


Using Eye Tracking to Measure Overall Usability of Online Grocery Shopping Websites

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ABSTRACT

This article examines usability evaluation methodologies, then presents a non-conscious behavioral indicator based on user eye movements and pupil dilation. The authors test how gender and online buying history affect the behavioral index's usability scores. This study uses three Iranian online food retailers. Thirty participants were asked to add things from predetermined grocery stores to virtual shopping carts before the experiment took them to the other two websites in a random order to collect eye movement data. Each group's presentation order was randomized. The number of fixations, number of saccades, total duration of fixations, scan-path length, pupil size, and task time were inversely linked with self-report usability measures. This research evaluates groups with different levels of online shopping expertise and gender based on experienced usability. Differences between groups suggest that user demographics affect usability.

KEYWORDS

Consumer Neuroscience, E-Commerce, Eye-Tracking, Neuromarketing, Online Shopping, Usability

1. INTRODUCTION

Shopping has become increasingly important as the internet has affected many other parts of people's daily lives all across the world. Electronic commerce websites like Amazon and eBay now do far more and on a much larger scale than traditional retail malls (Althafairi, Alhoumaida, Saxena, & Almsri, 2019; Cane & Parra, 2020). However, some circumstances, most notably the COVID-19 outbreak, have forced customers to use online buying sites even more frequently. (Villa & Monzón, 2021). B2C e-commerce enterprises have thrived in Iran and many other nations as a result (Malehmir, Maeen, & Jahangir, 2017). For example, according to Alexa.com, an Iranian e-commerce website called Digikala was the third most visited in Iran and the 140th most visited worldwide at the time this article was written (Analytics, 2019). Digikala.com's rapid development suggests that e-commerce is gaining traction in Iran. E-commerce sites are like massive shopping malls, attracting tens of thousands and

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in some cases, millions of customers each day. As a result, even the smallest changes to this massive store's layout can have a significant impact on sales.

Having said that, user-centered design is essential for e-commerce websites in the cut-throat business environment of today (Khosla, Damiani, & Grosky, 2003; Kramer, Noronha, & Vergo, 2000; Paknejad, Mosaddad, & Sadeghi Naeini, 2021; Sadeghi Naeini, Dalal, Mosaddad, & Karuppiah, 2018). To make sure they work effectively and efficiently, e-commerce websites should be regularly evaluated from different points of view. from their search engine optimization metrics (Hasan, Morris, & Proberts, 2009) to user interface design and usability (Sivaji, Downe, Mazlan, Soo, & Abdullah, 2011). One of the most important aspects of an e-commerce website is its usability (Sivaji et al., 2011), which has been of great concern to many researchers (Díaz, Rusu, & Collazos, 2017; Goh et al., 2013; Hasan et al., 2009; Singh, Malik, & Sarkar, 2016; Sivaji et al., 2011).

There are numerous explanations about what the term "usability" means (Bevan, 1995, 2008; Han, Yun, Kim, & Kwahk, 2000; Jokela, Iivari, Tornberg, & Electro, 2004; Jurek Kirakowski & Cierlik, 1998; Kwahk & Han, 2002; McNamara & Kirakowski, 2006; Thoma & Dodd, 2019). Nevertheless, the one suggested by ISO is presumably of more importance and has been recognized more widely. ISO 9241-11 (Jokela et al., 2004) defines usability 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." Han et al. in another established definition, delineate usability of consumer electronic products as "satisfying the users in terms of both the performance and the image and impression felt by them" (Han, Yun, Kwahk, & Hong, 2001).

According to the model proposed by ISO-9241, the usability of a system is comprised of three components:

- 1- *Effectiveness*, which is measured through the users' success rate in undertaking specified tasks using the system. In other words, the smaller the user mistake rate, the greater the effectiveness of the system under consideration.
- 2- *Efficiency* relates to the effort that a user should exert in order to complete a particular task using the system. This usability component is frequently measured using metrics such as Reaction Time, Task Completion Time, and Workload.
- 3- *Satisfaction*, Self-report assessments are often used to assess subjective and attitudinal components.

Besides these major components, usability models proposed by others suggest learnability (Constantine & Lockwood, 1999; Nielsen, 1994a; Preece et al., 1994; Scneiderman, 1992; Shackel, 2009) and memorability (Constantine & Lockwood, 1999; Nielsen, 1994a; Scneiderman, 1992; Shackel, 2009), safety (Roman, Ancker, Johnson, & Senathirajah, 2017), truthfulness (Ahuja, 2000; Atif, 2002), accessibility (Caldwell, Cooper, Reid, & Vanderheiden, 2008), universality (Seffah, Donyae, Kline, & Padda, 2006), and usefulness (Seffah et al., 2006) attributes of the systems should be taken in to account when evaluating their usability. Learnability is measured by the average time a target user needs to learn using a system (Scneiderman, 1992). Yet memorability is measured through time that they can retain the knowledge or skills they need for using the system (Shackel, 2009). Needless to say, a system may be easy to learn but arduous to memorize or vice versa.

The safety of a system is concerned with its security, fault tolerance, environmental friendliness, and curbing any kind of harm to users and their resources (Seffah et al., 2006). The term "*Truthfulness*" refers to the expectation that if the system is given the correct input, it will create and deliver accurate outcomes (Ahuja, 2000; Atif, 2002; Friedman, Khan Jr, & Howe, 2000). But it still is a valid factor in many other systems as well. *Accessibility* deals with the capability of the system to be used by users of any kind of disability (Billi et al., 2010; Petrie & Kheir, 2007). *Universality*, relates to the extent to which the system can be used by users of different languages and cultural backgrounds (Clemmensen, 2009; Cui, Wang, Pan, & Ni, 2020). And finally, *Usefulness* is concerned with addressing users' real needs in an appropriate way (Ishaq, Zin, Rosdi, Abid, & Ali, 2020; Snyder et al., 2021).

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