

EVALUATION OF CROSS-CULTURAL WEB INFORMATION SYSTEM DESIGN GUIDELINES

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Abstract: This article summarizes, analyzes and evaluates the selected set of guidelines provided for the cross-cultural web information system design. Globalization affects various fields of human activities such as communication, business, travelling and others. In a business field, many companies search a way to expand their services globally. One of the main support tools for a global business is an information system that can function online and instantly serve information to people from various parts of the world. Such information system is often called a cross-cultural web information system. In this paper hypothesis is brought forward that part of the guidelines provided for cross-cultural web information system designers are not appropriate for application in the existing or in future developed projects. Guidelines are selected based on certain criteria. Evaluations of most visited web information systems by users from Japan and Latvia are performed by researchers from both countries. Evaluation results compliance to the summarized guidelines is reviewed.

1 INTRODUCTION

Cross-cultural information system (IS) design is a significant issue for IS developers. It is recognized that the design process of cross-cultural IS does not only involve just a translation of contents to an appropriate language, but also includes many other design tasks (Shaoyi, 2001).

People from various cultures think and act differently. These actions can affect people interaction with IS, including web information systems (WIS). At the same time, there is another point of view that WIS design can shape up users behaviour, such as thinking ways, actions and values that have been fundamental to their own culture (Rau et al., 2008). Partly it can be explained with the rapidly increasing number of WIS users from different countries and cultures, which use their culture characteristics to interact with the existing WIS and developing new ones (Aykin, 2004).

Published researches (Rau et al., 2008) have already shown that if a WIS that have been developed for users in a particular culture is later

without improvements introduced to those from the other cultures, usability and accessibility of this WIS decrease.

In the field of cross-cultural IS development various guidelines and practices have been introduced by several authors. Some of those guidelines give design recommendations for WIS designers, and many are acquired from researches based on examination of cultural dimensions introduced by works of Hofsted (Hofsted and Hofsted, 2005).

However, there are criticisms against Hofsted works coming in past years, such as performed by Oshlyansky (Oshlyansky, 2006). Oshlyansky argues, that cultures keep mixing and modifying with an impact of various factors. For example, Chinese users have accepted internationally used colour associations, such as yellow for attention, however previously some researches did not show such tendency (Rau et al., 2008).

According to such criticism, the hypothesis can be brought forward that part of the guidelines provided for WIS designers could not be appropriate

for applications in the existing or in future developed projects.

The aim of this article is to summarize, analyze and evaluate the set of guidelines provided for cross-cultural web information system designers and examine cross-cultural WIS design trends. To reach the aim, following tasks are brought forward:

1. Analyze previous researches and other types of literature that relate to cross-cultural WIS design and summarize the main existing guidelines for designers.
2. Select two culture groups and evaluate the existing WIS page designs compared with those summarized guidelines.
3. Summarize evaluation results and review guidelines compliance to the results.

2 MATERIALS AND METHODS

When summarizing and analysing various literature sources, multiple WIS design guidelines can be identified. While some of the guidelines are general and give issues for considerations, others provide precise recommendations for WIS designers.

The guidelines for this study were selected based on certain criteria. Only those guidelines were selected that could be evaluated with selected content analysis methods. These methods include the analysis of WIS pages source code, examination of page rendering on web browser and execution of automation tools for support of examination, such as page loading speed measurers. Scientific articles and web designer community websites were chosen as main sources for collection of the guidelines. From the analysis of selected literature, it can be seen that designer's community websites mention only few main guidelines that are also mentioned in selected scientific papers, such as by Marcus and Rau (Marcus and Rau, 2009).

In this research following guidelines are brought forward and are ordered in groups (Table 1). The groups include guidelines that address page layout, text content, graphical content and accessibility.

To evaluate those guidelines, two different culture groups are selected. Users from countries such as Latvia and Japan are chosen. Latvian users are chosen as Europe Union countries representative, while the users from Japan are chosen because they are separated from Latvian users by distance and have different characteristics and preferences than those from European countries (Okazaki, 2004). Some parts of the research were performed in Japan and others Latvia.

Table 1: Summarized cross-cultural WIS design guidelines.

Guideline	
Layout	1. For content layout, liquid layout is recommended, because same text in different languages can use different space (Choong, 2001; Marcus and Rau, 2009; Reece et al., 2010).
	2. Navigation menu should be placed according to users reading direction. (Reece et al., 2010) As a universal solution, top horizontal position is recommended (Arno, 2010).
Text content	3. It is recommended to use universal text encoding system, such as UTF-8 for supporting various characters (Arno, 2010; Andrew, 2010).
	4. Selection of appropriate font families has to be taken into account. Font families and their loading priorities has to be defined using Cascade Style Sheets (CSS) (Marcus and Rau, 2009; Andrew, 2010; Arno, 2010).
	5. Language reading direction has to be considered. Some countries read from left to right, some right to left and some top to bottom (Marcus and Rau, 2009; Reece et al., 2010).
	6. Designers should be aware when using alphabetic numbering for displaying ordered lists, because some countries have different sequence of letters. Alternative marking for lists is recommended (Marcus and Rau, 2009; Reece et al., 2010).
Graphical content	7. Colours can have cultural meanings (Marcus and Rau, 2009; Choong, 2001). White, grey, black, blue and yellow are most used cross-cultural interface colours (Kondratova and Goldfarb, 2007). Variations of blue
	8. Text should not be included in design of icons (Marcus and Rau, 2009).
	9. Publication of non ethical images is not recommended (Reece et al., 2010). In some cases WIS can be blocked by legal authorities if the content is offensive and considered non ethical by users from certain culture
Accessibility related	10. Usage of appropriate and understandable icons is recommended. For example, for e-mail function, image of an envelope is recommended (Choong, 2001; Reece et al., 2010).
	11. Users use various input and output devices to interact with IS. Main input device is keyboard. Keyboards are different in type and layout throughout the world (Choong, 2001). International Domain Names (IDN) can
	12. Inclusion of appropriate META keywords in documents can improve web information system rating at local search engines (Arno, 2010).
	13. Placing a web server in appropriate country can improve faster access to web information system (Liao et al., 2010; Andrew, 2010).
	14. There is a need to take into consideration network bandwidth of countries. Multiple versions of WIS should be developed, including version for low bandwidth (Liao et al., 2010; Andrew, 2010).

Content analysis was chosen as methodology, which is also used in various researches that relate to

identification of cross-cultural WIS design differences (Okazaki, 2004).

One hundred most visited WIS from each culture were selected on the first week of September, 2010. To acquire such information, statistics gathered by Alexa Internet Company services were used. The statistics provide a list of most accessed WIS by certain country, which is chosen as main criteria for WIS selection.

Each WIS from the acquired list was executed on web browser and examined. Only the main page of each WIS was examined. First of all, page source and CSS file codes of each page were manually evaluated to find necessary information about page encoding, META tags, colour codes, font families and type of layout. Information which was not possible to gather from the manual examination of source code was gathered by examination of page visual rendering on a web browser.

To evaluate certain guidelines, additional tools were used, such as online WHOIS protocol service provided by DomainTools.com that allows examine domains and determine web information system server location. Also Link Vendor SEO tool named "Website speed check" was used to determine size of each page. In the data collection process, part of data was coded with number 0 meaning non-affirmative or 1 meaning affirmative, and the other part as text string.

The results of evaluation were recorded and processed in spreadsheet documents. Most accessed Japanese user WIS page evaluation data were gathered in Japan from September to November, 2010, but most accessed Latvian WIS page evaluation data in Latvia from October 2010 to January 2011. Table 2 shows one record of the evaluation results.

In total, 200 WIS main pages were examined in this study. From 200 WIS pages, 2% of pages which are preferred by users from Japan and 1% which are preferred by users from Latvia were not available for examination.

3 RESULTS AND DISCUSSIONS

The examination of 1. and 2. layout guidelines (Table 1) show the following results.

The results acquired from the evaluation of pages preferred by users from Japan show that 61% of pages use liquid layout, while 37% have fixed one. The results acquired from the evaluation of pages preferred by users from Latvia show that 62% use liquid layout, while 37% have fixed layout.

Table 2: One record of gathered data from the WIS main page evaluation process.

Criteria	Result
URL of the WIS	jugem.jp
IDN is used as main URL	0
Are META keywords present?	1
Is UTF-8 character encoding used?	0
Which alternative character encoding used?	EUC-JP
Are CSS styles used for content presentation?	1
First priority font family	Meiryo
Reading direction	Left to right
Main colour for design	Blue
Are icons with text available?	0
Icon for email	Not available
Position of navigation menu	Horizontal
Is liquid layout used?	0
Is alphabet list used?	0
Area of web server location	Japan
Size of main page	70.68KB
Is non ethical images published?	0
Main language	Japanese

Layout examination shows that liquid layout is more widely used and preferred by WIS designers. It can be related not only to the fact that same text in different languages takes additional space, but also to increasing development of various portable devices with different screen sizes. So WIS pages need to have ability to be stretched and adjusted to both smaller and bigger size displays.

The results acquired from the evaluation of pages preferred by users from Japan show that 64% of pages have horizontal navigation menu, while 2% do not have menu, 22% used vertical menu and 10% used mixed menu, which includes combination of a horizontal and a vertical menu. The results acquired from the evaluation of pages preferred by users from Latvia show that 59% have horizontal navigation menu, while 7% do not have menu, 24% used vertical menu and 9% used mixed menu. Even it is recommended that a navigation menu should be placed according to users' reading direction, for example a menu should be placed in the right side of a WIS page in Japanese case, however there were no WIS pages met which menu was placed on the right side which is one of the primary side where to start reading from in Japanese.

The examination of 3.–6. text content guidelines (Table 1) show the following results.

The evaluation of pages preferred by users from Japan show that 57% of pages use UTF-8 encoding, while 41% use encodings such as Shift_JIS and EUC-JP. The evaluation of pages preferred by users from Latvia show that 85% use UTF-8 encoding, while 14% use encodings such as ISO-8859-1,

Windows-1251 or Windows-1257. It can be seen that in Latvian case WIS designers have in most cases implemented UTF-8 encoding that can support various character encoding. It can be related to the fact that many of these WIS pages are bilingual and have to display information in Latvian as the primary language and the secondary most used language which is Russian. Japanese WIS pages have less UTF-8 application cases and still the Japanese language character encoding scripts such as Shift-JIS and EUC-JP are widespread applied.

The evaluation of pages preferred by users from Japan show that 91% of pages have font families defined in priority using CSS, while 7% do not use font family priorities. Most used font families in pages preferred by Japanese users are MS PGothic, Hiragino and Osaka. The results acquired from the evaluation of pages preferred by users from Latvia show that 99% of pages have font families defined in priority using CSS and most used font families are Arial, Verdana and Tahoma. It can be seen that developers from Japan and Latvia have adopted WIS page styling with CSS and only in few cases it can be seen that font families are coded with the help of for example Hypertext Markup Language (HTML). There is a seen font-family usage difference. While Latvian WIS pages use widely known font families, such as Arial and Tahoma, Japanese use less known font families, such as Osaka and Hiragino.

Japanese traditional writing direction is top to bottom and right to left, called tategaki, but Latvian writing direction is left to right. The evaluation of pages preferred by users from Japan show that none of the pages have reading direction from top to bottom and right to left, while the evaluation of pages preferred by users from Latvia show that 99% use reading direction from left to right.

The evaluation of pages preferred by users from Japan show that 98% of pages do not use alphabetic numbering for lists or do not have lists, but the evaluation of pages preferred by users from Latvia show similar results that is 99% of pages do not use alphabetic numbering for lists or do not have lists. In both cultures, for pages containing unordered lists, various styles of bullets as markers are used, but for ordered lists, Arabic numerals instead of alphabetic numbering are chosen.

The examination of 7.–10. graphical content guidelines (Table 1) show the following results.

The evaluation of pages preferred by users from Japan show that 49% use variations of blue as a main colour for design, followed by variations of grey colour in 29% of cases. 20% use red, yellow, orange, pink, white and green as main colour. The

results acquired from the evaluation of pages preferred by users from Latvia show that 46% of pages use variations of blue as a main colour for design, followed by variations of grey in 31% and orange in 13% of pages. 9% use red, black, white, green and yellow colours. It can be seen that main colour preferences are similar between both cultures and that blue colour is one of the most used colours in evaluated WIS pages.

The evaluation of pages preferred by users from Japan show that in 88% of pages icons do not include text or icons are not used on the page, while 10% had icons with texts. As for users from Latvia case, evaluation show that 98% icons do not include text or icons are not used on the page, while 1% had icons with texts. Also examination of WIS pages shows that icons are rarely used as developers give more preference to buttons with text explanation.

The evaluation of non ethical images is very relative and time consuming task. In this research simplified evaluation has been performed, where non ethical images are considered those which contain pornography related content. The results acquired from the evaluation of pages preferred by users from Japan show that 9% of pages include non ethical images, while 89% did not contain non ethical images. The evaluation of pages preferred by users from Latvia show that 12% include non ethical images, while 86% did not contain non ethical images.

For this research evaluation of e-mail icon has been performed. In case icon is used, envelope as a cross-cultural icon is recommended for this purpose. The results of the evaluation of pages preferred by users from Japan show that in 12% of pages envelope was used as an icon for marking e-mail, 50% use plain text to mark e-mail, while 36% of pages did not had e-mail function. Users from Latvia case show that in 4% of pages envelope was used as an icon for marking e-mail, 37% use plain text to mark e-mail, while 57% did not had e-mail function. There was no case met when for email icon other image than envelope was used. It is concluded that WIS developers have taken into account such recommendation.

The examination of 11.–14. accessibility related guidelines (Table 1) show the following results.

The evaluation of pages preferred by users from Japan show that from selected WIS pages there was no page which used IDN for a primary domain, but in case of users from Latvia, the evaluation show that there was one case when IDN for a primary domain is used. Even IDN is popularised, available for registration and advised for application, it is seen

that WIS developers for primary domain names use Latin characters. In Latvian case when IDN was used, WIS page still had alternative Latin character domain name.

The results acquired from the evaluation of pages preferred by users from Japan show that in 66% of pages META keywords are used, while in 32% META keywords are not used. The evaluation of pages preferred by users from Latvia show that in 48% of pages META keywords are used, while in 51% of pages META keywords are not used. It is seen that META keywords are used only in half of overall evaluated pages. META keywords are mainly used for WIS page indexing by search engines. So this could be explained by the actions of developers who realize that the search engine indexing strategies are changing and META keyword impact on search results is decreasing.

The evaluation of pages preferred by users from Japan shows that in 61% of cases, servers for storage of pages are located in Japan, but in 47% of cases outside of Japan. The evaluation of pages preferred by users from Latvia show that in 38% of cases, servers for storage of pages are located in Latvia, but in 61% of cases outside of Latvia.

The results acquired from the evaluation of pages preferred by Japanese and Latvian users show that none of the WIS offers multiple speed versions, although the creation of multiple versions is advised by guidelines. Also none of the tested pages had a size over 350KB. An average size of the page preferred by users from Japan is 60,7KB, but for users from Latvia is 60,3KB. Figure 1 shows evaluated guideline compliance to the evaluation results in percents.



Figure 1: Guideline compliance to the evaluation results.

4 CONCLUSIONS

The guidelines selected for this study relate to WIS design and with the results gathered from the

experiments show certain trends for developers.

It is seen that many of the recommendations included in the guidelines are applied in practice and have good compliance with the experiments results. However, designers of published WIS do not or partly follow certain recommendations.

This study found that almost one third of summarized guidelines have compliance to the results beneath 50% (Figure 1).

This result can be directly linked to happening synthesis of cultures with the de facto practices of WIS development. One of clear examples is preferences by users from Japan. Although the guidelines recommend taking into consideration reading direction of certain culture, which would be starting from the right side and reading top to bottom for Japanese users, there was no case found where such content layout direction is applied. IDN application cases of are also low in numbers.

Developers are also not focusing on creation of multiple bandwidth versions of their WIS and files storage on country local servers, even it is recommended by the guidelines. It is seen trend that with the development of global networking developers will be less focusing on matters relating network bandwidth, even in a cross-culturally used WIS pages.

This study shows that developers should be cautious with published guidelines straightforward application in existing and future WIS projects.

The previously brought forward hypothesis appears to be true. It can be concluded that users from various cultures are accepting and using widespread applied information displaying practices and adjusting their cultural preferences.

Still, for more successful design of WIS, further researches are required with local users from selected cultures.

There is also a need to do a further researches with the literature that include guideline groups that were not evaluated in this study and are addressing issues such as typography, verbal style and aesthetic of WIS pages.

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