

# Eye-Tracking

NUMBER OF PARTICIPANTS	FACILITATORS	CATEGORY	DURATION	LEVEL OF DIFFICULTY
1 User 1 Product Owner	1 Moderator, 1 Usability Engineer	Test Phase	Depends on the product's complexity	Moderate

## Description

Eye-Tracking is a usability method that is used to track movements of a user's eyes while browsing a given application. Both the pupils of the user and also their position on the screen are measured by the eye-tracker to get knowledge about the user's visual attention (Manhartsberger, Zellhofer, 2005).

Eye-tracking is used to test applications by getting an objective insight of the user's mind while he/she uses the given application.

The given application could be a web page, a mobile app or any other form of things that can be observed by human eyes, in this particular context we focus on software and other computer applications. It is important to simulate the real-life usability context and to follow each step a user would go through, achieving a specific goal using the application. When the eye-tracking process is finished the usability-engineer needs to analyze the results and adapt the application according to the results.

The main goal is to achieve a high level of software ergonomics by testing strengths and weaknesses of the given application. Users should have it as easy as possible finding things or executing certain tasks. The focus lies on increasing the ease of use and usefulness which means an increase in usability.

## Materials

- ▶ Computer, Monitor
- ▶ Eye-tracking sensor/device
- ▶ VR Headset

## Preparation

Configuration of the test system. Start the computer and make sure there is a quiet and comfortable environment. Make sure that all technical devices work as expected.

## Step-by-Step Instructions

1. Discuss with the Client what are the most important aspects to achieve, regarding the application that is tested. In addition, the target segments of users should be discussed so the usability lab can invite the users that are addressed by the application (It is the user who decides on the success of your products, n.d.).
2. The user needs to be placed into the right position in front of the eye-tracking setup. Users should maintain in that position over the whole duration of the testing scenario so that their posture needs to be comfortable (How to position the participant and the eye tracker, 2015). Also, the user needs to sit in the right angle so the eye-tracking sensors can be calibrated and used properly. The calibration phase takes approximately 10-30 seconds, though it depends which device is being used (Manhartsberger, Zellhofer, 2005). The facilitator should study and follow the user manual of the used device to know, what are the right calibration steps for a particular device.
3. Give the user tasks that need to be executed in a real-life scenario for example purchasing a product on an e-commerce platform. The tasks that will be executed need to be clear and understandable so there is no delay or misconception throughout the usability test.
4. Start the eye-tracking process and support the user if questions arise.
5. While executing the tasks, the user should provide information about his/her mental model for example through the usability method "thinking aloud" (Manhartsberger, Zellhofer, 2005). With those information usability engineers can rethink the given application from the users perspective.
6. Observe the Data Visualization and Metrics: There are different methods for visualization of eye-movement. Mostly they are qualitative methods except Heat maps/Hot spots.
  1. First there is live-video observation where the facilitator can watch the live movement of a user's eyes. This method shows the gaze in real time and there can be a direct reaction or question by the facilitator(usability engineer), and/or the product owner. (Manhartsberger, Zellhofer, 2005). There will be a video recorded also of the testing scenario so that there can be further evaluation after the test, too.
  2. Then there is the method Scan Path/Gaze Plot that shows in which order the user watched at different positions of the screen. Also, the amount of time in which the gaze stayed on an object is shown here. It is important to know that this method is not live but providing a snapshot from a test because the gaze plot gets messy after a while and will be hard to read (Manhartsberger, Zellhofer, 2005). Dynamic replays of a snapshot suite best for this technique.
  3. Heat maps or Hot Spots show results of tests of many users combined. It is possible to see where on the screen the majority of people looked at and which areas weren't that interesting for a tested control group

(Manhartsberger, Zellhofer, 2005). It is important that heat maps are a quantitative instrument and it is necessary to have a control group of many people.

4. Area of interest: Eye-tracking data like number of fixations, fixation duration and others are conducted to specific areas like menus or pictures on a website or a login window. Each of those areas is an area of interest. (Manhartsberger, Zellhofer, 2005). Each area of interest has a different data like duration per view or view count.

7. Evaluate the different visualizations of the eye-movement. At this point it is important to understand the eye-movements that are tracked to get the right interpretation on how the user felt during the usability test. It needs to be understood where the user had problems to continue, for example within the purchasing process, or other difficulties that could harm the ease of use of the given application.

Live Video/Recorded Video: What are the facial expressions? Movement of eyes and head. Scan paths/gaze plots: Which texts were read by users the most? And how did they read them (more than once etc.)? Which text where unnecessary and maybe distracted the user from his/her tasks?

Areas of interest: Which are the most important areas of interest? How long and how often people viewed on certain areas? How is the order of the website and how should it be? Heat maps/Hot spots: Where are the hottest spots on the website what did people interest the most? All these questions need to be addressed by the usability engineer. Another very important point is that the product owner and the usability engineer should discuss which visualization method suites the specific context best so that the evaluation and interpretation are achieving the expected success.

8. Improvement: Analyze what could be changed to give the user a better user experience and to make processes more usable. That could be for example a different order of objects/items on the pages that are tested. Use the result from the eye-tracking test. What could be done better? Adjust the application to the discussed changes and execute another usability test with eye-tracking to check if the changes are successful. Repeat this process until a continuous improvement is seen that satisfies the product owner.

## Remarks, Tips, Limitations

- ▶ Take a user's point of view and try to understand which things are most important
- ▶ Understand the user's mental model by asking questions and support the user while testing the application. Communication is very important in this context.
- ▶ Try to make users comfortable during the whole test as people behave differently in stressing situations like tests.
- ▶ A limitation is that Eye-tracking only tracks the eyes and sometimes the facial expressions, there is no focus on hearing or haptics

**Strengths:** User-centered problem analysis, which can show deeply rooted design problems.

**Weaknesses:** Needs a lot of expensive technological equipment.

## References

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