



Usability Testing of Waters Brand Promotion Website on University Students

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Keywords:

Usability Testing; Eye-Tracking; Areas of Interest (AOI); Dwell Time; Website Engagement

ABSTRACT

Usability testing plays a pivotal role in assessing user experience on websites, providing businesses with invaluable insights into customer perspectives. Eye-tracking, a widely accepted methodology, zeroes in on visual engagement by analyzing specific Areas of Interest (AOI). This study embarked on an exploration of the impact of AOI on dwell time for the latest iteration of the Waters website and further delineated the sections that captivated the most and least user attention. Adopting a quantitative stance, a two-way ANOVA was deployed on a sample comprising 15 master's students from two distinct academic institutions. Preliminary findings underscore significant disparities in dwell times across different AOIs, implying that specific AOIs retain user attention more robustly. Notably, the research has its constraints, encompassing potential deviations in webcam-based eye-tracking accuracy, the modest sample size, and post-hoc AOI categorization. As an extension, subsequent studies could probe the nuanced factors swaying dwell time within Waters' website AOIs, integrating methodologies such as the WSD technique and proactive AOI classification.

INTRODUCTION

In the contemporary digital milieu, websites function as instrumental conduits, fortifying business outreach and framing brand perceptions (Chaffey & Ellis-Chadwick, 2019). Indeed, a corporate web presence frequently serves as the inaugural touchpoint for potential customers, underscoring its integral role in shaping perceptions. Usability testing, as conceptualized by Ganiyu et al. (2017), emerges as an empirical means to gauge user experiences, delineating the success metrics of a website. Similarly, eye tracking, as elucidated by (Białowas & Szyszka, 2019), offers nuanced insights into users' visual trajectories, spotlighting areas of visual attraction and neglect. The AOI concept, central to such evaluations, demarcates the object's vicinities of interest and encapsulates associated fixations, potentially influencing research inferences (Orquin et al., 2016).

Waters, an established U.S.-based entity, has carved its niche across seven decades, boasting a global distributor network. Recent endeavours witnessed a website overhaul, aiming to elevate user

experiences and streamline product acquisition pathways. The current research endeavour seeks to critically evaluate the revamped website's usability, pivoting on the eye-tracking paradigm. This study embarked on an exploration of the impact of AOI on dwell time for the latest iteration of the Waters website and further delineated the sections that captivated the most and least user attention.

METHOD

Participant

A cohort of 15 respondents, representing a segment of the target demographic for the Waters website, participated in the study. Age distribution was as follows: 24-30 years: 5 participants, 31-35 years: 8 participants, 36-40 years: 2 participants. All participants were employed at the time of the study, ensuring a certain level of professional exposure.

Eye-Tracking Instrumentation and Procedure

The Waters brand promotion website underwent assessment employing the eye-tracking technique. GazeRecorder Tracker technology facilitated data collection. Participants underwent a red dot calibration procedure on the computer monitor, post which, they interacted with the website's advertising stimuli. The fundamental objective was to discern which website sections were most engaging. (Białowas & Szyszka, 2019) define eye-tracking as a methodology gauging, interpreting, and analyzing eyeball movement and position. Eye-tracking elucidates where a viewer's gaze fixates, the duration of said fixation, and the subsequent ocular trajectory (Bergstrom & Schall, 2014).

For any market research, data integrity is paramount. Eye-tracking offers data that is reliable; however, as (Carter & Luke, 2020) posits, reliability is futile without validity. An accurate study design and pertinent analysis ensure the eye-tracking data's validity.

Predominantly, eye-tracking research employs infrared remote eye-trackers. This modality captures participants' eye movements as they engage with on-screen stimuli, leveraging the infrared reflection to ascertain eyeball orientation (Vehlen et al., 2021). After calibration, participants navigated the website at their own pace, progressing via mouse clicks. Data metrics encompassed total page time, fixation length, and fixation count. Fixation length, delineating when one pauses to interpret content, holds significance as it demarcates cognitive processing periods.

Eye-Tracking Data Quality Indicators

Vehlen et al. (2021) classify three primary indices of eye-tracking data quality: robustness, precision, and accuracy. Robustness (or trackability) is the data percentage against the sample count for a period. Precision, indicating the average gaze point fluctuation, signifies data compactness, often articulated as standard deviation. Accuracy epitomizes the gaze measurement's veracity vis-a-vis the stimulus display target point.

Areas of Interest (AOI) Classification

Post-experiment, data required classification into predefined AOIs, demarcated in yellow. For this research, AOIs bifurcated into two categories: textual content only and a combination of text and imagery. Drawing from Figure 1, AOIs were differentiated based on their content. AOI 2 and AOI 3 encompassed both text and images, while AOI 1, AOI 4, AOI 5, AOI 6, and AOI 7 predominantly showcased textual content. Data gathering for this research spanned from the 18th to the 27th of October 2022. A fundamental component of this research entails the integration of heatmaps derived from participant data. Heatmaps render voluminous data sets comprehensible, particularly to individuals unfamiliar with intricate data analyses. In the current context, the heatmap uses a tri-color scale:

Green: Denotes areas where participants briefly focused their gaze.

Yellow: Represents sections drawing prolonged attention compared to other areas.

Red: Highlights the regions capturing the maximum duration of participants' engagement, signifying utmost interest or potential areas of confusion.

Such colour-coded visual representations enable rapid insights into user behaviour, pinpointing areas of heightened user activity or potential bottlenecks (Othman et al., 2020).

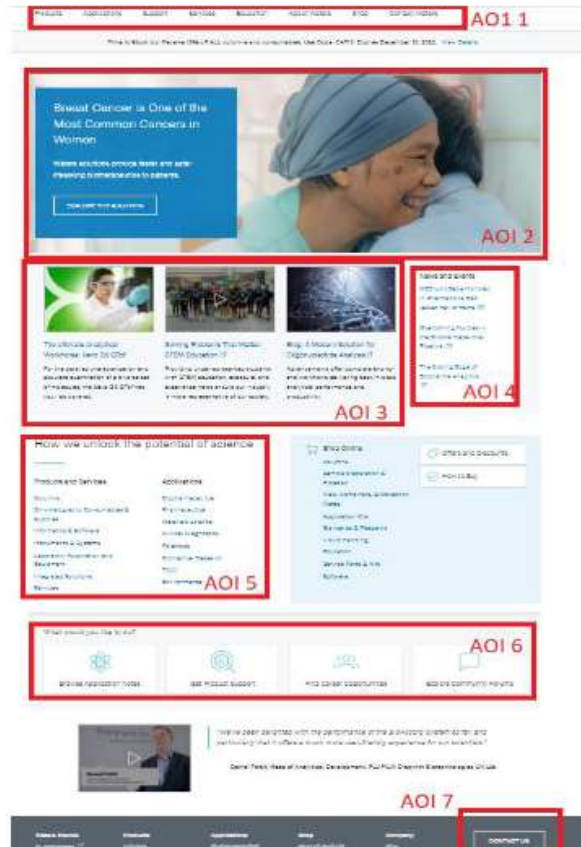


Fig. 1 Several Areas of Interest (AOI) in Waters website (October, 2022)

Two-Way ANOVA Test

The Analysis of Variance (ANOVA) stands as a robust statistical tool to decipher differences among group means. In this study, a two-way ANOVA was executed utilizing the GraphPad Prism software to gauge if discernable discrepancies emerged in the data acquired for varied AOIs or the advertisement as a whole.

At its core, ANOVA operates on the principle of dissecting the variability observed within the collected data. Specifically, it examines the source of variance, determining if such differences can be ascribed to random error or genuine differences among the means (Kutner et al., 1983). When addressing the term "two-way," it references the examination of the effects of two distinct categorical independent variables simultaneously.

To ensure the validity of an ANOVA test, researchers must adhere to a set of foundational assumptions: **Normality:** Every population from which samples are drawn must adhere to a normal distribution. This assumption implies that the distribution of the dependent variable, for every combination of the groups of the two independent variables, should be approximately normal (Field, 2013).

Independence: Samples must be selected at random and must remain independent. This entails that the data for any given subject doesn't depend on the data of any other participant.

Homogeneity of Variance: This postulates that the variances among the different groups should be roughly equivalent. If substantial differences in variances emerge, it may distort the results of the ANOVA (Levine et al., 2009).

Adherence to these assumptions ensures that the results derived from the ANOVA are accurate and trustworthy.

RESULTS AND DISCUSSION

Eye tracking provides an objective measure to evaluate how users interact with a digital platform, shedding light on aspects such as visual attention, engagement, and information processing (Bojko, 2013). For this study, the GazeRecorder was employed to monitor and record the dwell time – the duration a user spends focused on a particular content segment – on Waters' website (<https://www.waters.com/>). Data from a total of 15 participants was collected and analyzed, capturing dwell times across seven distinct Areas of Interest (AOIs). The aim was to discern any significant disparities in dwell times across these AOIs, and more importantly, between AOIs that incorporated text alone versus those that combined both text and imagery.

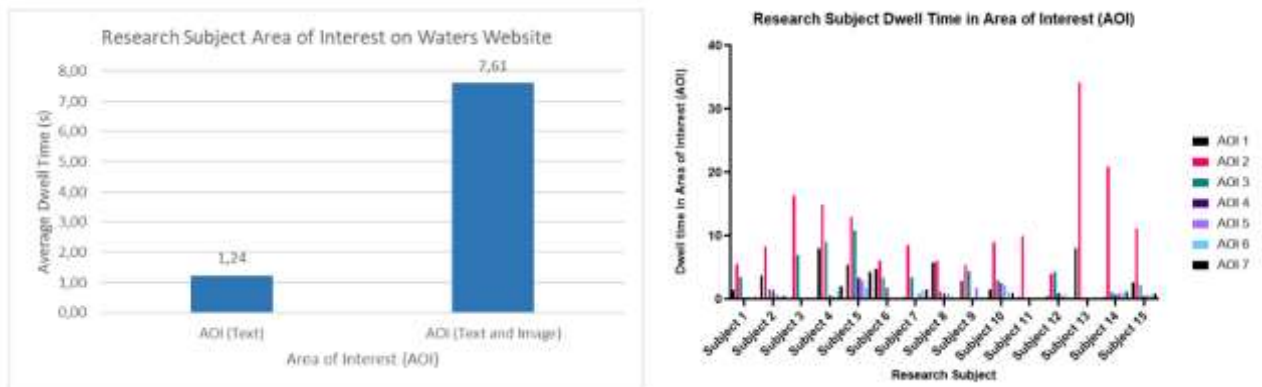


Fig. 2 Average dwell time from AOI that contains text and images

Fig. 2 visually represents the mean dwell time across the two main AOI categories. Insights drawn from this figure depict that participant, on average, allocated a greater amount of their attention to AOIs that encompassed both text and images, with a mean dwell time of 7.61 seconds. Conversely, the AOIs displaying text solely amassed a considerably shorter average dwell time of 1.24 seconds.

Table 1
Total research subject and Area of Interest (AOI) variation

Source of Variation	% of total variation	P Value
Research Subject	8.916	0.1368
Area of Interest	54.93	<0.0001

Table 2
The two-way ANOVA result for research subject and area of interest

Anova Table	SS (Type III)	DF	MS	F(DFn, DFd)	P Value
Research Subject	227.7	14	16.26	F(14,82) = 1.480	0.1368
Area of Interest	1403	6	233.8	F(6,84) = 21.27	0.0001

Residual	923.4	84	10.99
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SS = Sum of Squares, DF = Degree of Freedom, MS = Mean Squares.

Consulting Tables 1 and 2, a detailed breakdown of dwell times is provided. From the statistical analysis, it's evident that dwell time variations across participants didn't exhibit a significant difference, $F(14, 28) = 1.48$, $p = 0.1368$, accounting for only 8.916% of the variance. However, when focusing on the variations across the AOIs, a highly significant difference emerged, $F(6, 84) = 21.27$, $p < 0.0001$, accounting for a substantial 54.93% of the variance. The residual error, represented by the mean square, stands at 10.99. The implications of these findings underscore the salient role visual components (like images) play in engaging users on a website. Holmqvist et al. (2011) postulated that the human visual system is inherently attracted to multi-modal content, validating the observations from this study.

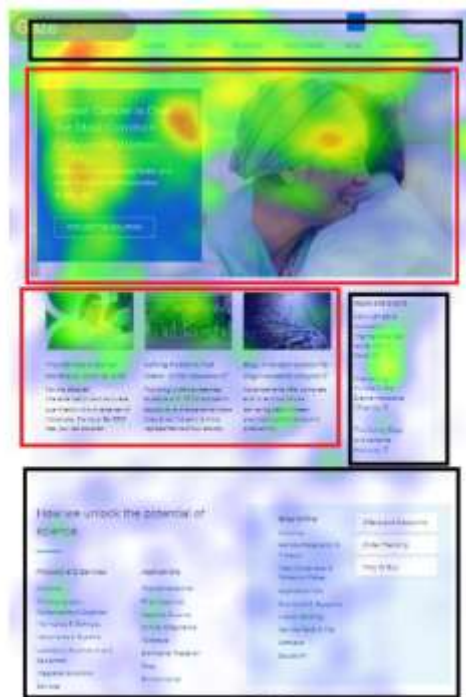


Fig. 3 Heatmap distribution on the Waters website (October 2022). Red squares indicate the combination of visual and textual information. Meanwhile, black squares indicate the textual information

Eye-tracking methodologies serve as a potent tool in deciphering user engagement and attention on digital platforms. As corroborated by Wang et al. (2020), a blend of visual and textual content significantly impacts user perceptions. Further affirming this, the human brain's innate propensity to process visual data swiftly over textual data (Farhana et al., 2016) was evident in this study, as participants allocated more dwell time to AOIs integrating both visual and textual content. Although there was a discernible uniformity in dwell time across participants, the disparities across various AOIs were significant. This points to the content's influence within these AOIs rather than intrinsic participant differences affecting dwell time. As pointed out by Punde et al. (2017), such insights can provide invaluable feedback in finetuning visual marketing strategies.

Future research endeavours might benefit from an enhanced categorization of AOIs, focusing on various elements such as colour schemes, spatial orientation, and information hierarchy. Furthermore, a segmented analysis based on demographic attributes like age could yield nuanced insights, especially when considering variations in colour perception (Wu et al., 2020). Future studies might also contemplate deploying the Weighted Sum Duration (WSD) method, as proposed by Rim et al. (2021),

to foster a balance between reducing AOI subjectivity and retaining interpretability.

CONCLUSIONS

In summary, while participants exhibited no significant difference in dwell time, AOIs packed with a synergy of visuals and text captivated their attention longer. Further research deploying the ANOVA analysis and other refined methodologies could offer deeper insights. This study's findings, while promising, do harbour certain limitations. The Gaze Recorder, coupled with the eye-tracking website application, encountered data loss and inaccuracies, potentially attributed to webcam imperfections and user-centric issues. These discrepancies underscore the need for advanced eye-tracking tools offering greater accuracy and reliability. Future research avenues might include a qualitative dimension, delving into reasons behind participants' behaviour – like site abandonment at specific areas, ease of navigation, or the comprehensiveness of the website content. Introducing pre-study categorizations for AOIs, increasing the participant pool, and incorporating multiple eye-tracking sessions could also enhance the robustness and generalizability of the findings

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