Exploring Cultural Differences in Information Behavior Applying Psychophysiological Methods

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CHI 2010, April 10–15, 2010, Atlanta, Georgia, USA.
ACM 978-1-60558-930-5/10/04.

Abstract
This ongoing exploratory study has two main goals: to compare information seeking behavior (1) across two cultures and (2) across the users' native and foreign languages. A secondary goal is the evaluation of the capability of psychophysiological data collection methods in the study of human-computer interaction (and especially the information interaction) experience. The applied physiological channels are Heart Period Variability (HPV), Skin Conductance (SC), pupil size, and eye-tracking data. The first part of the series of experiments has been completed with US participants with a significant (non-heritage) knowledge of Spanish. The second part will be performed in Hungary, with Hungarian participants with knowledge of English.

Keywords
Cross-cultural comparison, information behavior, user study, empirical methods, Heart Period Variability (HPV), Skin Conductance (SC), eye-tracking

ACM Classification Keywords
H5.4. Information interfaces and presentation (e.g., HCI) (I.7): Hypertext/Hypermedia. User Issues.

General Terms

Experimentation, Human Factors

Introduction to Cultural Differences in Information Behavior

With the availability of online translation services and the large amount of English-language content on the Web, more and more global users come in contact with content that was not created in their own language or culture. While some sites make efforts to localize their user interfaces and content, many simply translate content and use the same user interface. This is in direct contrast with findings that different cultures approach knowledge, information, and interaction with information in different ways.

Edward Hall, a leading cultural anthropologist of the 20th century wrote that "One of the functions of culture is to provide a highly selective screen between man and the outside world. In its many forms, culture therefore designates what we pay attention to and what we ignore." [7] Various cultural characteristics can influence many aspects of the information-seeking process [14].

An example of cultural differences that impact humans' interaction with information is that of categorization. Categorization reflects how we understand and make sense of the world and it is strongly impacted by the cultural and educational system we grow up in. Cultural differences in classification systems and categorization have long been described [4]. The impact of various categorization systems on website design is very strong, as the foundation of the design of any website is the underlying categorization of the information, the information architecture. Users who are not familiar with the traditions of information organization in the culture of the website can face difficulties while navigating the site.

Thus, the design of sites that provide information access to global user groups should consider these cultural differences. However, to understand the need for localization, we first need to understand the strongest culturally influenced differences in Web information behavior.

Related Research

Comparisons of information-seeking behavior across cultures are limited. Studies in information science look at international user groups in Western cultures, such as international students [15][16] or immigrants [6]. These studies take cultural differences into account, however, they examine groups that are in a sense bicultural or in the process of becoming bicultural by integrating into a new culture. They also often examine the specific needs of the group but do not necessarily compare them to another cultural group.

Very few studies looked at cross-cultural comparisons in information seeking outside of these needs studies in information science. However, the studies that took place found interesting differences. Iivonnen and White [13] showed varying levels of cultural difference in information seeking on the Web among Finnish and American students. They focused on the choice for initial search strategies, not the full search process. The study attributed differences to various cultural differences: searching style, cognitive style, language use, perceptions of search systems [13]. We will consider these intervening factors in our own study. Evers [5] found differences in various culture groups'

search, navigation, and user interface understanding within one website while studying differences in the use of a virtual learning environment. She attributed these differences to a set of variations in cultural characteristics.

Some of the studies more specifically involved tasks related to information seeking or other human-information interaction tasks, such as the larger domain of knowledge management. Chau et al. [3] found that US users use the Internet mostly for information seeking, while their Hong Kong counterparts used it mostly for social communication and tied these finding to values related to the community versus individual achievement. Calhoun et al. [1] found differences in how users in high and low context cultures process information. Hall [8] defined high context cultures as those where much of the information content of a message is embedded in the context and not in the message itself. Low context cultures express more of the information content in the message itself and do not rely on the context for the interpretation of the message. In Calhoun et al.'s study[1], users from a high context culture (Korea) were more easily overwhelmed by the information provided by their IS than users from the low context culture of the US. These differences further imply that a systematic cross cultural study of Web information seeking behavior will identify important differences.

Methodology

In this study we will address two main research questions related to the problem described in the introduction: 1) Do users in two different cultures exhibit different information behaviors on the Web and do they report different information-seeking habits? If yes, which phases and types of information behaviors are the most strongly impacted by culture?, 2) How does information seeking in the users' own language and for content created in their own culture differ from looking for information in a different language and created in a different culture? These broad research questions will drive an exploratory study of behavior to narrow down the impact of various user factors on search behavior.

Twenty eight participants will be recruited. The first part of the data collection has been completed with 14 US participants. The next part will be performed in Hungary with the same number of participants. In the US, participants with a significant knowledge of Spanish as a second (non-heritage) language were recruited in order to allow for data collection answering the second research question. In Hungary, this second language will be English.

At the beginning of the session participants are asked to fill out several questionnaires to collect data on the following independent variables: 1) a demographic questionnaire, including age, gender, cultural background, computer and Web experience, and Web information-seeking and use experience, 2) a cognitive style questionnaire (Personal Style Inventory created by Hogan and Champagne [2]), 3) a cultural dimensions questionnaire: a shortened version of Hofstede's [11] questionnaire to establish the participant's placement on various cultural dimensions.

Although the main independent variables are the nationality (US or Hungarian) and the language used (native vs. foreign), we are currently analyzing the data

to explore the impact of the other variables measure by the questionnaires.

The demographic questionnaire will help us confirm the homogeneity of our samples in terms of various demographic variables. The cognitive style questionnaire will inform our analysis by linking performance to cognitive style which has been shown to influence information seeking. In one of our previous studies [10], a specific aim of the series of experiments was to compare the behavior of users during solving information-seeking tasks. We were able to identify some significant differences between the behavior of users with different demographic backgrounds and cognitive styles. The new series of experiments will focus on the effects of a new dimension: the cross-cultural aspect. The application of the cultural dimension questionnaire will ensure that participants exhibit various characteristics typical of the groups they are members of.

Next, the participants are asked to carry out several information seeking tasks. Some of the tasks are prescribed for them, while others are defined by the participants. The prescribed tasks are representative of various information-seeking task types, including: known item seeking, subject driven and exhaustive searches. There are no starting points defined for the tasks, as Iivonen and White [13] found that there were strong cultural differences in terms of search starting points. At the end of the session the participants are interviewed about their information-seeking experience and habits.

Objective parameters of the users' behavior during the session are recorded, including their computer activity log, physiological data such as heart periods, skin conductance, pupil size, and eye gaze movements. From the activity log we will record the following data: starting points, time spent on pages and steps, types of steps, number of steps, sequence of steps, and number of search results.

To display the videos, curves and other data simultaneously in a synchronized way, the team of the Budapest University of Technology and Economics developed an own software; this software and methodology use special algorithms described in our other publications [9][10][11]. A moment of one of our new sessions can be seen in fig. 1.

We will use the physiological data to identify high mental effort steps [9][10][11] and emotional reactions [9]. Both of these will supplement the analysis of the video capture of the participant's facial expressions and body postures. The eye gaze data will help us identify lower-level steps in the users' activities and hotspots on the pages that were particularly popular.

Conclusions

Previous studies have shown national cultural variations in information seeking and use behavior in various contexts. Most studies either looked at the needs of a specific user group, studied only a part of the information seeking and use process, or examined information behavior as a high level activity compared with other activities, but not the specific steps of the process.

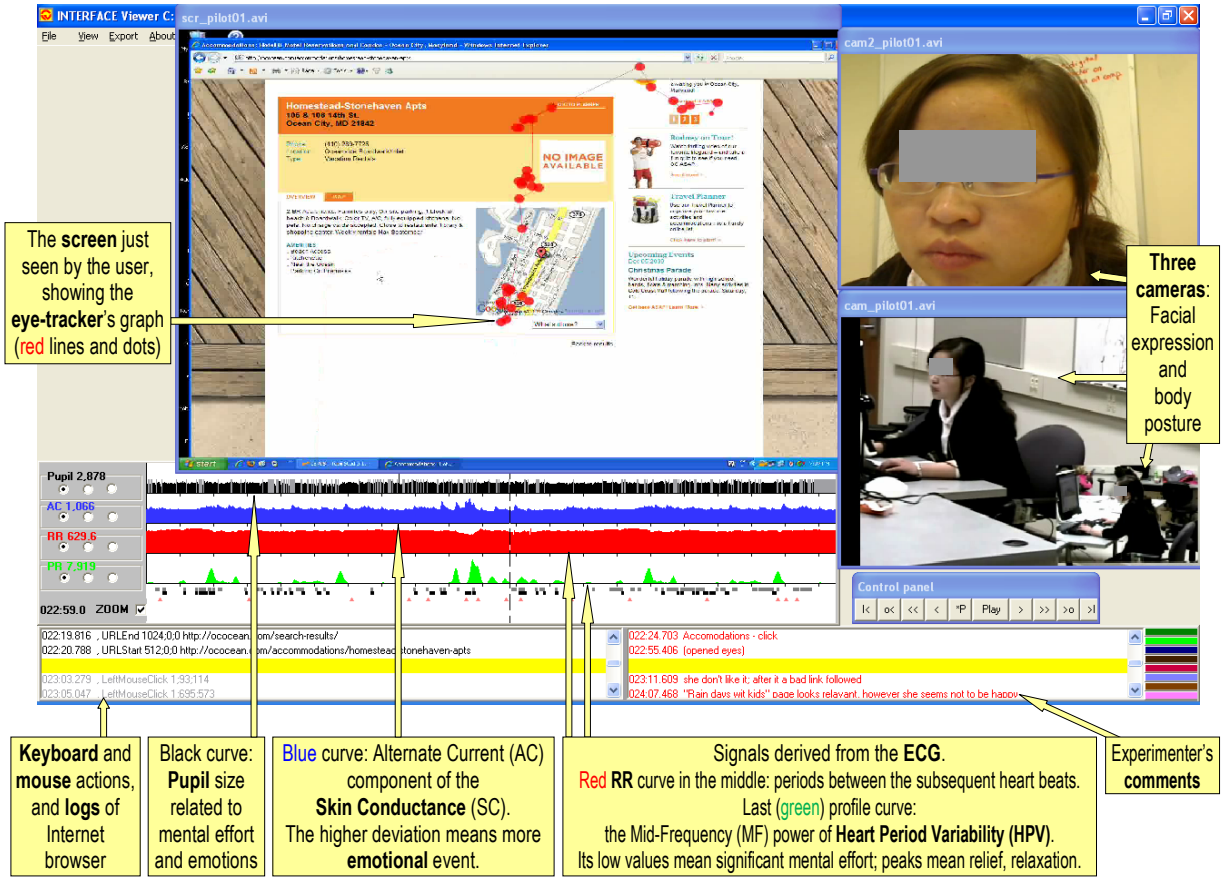

Figure 1. The synchronized data channels: a moment of a session showed by our viewer software.

The ongoing series of experiments systematically study the information seeking process and identify those area most impacted by culture. While the results will be limited for those two cultures, other groups with similar cultural characteristics can also benefit from the findings. The results can also provide the basis for future studies involving more cultures. It is hoped that the results of the user study can provide guidance for the designers of information websites that serve a global audience.

Acknowledgements

The authors would like to thank the Fulbright Commission for its support and the student co-researchers (R. Ahmad, Y. Sung, J. Wang, K. Emmerling, H. Qian, C. Blount, J. Lai, M. Alizmey) and the participants for their cooperation. This material is based upon work supported by the National Science Foundation (NSF) under Grant No. CNS-0619379. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

Citations

[1] Calhoun, K.J., Teng, J.T.C., Cheon, M.J. Impact of national culture on information technology usage behavior: An exploratory study of decision making in Korea and the USA. *Behaviour and Information Technology* Vol. 21, No. 4 (2002), 293-302.

[2] Champagne, D.W., Hogan, R.C. *Supervisory and Management Skills: A Competency Based Training Program for Middle Managers of Educational Systems.* Eds. by D.W. Champagne and R.C. Hogan, 1979.

[3] Chau, P.Y.K., Cole, M., Massey, A.P., Montoya-Weiss, M., O'Keefe, R.M. Cultural differences in the online behavior of consumers. *Communications of the ACM* Vol. 45, No. 10 (2002) 138-143.

[4] Clemmensen, T., Hertzum, M., Hornbaek, K., Qingxin, S., Yammiyavar, P. Cultural cognition in usability evaluation. *Interacting with Computers* Vol. 21 (2009) 212-220.

[5] Evers, V. *Cultural Apects of User Interface Understanding*. Doc. Diss. Open Univ, London, 2001.

[6] Fisher, K.E., Durrance, J.C., Hinton, M.B. Information grounds and the use of need-based services by immigrants in Queens , NY: a context-based, outcome evaluation approach. *Journal of the American Society for Information Science & Technology*, 55(8) (2004) 754-766.

[7] Hall, E.T. *Beyond Culture*. Doubleday, New York, NY, USA, 1976.

[8] Hall, E.T. *The Hidden Dimension*. Doubleday, New York, NY, USA, 1990.

[9] Hercegfi, K., Csillik, O., Bodnár, É., Sass, J., Izsó, L. Designers of Different Cognitive Styles Editing E-Learning Materials Studied by Monitoring Physiological and Other Data Simultaneously. In Proc. *HCII2009*, LNAI 5639, Springer (2009) 179–186.

[10] Hercegfi, K., Kiss, O.E.: Assessment of e-Learning Material with the INTERFACE System. In: Szűcs, A., Tait, A., Widal, M., Bernath, U. (eds): *Distance and E-Learning in Transition*. John Wiley & Sons and ISTE, Hoboken, NJ, USA, 2009. Chapter 45, 645-657.

[11] Izsó, L., Hercegfi, K. HCI Group of the Department of Ergonomics and Psychology at the Budapest University of Technology and Economics. *Ext. Abstracts CHI 2004*, ACM Press (2004), 1077-1078.

[12] Hofstede, G.H. *Culture's consequences : comparing values, behaviors, institutions, and organizations across nations*. Sage, Thousand Oaks, CA, USA, 2001.

[13] Iivonen, M., White, M.D. The choice of initial web search strategies: A comparison between Finnish and American searchers. *Journal of Documentation,* v57 n4 (2001) 465-491.

[14] Komlodi, A. Carlin, M. Identifying cultural variables in information-seeking behavior. In Proc. *AMCIS2004*. Association for Information Systems, New York, NY, USA (2004) 477-481.

[15] Park, I. A comparative study of major OPACs in selected academic libraries for developing countries – User study and subjective user evaluation. *International Information and Library Review* Vol 29 (1997) 67-83.

[16] Yi, Z. International student perceptions of information needs and use. *The Journal of Academic Librarianship* Vol. 33, No. 6 (2007) 666-673.