Usability in E-Commerce Websites: Results of Eye Tracking Evaluations

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***Abstract*—**Usability is one of the most important quality attributes for web-based information systems. Specifically, for e-commerce applications, usability becomes more prominent. In this study, we aimed to explore the features that experienced users seek in e-commerce applications. We used eye tracking method in evaluations. Eye movement data are obtained from the eye-tracking method and analyzed based on task completion time, number of fixations, as well as heat map and gaze plot measures. The results of the analysis show that the eye movements of participants' are too static in certain areas and their areas of interest are scattered in many different places. It has been determined that this causes users to fail to complete their transactions. According to the findings, we outlined the issues to improve the usability of e-commerce websites. Then we propose solutions to identify the issues. In this way, it is expected that e-commerce sites will be developed which will make experienced users more satisfied.

***Keywords*—**E-commerce websites, eye tracking method, usability, website evaluations.

I. Introduction

USABILITY has gained great importance in software systems with the development of information technology. Usability is defined by the International Standards Organization (ISO) in the ISO 9241-11 standard as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" [1], [2]. Users want to complete tasks quickly, easily, and successfully. Therefore, while software systems are being developed, it is aimed to meet these expectations of users by creating user-oriented design. If the users' expectations are not taken into account and if an easy-to-use and understandable interface is not provided, the system will not be adopted by the users [3].

Eye tracking method is widely used to evaluate the usability of software systems. This method provides data for understanding users' focus points in the software systems. It collects eye movements data when users using a system with eye-tracking device. Collected eye movements are analyzed based on fixation and saccade-based measures [4], [5]. After the analysis process, user's visual behaviors are determined. In this way, the strengths and weaknesses of the design features are revealed.

In this study, it is aimed to reveal which usability features should be provided in e-commerce websites for experienced users. In order to achieve this, usability problems in e-commerce websites are identified by using eye tracking method. After the usability issues of e-commerce sites were identified, various design recommendations have been made in order to avoid these problems in the future website design.

The rest of the paper is organized as follows. In Section II, we described the previous work related to eye tracking. The methodology of this research is explained in Section III. In Section IV, we presented the results obtained from the evaluation. The discussions of the results are shown in Section V. Finally, general conclusions obtained from this study are presented in Section VI.

II. Related Work

Eye tracking method is applied in usability evaluations in the analysis of eye movements that users make while using a system. Several studies have used eye tracking for usability analysis. Therefore, there are various studies in the literature for evaluating e-commerce sites using eye tracking method. In [6], heuristic evaluation and usability testing were used to evaluate the impact of usability and social and trust elements on four e-commerce websites. For usability testing, eye tracking was used to determine the impact of social presence in one e-commerce website. After evaluating the websites using two methods, they discussed the importance of usability and design elements, such as Gestalt principles, Fitts' Law, heuristics, and social networking. As a result of the discussion, they found that it is important to apply the Gestalt Principle, Fitts' Law and affordance across the e-commerce websites. Additionally, other principles such as trust, offline communication, and social presence need to be added in e-commerce websites.

In [7], eye tracking method was used to examine the eye movements of users as they interacted with the interface of e-commerce websites. In this way, they tried to obtain eye movement data as an indicator of the user's cognitive processes. In addition to the acquired eye movement data, expert inspections and user-based observations were also used in the usability evaluation. As a result of the study, they suggested a new usability evaluation method that combines all other usability evaluation methods.

The effects of user testing and heuristic evaluation methods have been compared to define usability problems of e-commerce websites in the study by [8], for determining the usability problems of e-commerce sites. As a result of the comparison, they determined that user tests are more effective in determining the basic usability problems of e-commerce sites. They found that the heuristic evaluation method was effective in finding problems that are not important.

In [9], a study was made to combine guidelines of web

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