

Understanding the cultural dimension on the Web homepage preferences and visual exploration

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Abstract— In an experimental study conducted with thirty-two French and Japanese users, we investigated the impact of culture (*i.e.*, cultural cognitive style) on users' preferences and their visual exploration of homepages with two different designs: French-ness and Japan-ness design. Two main results have been obtained: (1) Even if homepages are culturally designed, preferences of the user is not related to this culture-centered design; (2) The visual exploration of homepages is subordinate to the culture of the user, *i.e.* is not really related to the design.

Keywords- visual exploration; culture; consumer; preference; design

I. INTRODUCTION

Since the early 1990s, many studies have focused on the influence of culture on the design of Websites and Webpages [1, 2, 25], giving rise to a current design focuses on culture [5, 6, 7, 8, 34]. In parallel, recent studies have focused on the impact of the culture of users and consumers about their perceptions and behaviours during online information searching [9] [10] [36]. All these studies emphasize the importance of the relationship between culture and usability

in Web design and Web use, *i.e.* culturability (*culture + usability*; [1]).

In this paper, we focus on the two culturally determined cognitive styles (analytic style *vs.* holistic style) on preferences and visual explorations of homepages by users/consumers recruited from two different cultures (Japan *vs.* French).

II. THE IMPORTANCE OF THE HOMEPAGE AND ITS CULTURE-CENTERED DESIGN

According to Nielsen [26], “Corporate homepages are the most valuable real estate in the world” because homepage determines the first impression at the consumer and then determines, in part, the future behavior of that consumer.

It is essentially the homepage of the Website where a user arrives prompting said user to enter or not in that site [7, 19, 20] (Figure 1), especially if it is an unknown site. This explains why the design and the design of homepages are of primary interest in e-commerce. Indeed, one of the issues for businesses is that the user remains long enough on the homepage of their site to make them want to enter

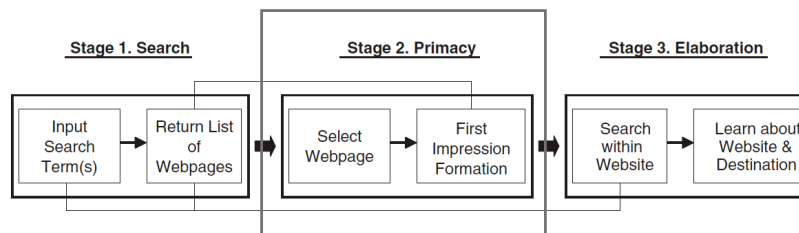


Figure 1. The importance of first impression in the process of online information searching, according to Kim & Fesenmaier [19].

A research team at Microsoft Research has recently proposed a mathematical model explaining dropout behavior of users [21]. After analyzing the behavior of thousands of users over 200,000 websites, the team determined that the time spent by an individual on a Webpage followed the Weibull distribution. According to this Weibull distribution, the probability that an individual leaves a Webpage decreases as time increases that individual remains on said Webpage. And it appears that the first 10 seconds are crucial [20, 25].

In other words, if an individual stays longer than 10 seconds on the homepage of a Website, then the probability that the individual enters and explores this Website increase significantly because the user's attention has been captured and “hung”. Then we understand the issues related to the homepages of Websites since these

homepages, which will determine the behavior of the individual: to enter into the Website, or to leave immediately.

According to Nielsen [26], the average percentage of pixels used for each category on homepages is the following:

- Operating system and browser overhead: 19%
- Navigation: 20%
- Content of interest to users: 20%
- Advertisements: 2%
- Self-promotions (ads for the site's own stuff): 9%
- Welcome, logo, tagline, and other site identifications: 5%
- Filler (useless stock art, such as “smiling ladies”): 5%
- Unused: 20%

Nielsen [26, 27, 28] assumes that this distribution of these different types of information on homepages is universal. But it appears that, for a given company, homepages are very different among culture of designers and/or intended end-users. And some recent studies [7] [34] confirmed that the allocation of the different types of information is different among the version (French vs. Japan). In other words, homepages are culturally designed (Figure 2 shows an example).

But, what is the real impact of this culture-centered Web homepage design on users' preferences and their visual exploration among the culture of these users?



Figure 2. The Japan (on the left) and the French (on the right) homepages of the Honda company©: An example of a culture-centered design.

III. COGNITIVE STYLE AND INFORMATION BEHAVIOUR

The concept of “cognitive style” was developed in the late 1970s to explain the inter-individual differences in task selection, retention and retrieval of information [14, 15]. Cognitive style is defined as an individual adopts the approach to explore, analyze and organize their environment [32]. This cognitive style thus influences the individual strategies of analysis and exploration, including visual exploration.

Several studies have shown that cognitive style was essentially linked to the culture of the individual [3, 22, 23, 29, 30, 31, 32, 34]. Traditionally, the impact of culture is considered from the standpoint of theoretical work developed by Hofstede [17], considering only the behavioral level. But recently, Faiola and his collaborators [11, 12, 13] have suggested that culture could have an impact on cognitive processes on the one hand, designers of Websites and on the other hand, users and consumers of these Websites. In other words, culture does not express only in

terms of behavior: Culture would influence processes and cognitive strategies, creative Web design and use.

Indeed, Faiola & Matei [13] have confirmed that cognitive styles determined the conception and design Webpages. But these authors also showed that users within the same cognitive style that designers of Websites were most effective. In their study conducted with 171 American and Chinese individuals, participants were asked to find answers to factual questions in two versions of a Website: A site designed by Chinese developers and a site designed by U.S. developers. The results showed that the performance of individuals (*i.e.*, time taken to find the right answers) were directly related to the culture of the designer. More precisely, the performance was better when there was concordance between the culture of the user-participant (American *vs.* Chinese) and the culture of the developer-designer (U.S. *vs.* Chinese). This result was interpreted as evidence of the existence and impact of cognitive styles [13]: If a user of a given culture (and therefore, with a specific cognitive style) is “better” in a task involving a Website designed by a designer from the same culture, it is because the cognitive styles of these two individuals are identical.

As mentioned previously, cognitive style exploration of its environment depends directly on its culture, the analytic style and holistic style resulting in a large number of studies [23, 24, 29, 30, 31, 33]. The analytical style is characterized by a detachment of the object from its context, a tendency to focus on the attributes of the object, in order to assign it into categories, and production of inferences based in part on the contextualization of the content structure. The holistic style is characterized by orientation in the context or field as a whole, including attention to relations between the focal object and the field, a preference to explain or predict events based on these relationships, and an emphasis on the importance of change, recognition and identification, and the need for multiple perspectives. In other words, individuals with an analytical style tend to perceive an object regardless of the scene in which the object is and tend to assign objects to categories: they are more field independent. In contrast, individuals with a holistic style tend to perceive the scene as a whole, comes to perceive the context and scope as a whole. They tend to focus on the relationships between objects and the field: they are more field dependent. Studies show that the analytical style is mainly present in Western (USA, Western Europe) while the holistic style is mainly present in populations of the Far East (China, Japan, Korea) [23, 24, 29, 30, 31].

In an experiment, we investigated the impact of this holistic-analytic cognitive style on the Web homepage preferences and visual exploration for individuals recruited in two different cultures.

IV. EXPERIMENT

In an experimental study conducted with thirty-two French and Japanese users, we investigated the impact of culture (*i.e.*, cultural cognitive style) on their preferences and their visual exploration of different homepages issued and translated from the two cultures (France *vs.* Japan).

A. Participants

The sample consisted of seventeen French students (14 males and 3 females; mean age = 22.3 years) and fifteen Japanese students (12 males and 3 females; mean age = 22.3 years). All were students in Master degree in physics and mathematics. All of participating students self-reported that they, on average, used the Web more than 15 hours per week for academic and commercial purposes.

B. Independent variables

In our experiment, two independent variables were manipulated:

- The culture of the participants, with two modalities: French (FR) *vs.* Japanese (JP);
- The culture-centered design of homepages, with two modalities: French-ness (FR) *vs.* Japan-ness (JP).

C. Dependent variables (data collected)

In our experiment, the following data were collected:

- Preferences: After experiment, participants were asked to indicate their preferences between the two versions of homepages (French-ness *vs.* Japan-ness) for the two prototypes of Websites;
- Visual exploration: The viewing patterns were used to determine the way that participants read and scanned the homepages (Japan-ness *vs.* French-ness). According to Dong & Lee [9], five different viewing patterns can be distinguished:
 - “0” Shape: Eye movement is similar to drawing a “0” on the homepage;
 - “5” Shape: Eye movement is similar to drawing a “5” on the homepage;
 - “N” Shape: Eyes move down one column and then move over to another column;
 - “Z” Shape: Eyes pass over columns first and then move down the homepage;
 - “X” Shape: Eyes move diagonally across the homepage and scan it with random jumps.

D. Material

In this experiment, specific homepages and Websites have been created. More precisely, two versions of homepages (Japan-ness *vs.* French-ness) are designed for two prototypes of Websites (a Website to purchase computer equipment and a Website to find an internship). These two versions of homepage have been elaborated on the basis of data obtained with a previous ergonomics inspection (author, 2012). In other words, the average percentage of pixels used for each category on homepages is different between the two versions (Japan-ness *vs.* French-ness).

Moreover, participants viewed all these versions (presented in random order) on Tobii T120©. So, scanpaths and visual explorations of users were recorded in real time.

Finally, each participant was asked to complete two questionnaires before to search for information in the different Websites and to give their preferences:

- a questionnaire to collect socio-demographic data and the uses of the Web (frequency of use, nature of uses, etc.). The Web experience questionnaire was adapted from Thatcher and Greyling [35] and measures technical expertise with the Web based on the self-reported breadth and depth of exposure;
- the Analytic-Holistic Scale (AHS) elaborated by Choi, Koo & Choi [4] to determine the cognitive style of individuals. This questionnaire, a Likert-type scale (from 1 to 7), consists of 24 items assessing four dimensions related to cognitive style: causality, attitudes *vis-à-vis* the contradictions, change perception, and attentional focus.

E. Task and procedure

Each participant was individually asked to consult different prototypes of homepages (prototype A: a site to purchase computer equipment; Prototype B: a site to find an internship) before to give his/her opinion about these different versions. Consultation time was free. The order of presentation of the different prototypes and topics was counterbalanced.

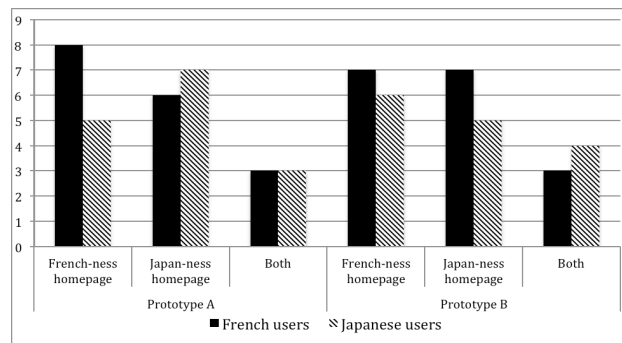
Then, each participant was asked to complete a questionnaire to collect socio-demographic data and the uses of the Web [35] and the Analytic-Holistic Scale (AHS; [4]) to determine the cognitive style of individuals.

V. RESULTS

First, according to previous data obtained by a lot of researchers [3] [29] [30] [31] [32], our results obtained with the Analytic-Holistic Scale (AHS) confirmed that our French users hold an analytic approach whereas Japanese users hold a holistic approach (mean score for French users = 5.10 vs. mean score for Japanese users = 2.9; $p < .005$).

Second, as Table 1 shows, there is no impact of culture of users on their design preferences between the two versions of homepages (French-ness vs. Japan-ness). Whatever the Website (A and B), the number of French users preferring French-ness and Japan-ness homepages is substantially equivalent. In the same way, the number of Japanese users preferring French-ness and Japan-ness homepages is substantially equivalent, whatever the Website (A and B).

TABLE I. PREFERENCES OF FRENCH AND JAPANESE USERS FOR EACH PROTOTYPE (A AND B)



Third, visual exploration of homepage is essentially influenced by the culture of users, and is not really influenced by the design of the homepage. As Table 2 shows:

- The “0” shape (red dots in Figures 5 and 6) is the most frequent viewing pattern used by French users to explore the homepages whatever the design (64.7% for the French-ness design and 52.9% for the Japan-ness design);
- The “S” shape (black dots in Figures 5 and 6) is the most frequent viewing pattern used by Japanese users to explore the homepages whatever the structure (60% for the French-ness design and 66.6% for the Japan-ness design).

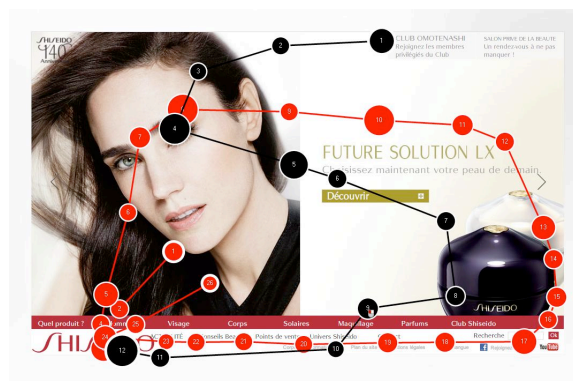
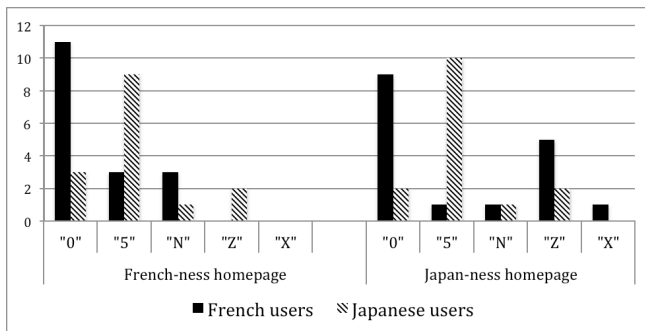


Figure 5. The “0” shape viewing pattern used by French users (red dots) and the “S” shape viewing pattern used by Japanese users (black dots) to scan the homepage a French-ness design.



Figure 6. The “0” shape viewing pattern used by French users (red dots) and the “5” shape viewing pattern used by Japanese users (black dots) to scan the homepage a Japan-ness design.

TABLE II. VIEWING PATTERNS OF EXPLORATION OF HOMEPAGES (“0”, “5”, “N”, “Z”, “X”) FOR FRENCH AND JAPANESE USERS FOR EACH DESIGN (FRENCH-NESS VS. JAPAN-NESS)



In other words, visual exploration used to read and to scan a Web homepage is culturally determined for our French and Japanese users. Thus, the visual exploration used by a user/consumer is dependent to his/her culture and is not dependent to the design of the Web homepage. More precisely, our experiment tends to show that the cognitive style (holistic vs. analytic) linked to the culture of the individual is a major factor to explain the visual exploration of homepages.

VI. CONCLUSION AND FUTURE WORK

The two main results obtained in our study are the following:

- Even if homepages are culturally designed, preferences of the user is not necessary related to this culture-centered design;
- The visual exploration of homepages is subordinate to the culture of the user (and not related to the design).

From an ergonomics point of view, the results of our study have mainly shown that cognitive differences at the design level exist in the form of cultural styles that are perceptible to users/consumers. In accordance with other recent studies [13], although the purpose of our study was not to provide Web design recommendations *per se*, the results strongly suggest that awareness of cultural cognitive style is necessary for the improvement of online communication.

Building upon this research, we foresee future work that will better inform Website designers about how to respond to implicit thinking patterns of cross-cultural users. From a theoretical point of view, our experiment supports the view that culture is expressed and influences the cognitive processes of visual scanning, and not just behavior [11, 12, 13]. The growth of electronic commerce, in particular business-to-consumer, has been explosive during the last few years. Until recently, the Web community has been a dominated western-oriented society, with the design of Web sites reflecting that homogenous audience. But our results indicate that preferences and visual exploration of homepages differences exist between the cultural groups. So, if development of a “Universal” Website and homepages that appeals to all audiences and encourages increased visits and transactions is perhaps the “holy grail” of developers, creation of a single universally appealing global site does not appear feasible given the differences between some cultures/consumers, and that a preferable strategy might be to instead create culturally and consumer specific sites. In summary, the differences in culture plus the rapid expansion of the Web throughout the globe indicate that the current homogenous Website blueprint should change.

A user’s preference and visual exploration with/of a homepage could affect the first impression, *i.e.* propensity to enter into that Website and ultimately initiate transactions with that business [20] [25]. So understanding culture-based perceptions of Internet users and their behaviors could serve to improve a Website to such an extent that it might also improve the competitive position of the business itself.

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