
Using Eye Tracking to Identify Cultural Differences in Information Seeking Behavior

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Abstract

The main goal of this research is to investigate how people with different cultural background differ in their interaction style and visual behavior on search engine results pages (SERP), more specifically between groups from the Middle Eastern region vs. Western Europe. The researchers conducted a controlled eye-tracking experiment to explore and evaluate the visual behavior of Arab (U.A.E) and Spaniard users when scanning through the first page of the search results in Google. Significant differences were observed in the 4 aspects of the study: U.A.E. participants stayed longer on the SERPs, read more search results and viewed each snippet in a more detailed way than their counterpart, Spaniards. In Spain, people tended to scan the SERP, reading less text on each snippet, and chose a result among the first top ranked ones without paying attention to those in the bottom positions.

Author Keywords

search engines; cultural differences; eye tracking; visual behavior; user experience

ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.



Figure 1: Heat map showing vertical reading patterns of Spanish participants



Figure 2: Heat map showing horizontal reading patterns of Arab participants

Introduction

The Internet has revolutionized the way people live, work, study, shop, communicate and do business. Search engines are considered the main entrance gate to the web because it allows to find pages of interest according to queries. Nevertheless, little attention has been given on the presentation of the search results pages based on cultural differences. Nowadays, the interface looks the same for all users regardless of their location. Previous research [2] argued that there is a correlation between culturally determined thinking patterns and information search behavior.

The primary goal of this research is to investigate how people with different cultural background differ in their interaction style and visual behavior on search engine results pages (SERP), more specifically between groups from the Middle Eastern region vs. Western Europe. The researchers conducted a controlled eye-tracking experiment to explore and evaluate the visual behavior of U.A.E and Spanish users when scanning through the first page of the search results in Google. The research aim is to examine if culture influences the behavior of these two groups in the way they evaluate the list of search results to choose a link. It is expected to find some differences in reading patterns, number of search results considered, browsing time on SERP until a result is clicked (dwell time) and success rate for correct answers to the questions. In future work, the researchers will analyze how special elements like ads, multimedia results and rich elements will attract and impact users visual attention.

Methodology

In total, 117 people participated in the test: 60 people in Barcelona (Spain, Western culture) and 57 in Dubai (U.A.E., Eastern culture). From these groups, 63% of

participants are women and 80% are between 18 and 40 years old. The tests were administered at the respective labs at University Pompeu Fabra in Barcelona and Zayed University in Dubai.

The researchers prepared 12 SERPs with 3 versions of each: first one with ads, second with enriched snippets like images, maps, etc., and third with no adds or enriched snippets. The test intended to cover all kind of elements that search engines usually include in SERPs. Our SERPs were divided in 3 general topics including architecture, ports and tourism. The search results to queries were also made related to each topic.

In the test, participants were asked to answer 12 questions (4 for each topic). For each query, participants were presented with a question and its corresponding SERP. We controlled that all participants have the same SERPs for each specific query. Second, participants were instructed to click on the result they thought was the most appropriate for the query. Finally, they were asked to choose an answer to the query from a list of 4 options: *a wrong answer*, *a right answer*, *I don't know* and *none of the above*. The answer to the query is visually embedded in the results presented in the SERP.

The eye-tracking equipment used in the study were Tobii 1750 in Spain and Tobii T-120 in U.A.E. The Tobii Studio software version 2.3 was used for the data analysis. The metrics obtained per country so far were the following:

1. *Hetmaps for reading patterns:* heat maps indicates the time that the users spent on each result, and a reading pattern can be obtained from them.
2. *Number of results read by the users.*



Figure 3: Spaniard participants read few results



Figure 4: Arab participants read many results

3. *Time to First Click (TFC)*: indicates the dwell time of the users on the list of search results until deciding which result to click. questions.
4. *Success rates*: percentage of correct answers of the total

Preliminary Results

The 4 metrics were analyzed to show if there are significant differences between both countries:

1. *Reading patterns by country*: while a scanning vertical pattern can be observed in Spain (see figure 1), a clear horizontal one is given by U.A.E. participants (see figure 2).
2. *Dwell time on SERPs*: Spain users spent much less time on SERPs than U.A.E. participants, who prefer to read more before taking a decision. On average, Spaniards took 39.26 seconds per page and Arabs took 62.99 seconds. We used Mann Whitney approach to verify that there was actually a statistical difference between the two groups. Figure 6 shows that 50% of participants in Spain took less than 10 seconds per page before choosing an answer in contrast to 20 seconds for the other group.
3. *Number of scanned results by country*: accordingly to the previous results, Spain participants read fewer results than U.A.E. users. In particular Spaniards read mostly top ranked results while Arab users considered bottom results as well before clicking (figure 3 and 4).
4. *Success rate*: surprisingly, more successful answers were found in Spain tests (50% chose the correct answers in Spain, vs. 40% in U.A.E) but the percentage of wrong answers is similar (43% chose the wrong answers in Spain, 39% in U.A.E). The

difference is due to the none of the above option (Spain, 2% vs. U.A.E. 12%) and I don't know option (Spain 3% vs. U.A.E. 9%). This implies that Arab people from our test preferred to choose one of these options (I don't know or none of the above) more than Spaniards who preferred to risk for a right answer more often. Figure 5 shows the success rates for U.A.E and Spain.

Discussion and Conclusions

Significant differences were found in the 4 aspects covered by the study: U.A.E. participants stayed on the SERPs for longer, they read more results and viewed each snippet in more detailed way than Spaniards. In Spain, people tended to scan the SERP, reading less text on each snippet, and choose a result among the first top ranked ones without hardly seeing those in bottom positions. Further work is necessary to determine the actual reasons for these differences. Based on the current results, the researchers think that they can be attributed to the following factors:

(b) The presence of the moderator may have intimidated people at Zayed University. According to [1], Arab countries are ranked between the 12-14 place in power distance while Spain is ranked between 45-46 (lower power distance). A typical behavior of a large power distance countries is the high respect to teachers even outside the classroom. It is believed that this motivated Dubai users to spend more time searching for the answers in SERP.

1. Cultural aspects:
 - (a) The results seem to be coincided with [3] theories about holistic cognition of Eastern cultures versus the analytic style in Western cultures. They compared East Asian and American, while we observed people from an

Arabic culture and a Mediterranean one, so Nisbett's work is not necessarily applied to this study.

- (b) The presence of the moderator may have intimidated people at Zayed University. According to [1], Arab countries are ranked between the 12-14 place in power distance while Spain is ranked between 45-46 (lower power distance). A typical behavior of a large power distance countries is the high respect to teachers even outside the classroom. It is believed that this motivated Dubai users to spend more time searching for the answers in SERP.

2. Language skills: Spaniards viewed SERPs in their native language, while U.A.E. users saw them in English. Although U.A.E. participants have a good level of English skills due to the fact that English is the language of instruction at Zayed University, but being a non-native speakers could have caused a lack of self-confidence at the user side which resulted in a low performance doing the tasks.

	SPAIN	UAE
Right	50%	40%
Wrong	43%	39%
None	2%	12%
Don't know	3%	9%

Figure 5: Success rate between Spain and U.A.E

For now, we have preliminary results that should be validated and compared with future experiments considering:

- Run an Arabic version of the test in U.A.E. and English test in Spain
- Include more countries and cultures to the study
- Perform a detailed analysis filtered by age and gender, comparing organic results to ads with different types of results (multimedia, site links, social recommendation, etc)
- Add more questions with new topics
- Allow users to type their own queries and see the clicked results

This is the first study on how cultural background can affect the users visual and cognitive behavior on information seeking in search engines environment. We consider this as an interesting research topic for both Human-Computer Interaction and Information Retrieval communities.

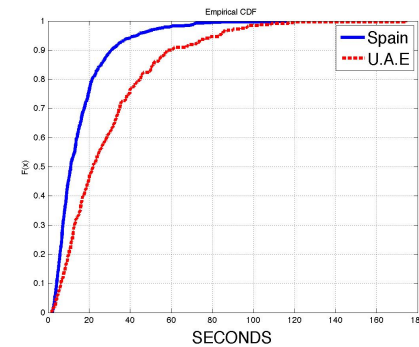


Figure 6: CDF of dwell time on SERPs of participants from U.A.E and Spain

Acknowledgements

This research is partially supported by the Spanish MEC project HIPERGRAPH TIN2009-14560-C03-01.

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