Designing for Culturally Diverse Audiences: Can Automated Attention Analysis Substitute the Eye-Tracking in Website Development?

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Abstract. Developers use a variety of methods to evaluate user's reactions to the website. Research in neuroscience and natural vision processing resulted in the development of automated methods which simulate human attention and are able to provide similar results to eye-tracking. However robust evidence is still missing.

This study contributes and expands on this debate. Eye-tracking studies on cultural differences confirmed that users from different cultures have different expectations and preferences. This study answers the question whether cultural differences in web design could be revealed also by automated attention analysis. Websites of the largest beer producers from different countries with different cultural background were analyzed through automated attention analysis tool to determine whether there is a difference in the number of potential areas of interest and their size. The study confirms that automated tools can depict cultural differences and thus provide fast and inexpensive results for initial assessment of website interfaces.

Keywords: culture, differences, webdesign, attention analysis, automated tool.

1 Introduction

One of the key components of website development is design testing [1]. Web developers use a variety of methods to evaluate user's reactions to the website [2]. For instance, eye-tracking can be used to determine user's visual attention over objects on the website [3]. However, eye-tracking is usually an extensive resource-consuming exercise and requires highly skilled researchers capable to analyze and interpret research evidence [4]. Research in neuroscience and natural vision processing resulted in the development of automated methods which simulate human attention and thus might be able to provide similar results to eye-tracking studies [5]. Website snapshot can be automatically analyzed on various features to predict consumer's reactions to visual stimuli. The analysis includes several website features such as color, orientation, density, contrast, intensity, size, weight, closure, length, width or

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curve of displayed objects (including skin color and face detection). Developers of those automated detection tools claim 75-90 % correlation with real eye-tracking data, however much debate has evolved around their ability to simulate human perception and robust evidence is missing [6].

The aim of this study is to contribute and expand on this debate. Eye-tracking studies on cultural differences in web design confirmed that consumers from different cultures have different expectations and preferences [7]. This study answers the question whether cultural differences in web design could be revealed also by automated attention analysis. A number of websites of the largest beer producers from six countries (ten largest from each country) with different cultural background were analyzed through automated attention analysis tool to determine whether there is a difference in the number of potential areas of interest and their size. Our study confirms that automated tools can be useful to depict cultural differences and thus could provide fast and inexpensive results for initial assessment of website interfaces.

2 Research Design and Methodology

Market interdependence has stimulated emergence of theories trying to explain differences between markets [8]. With a massive expansion of World Wide Web, web designers also began reflecting user‘s cultural characteristics [9]. Culture impacts on web design as well as on web content [10]. Websites need to be culturally adapted [11] and studies on cultural differences in web design supported the hypothesis that consumers from different cultures have different expectations and preferences about web design [12], [13]. This has been also confirmed by eye-tracking studies [7]. This study answers the question whether cultural differences could be revealed also by automated attention analysis.

Research sample consisted of commercial websites of large beer brands. Beer is popular with consumers across the world and has been the most widespread alcohol drink [14]. Local beer markets offer opportunity to global as well as local brands, whereas brand cultural belongingness is usually well articulated. Beer is also a product with comparable price and societal positioning in most cultures [15]. All selected countries have ranked on top positions in beer consumption and production per capita and have strong beer culture and tradition [16] (but national cultures differ [17]).

The study also included (as a control group) a group of prime international brands with highest worldwide consumption (in the case the brand has been previously selected as a national brand, it was surveyed with the international group only as international brands could speak different than local cultural values). List of all websites included in the study is in Table 1.

Opening introductory web sites (in resolution, which was the most typical at the time of research) were surveyed. Screenshots were then analyzed through Feng-Gui (http://www.feng-gui.com) tool for the number of areas of interest (AOIs) which would be likely the focal points of user eye activity. The number of AOIs was captures as well as the overall area occupied by AOIs (in pixels).

Table 1. List of Surveyed Websites

Czech Republic	Great Britain	Japan
Gambrinus	Carling	Asahi
Radegast	John Smith's	Kirin
Staropramen	Old Speckled Hen	Suntory
Krušovice	Cobra	Sapporo
Pilsner Urquell	Newcastle Brown	Orion
Budějovický Budvar	Fuller's London Pride	Baird
Bernard	Hobgoblin	Taisetsu Ji Bīru
Velkopopovický Kozel	Marston's Pedigree	Okhotsk Bīru
Starobrno	Abbot Alle	Tokachi Bīru
Ostravar	Tanglefoot	Otaru Bīru
Germany	Brazil	International
Oettinger	Brahma	Snow (China)
Krombacher	Antárctica	Budlight (USA)
Bitburger	Cintra	Budweiser (USA)
Warsteiner	Bohemia	Skol (Brazil)
Beck's	Bavaria	Corona (Mexico)
Hasseröder	Nova Schin	Heineken (Netherlands)
Veltins	Kaiser	Miller Lite (USA)
Paulaner	Xingu	Guiness (UK)
Radeberger	Colonia	Coors (USA)
Erdinger	Stella Artois	Fosters (Australia)

3 Results and Conclusion

Paired similarity in number and area of AOIs was tested through non-parametric Mann-Whitney test [18]. The analysis was performed through SPSS Statistical Software. Table 2 depicts the key findings.

Czech British and German beer sites are similar in terms of number and size of focal points. All three markets are labeled as low context; hence approaching consumers through websites might be similar. All three website groups feature rich and vibrant colors with shades emphasizing trust, tradition or nature. Number of interactive objects is high complemented by rich information content. Number and size of AOIs is different for Czech sites and for the Japanese ones. Japan is considered one of the most high context cultures. Absence of interactive features could be explained through the lens of Japanese cultural distinctiveness. Traditional beer cultures use rich and vibrant colors bringing forward natural and calming impressions, Japanese beer websites utilize plain white color which reduces first-impression attractiveness.

Number of AOIs (but not their size) is different for Brazilian and International brands and for Czech leading beers. Several international brands do not originate from western low-context cultures but from Asia or Latin America featuring fewer interactive qualities less diverse and informative content and are less informative in general. Number of AOIs is different for Great Britain, Japanese, Brazilian and International brands comparison. Representation of non-Western brands from high context cultures which do not have English websites could explain some of the differences. The number of AOIs is

higher on Germans websites and they are smaller than on Japanese (Brazilian and International) websites. German websites seems to be on the half way between traditional brewing countries and the other groups.

The number of AOIs is similar on of Japanese and International (and Brazilian) websites. In contrary, there is a difference between AOIs size. International (and Brazilian) websites stand on the verge between East and West. There was no difference in number of AOIs or their size. It may well be that developing or emerging markets seem more promising for international beer brewers. Traditional beer cultures typically host several strong local brands which outperform international brands.

Table 2. The Results

		Great Britain	Japan	Germany	Brazil	International
Czech Republic	AOIs	same	different	same	different	different
	AOIs size	same	different	same	same	same
Great Britain	AOIs		different	same	different	different
	AOIs size		different	same	same	same
Japan	AOIs			same	same	same
	AOIs size			same	different	different
Germany	AOIs				same	same
	AOIs size				same	same
Brazil	AOIs					same
	AOIs size					same

Cultural differences between websites can be deduced not only through demanding resource-consuming user testing or through expert panels. Cultural differences can be diagnosed via automated tools which simulate natural vision processing. Automated tools do not reflect local fluctuations or context and are prone to inappropriate sampling and personal bias. On the other hand, automated approaches offer less rich findings. The results could be also interpreted another way, since the automated tools do not perform testing on the same basis – user testing is based on specified task and eye-tracking results could be different according to different user scenarios. The results are also influenced by prior user experience or task with the website. None of these factors are included in automated attention analysis and automated tools are not suited to depict such contingencies. Nevertheless, automated tools for website assessment have been a recent and increasingly popular phenomenon and have become prominent in other areas of web design. Automated tools can never fully substitute human experts in assessing human-computer interaction or user experience. Automated tools may provide fast and relatively inexpensive results for initial assessment of e commerce and online marketing interfaces. Using initial automated testing may significantly reduce website development cost and contribute to more efficient marketing communications.

References

1. Pressman, R.S., Lowe, D.: Web Engineering. International Journal of Information Technology and Web Engineering 4, 78–80 (2009)
2. Zikmund, W.G., Babin, B.J.: Exploring marketing research. South-Western Pub. (2006)
3. Duchowski, A.T.: A breadth-first survey of eye-tracking applications. Behavior Research Methods 34, 455–470 (2002)
4. Berger, S., Wagner, U., Schwand, C.: Assessing Advertising Effectiveness: The Potential of Goal-Directed Behavior. Psychology and Marketing 29, 411–421 (2012)
5. Mancas, M.: Computational Attention: Modelisation & Application to Audio and Image Processing. TCTS laboratory, Ph.D. thesis. Faculty of Engineering, Mons, Belgium, Mons, Belgium (2007)
6. Harty, J.: Finding usability bugs with automated tests. Communications of the ACM 54, 44–49 (2011)
7. Cyr, D., Head, M., Larios, H.: Colour appeal in website design within and across cultures: A multi-method evaluation. International Journal of Human-Computer Studies 68, 1–21 (2010)
8. Maheswaran, D., Shavitt, S.: Issues and new directions in global consumer psychology. Journal of Consumer Psychology 9, 59–66 (2000)
9. Hsieh, H.C., Holland, R., Young, M.: A Theoretical Model for Cross-Cultural Web Design. In: Kurosu, M. (ed.) HCD 2009. LNCS, vol. 5619, pp. 712–721. Springer, Heidelberg (2009)
10. Blake, B.F., Shamatta, C., Neuendorf, K.A., Hamilton, R.L.: The cross-national comparison of website feature preferences: A practical approach. International Journal of Internet Marketing and Advertising 5, 145–165 (2009)
11. Usunier, J.C., Roulin, N., Ivens, B.S.: Cultural, National, and Industry-Level Differences in B2B Web Site Design and Content. International Journal of Electronic Commerce 14, 41–88 (2009)
12. Callahan, E.: Cultural similarities and differences in the design of university web sites. Journal of Computer-Mediated Communication 11, 239–273 (2005)
13. Goyal, N., Miner, W., Nawathe, N.: Cultural differences across governmental website design, pp. 149–152. ACM (Year)
14. Ferreira, M.P., Willoughby, D.: Alcohol consumption: the good, the bad, and the indifferent. Applied Physiology, Nutrition, and Metabolism 33, 12–20 (2008)
15. Dimofte, C., Zeugner-Roth, K., Johansson, J.: Local or Global Brand Choice: Do Travelers Really Prefer Global Brands? In: Proceedings of the Global Brand Management Q7 Conference (2010)
16. Mäkelä, P., Gmel, G., Grittner, U., Kuendig, H.É., Kuntsche, S., Bloomfield, K., Room, R.: Drinking patterns and their gender differences in Europe. Alcohol and Alcoholism 41, i8 (2006)
17. House, R.J.: Culture, leadership, and organizations: The GLOBE study of 62 societies. Sage Publications, Inc. (2004)
18. Black, K.: Business statistics: Contemporary decision making. Wiley (2009)