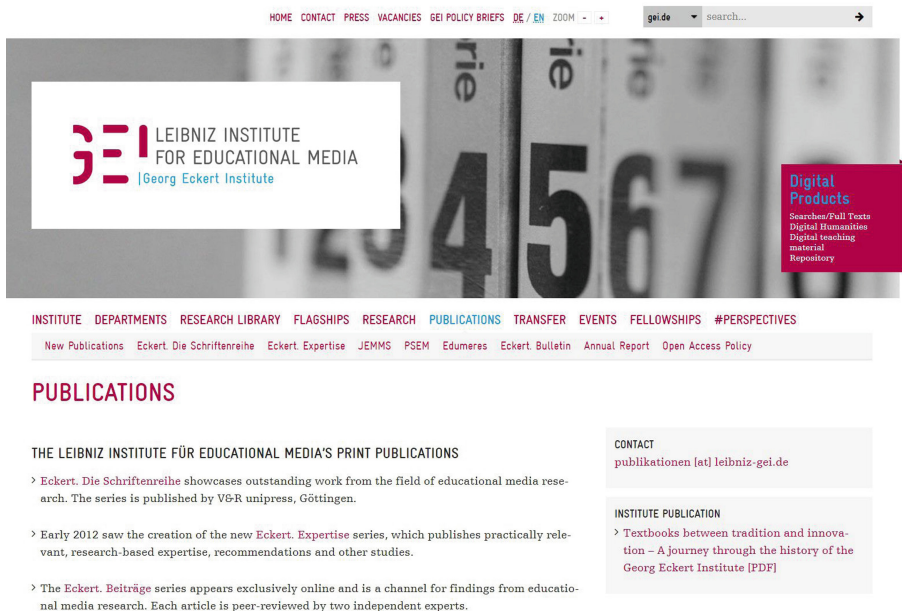
Fig. 4. GEI website - *Publications* page (before the re-design)

In the *Publications* page (Fig. 4), the articles published by the institute's members are listed and grouped by topic or associated project.

3   Usability Study

In this section, we describe the design of the usability tests which were carried out to evaluate the GEI website and discuss the related findings. For each page evaluated, we first describe the task that the participants are asked to solve, and then we report the results (in terms of either *heat maps* or *gaze plots*) from which the final conclusions are drawn.

Heat Maps: A *heat map* is a graphical representation of the user's mouse or eye movement (as in our usability studies) when using a product or service. Heat maps are helpful indicators of what grabs a user's attention, where the users are spending their time, and how much time is being spent on which areas [1,3]. Long dwelling times visualised as the "hotter" areas in a heat map therefore indicate attention, be it positive (e.g., appealing user interface elements) or negative (e.g., confusion). If in doubt, qualitative information - gathered from user surveys or
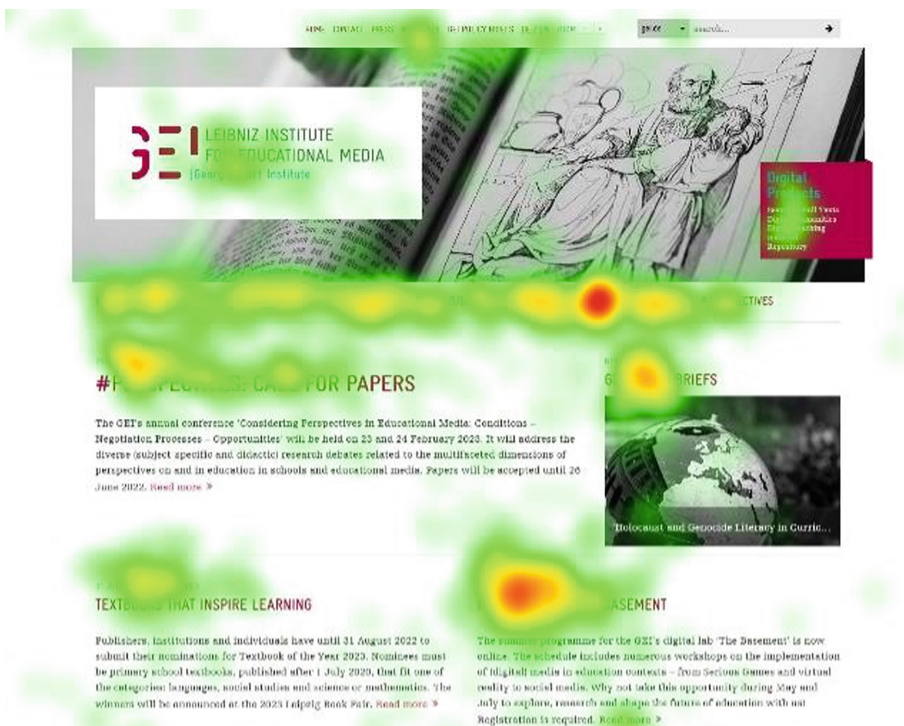
Fig. 5. Aggregate heat map of the usability tests of the *Home* page.

contextual interviews - offers evidence to interpret long dwelling times. Overall, heat maps can help determine which aspects of digital tools need to be improved.

Gaze Plots: Besides heat maps, gaze plots are another graphical representation of eye-tracking study results. When participants look at a specific location, the area they are looking at is marked by a circle. The longer the area is fixated, the bigger the circle is visualised. In the end, a series of numbered circles illustrate the movements of the eye. Thereby, different colours represent the eye movement of different participants. Between the circles, the eye's focus transitions to another location. This jump is called a *saccade*. During saccades, humans cannot see, but because these eye movements are very fast, humans are not aware of them.

3.1 *Home* Page

For the usability analysis of the *Home* page, the task assigned to the test participants is the following: "Find and read the most recent events of the institute". The heat map in Fig. 5 displays how the users are supposed to focus on the term "*events*" on the screen, but they overall look all around the page focusing all section headings, meaning that the layout is not straightforward and not very intuitive in presenting the latest and most important events at the GEI.

3.2 *Institute* Page

In testing the *Institute* page, the participants are required to locate the Mexican partner of the GEI. All users successfully completed the task, and the resulting heat map in Fig. 6 clearly shows the ease of use of the page, considering the unequivocal path followed by the testers to reach the correct item.

3.3 *Departments Page*

In this test, we ask the participants to visit the Research Library to borrow a book. In particular, they would have to check the address, opening hours and Covid-19 protocols for the visit[3] and note the book lending procedure. Only 25% of the testers were able to find out the Research Library regulations.

---

[3] The usability study was conducted in Spring 2022 when measures against Covid-19 were still in place.

Fig. 6. Aggregate heat map of the usability tests of the *Institute* page.

As shown in the heat map in Fig. 7, many participants missed the hyperlink to "Library Use". This is probably due to the unclear flow of information on the specific page and a poor intuitive design since the "Library Use" points to both "Library Regulations" and "Covid-19 Regulations".

3.4 *Publications* Page

On the *Publications* page, as the usability test task provided, the participants should reach the *Journal on Educational Media, Memory and Society* (JEMMS) section and search for the publication on "Holocaust" by Basabi Khan Banerjee and Georg Stöber. Due to previously known difficulties in locating the search

Fig. 7. Aggregate heat map of the usability tests of the *Departments* page.

bar of the web page, the users are also asked not to use the search functionality. The task was completed by 90% of the testers, but as shown in the heat map in Fig. 8, they went through the whole page before finding the correct links to get closer to the target. The main finding of this experiment is that it is paramount to make the search bar clearly visible on every page where a list of items or resources is displayed in order to improve ease of use and subjective satisfaction. In addition, filtering criteria to narrow down the topic can be considered.

Fig. 8. Aggregate heat map of the usability tests of the *Publications* page.

4 Conclusion

In this paper, we presented the main results of the studies carried out at the Leibniz Institute for Educational Media | Georg Eckert Institute to analyse the usability of the institute's website in view of the launch of a new version of the same. In particular, four specific sections were evaluated, namely *Home*, *Institute*, *Departments* and *Publications* pages, to discover positive and negative usability findings for planning the potential corrective actions for the novel restyling in progress. The experimental outcomes are displayed in form of aggregated heat maps and mainly show several issues concerning the ease of use of the different analysed sections.

References

1. Hirzle, T., Sauter, M., Wagner, T., Hummel, S., Rukzio, E., Huckauf, A.: Attention of many observers visualized by eye movements. In: Shic, F., et al. (eds.) ETRA 2022: Symposium on Eye Tracking Research and Applications, Seattle, WA, USA, 8–11 June 2022, pp. 65:1–65:7. ACM (2022). https://doi.org/10.1145/3517031.3529235
2. Jeng, J.: Usability assessment of academic digital libraries: effectiveness, efficiency, satisfaction, and learnability (2005)
3. Lamberti, F., Paravati, G., Gatteschi, V., Cannavò, A.: Supporting web analytics by aggregating user interaction data from heterogeneous devices using viewport-DOM-based heat maps. IEEE Trans. Ind. Inform. **13**(4), 1989–1999 (2017). https://doi.org/10.1109/TII.2017.2658663
4. Roy, S., Pattnaik, P.K., Mall, R.: A quantitative approach to evaluate usability of academic websites based on human perception. Egypt. Inform. J. **15**(3), 159–167 (2014)