Cross-Cultural Web Design Guidelines

Rukshan Alexander
School of Engineering and
Information Technology,
Murdoch University, Perth, Australia
R.Alexander@murdoch.edu.au

David Murray
School of Engineering and
Information Technology,
Murdoch University, Perth, Australia
D.Murray@murdoch.edu.au

Nik Thompson
School of Information Systems
Curtin University
Perth, Australia
nik.thompson@curtin.edu.au

ABSTRACT

Adapting web pages to cultural preferences has been shown to improve communication effectiveness. However, the lack of a set of research-based web design guidelines or best practices renders the creation of culturally tailored versions of a website a time-consuming, costly task which is rarely undertaken by designers. This research aims to develop guidelines for cross-cultural web design to overcome these issues. The authors' prior work has provided empirical data showing significant cultural differences in the usage of design web attributes. These are used to determine a relationship between design attributes, cultural factors, and HCI factors. The result is a synthesis of culturally specific design attributes and published theories of culture to create a set of website design guidelines. The development process involved five steps: evaluation of the usage of design elements between cultures, identification of prominent design elements, organisation of cultural factors, organisation of HCI factors, and finally development the cross-cultural design guidelines. It is hoped that these evidence and research based guidelines will ultimately enhance website usability for users from different cultural backgrounds.

CCS Concepts

• **Human-centered computing • Interaction design**
• **Interaction design process and methods • User centered design.**

Keywords

Web design guidelines; cross-cultural web communication.

1. INTRODUCTION

Website cultural adaptations should go beyond simple language translation to tailor the look, feel and aesthetics of the web page. Cultural usability is the integration of cultural aspects into interaction [3], which allows interfaces to relate to the user's culturally specific attributes and values.

This research focuses on incorporating anthropological cultural factors, and Human-Computer Interaction (HCI) factors into web page design to create web pages that incorporate cultural characteristics and values to enhance usability.

Prior work suggests that, Hofstede et al.'s [2] and Hall and Hall's [1] cultural factors are indeed useful to consider how to adapt website design concepts for cultural diversity [4, 5]. Researchers, as well as some website designers, have used cultural factors to show that web pages with culturally relevant characteristics are more usable [6, 7], and can increase user satisfaction and work efficiency [8].

To incorporate cultural factors into website design, the existing guidelines are insufficiently detailed [9], and lack usability tests to support their claims [5]. Therefore, new cross-cultural web design guidelines are required.

The aim of this research is to create cross-cultural design guidelines. Using these guidelines, cross-cultural websites can be easily designed. These guidelines may be used to test specific propositions on how web page design could be impacted by cultural factors and the level of usability between cultures.

2. RELATED WORK

Smith, Dunckley, French, Minocha and Chang [10] and Hsieh, Holland and Young [5] developed a model for developing usable cross-cultural websites that incorporated existing cultural factors and Barber and Badre's [11] cultural markers. Some website developers and researchers have demonstrated the limitations of using prior cross-cultural design guideline. They are not sensitive enough [9], usually considered limited website design attributes [12], and lack usability tests to support their claims [5]. To address these concerns, our wider research began with the first large scale study of cross-cultural website design, which provided the empirical baseline to support the new cross-cultural web design guidelines described in this paper.

3. CROSS-CULTURAL WEB DESIGN GUIDELINES

Our work incorporates design elements, cultural factors, and HCI factors. Design elements and cultural factors are both already the subject of cross-cultural investigation of website design [6, 7]. The HCI factors describe the style of information processing and the user's interaction characteristics. These HCI factors are generally linked with time, context, and mental aspects [4]. Therefore, it is believed that a richer and more comprehensive cross-cultural web design guidelines may be developed by considering these factors. To translate the theoretical cultural factors as cross-cultural design guidelines, a detailed literature review was undertaken to map statistically significant design elements with cultural factors and HCI factors.

4. DEVELOPMENT OF A NEW CROSS-CULTURAL WEB DESIGN GUIDELINES

The development of the guidelines is described through following sections.

4.1 Evaluation of the Usage of Design Elements between Cultures

To link website design and culture, the first thing to identify was, whether there are any differences in the usage of design attributes between cultures. Website design contains design attributes that enable effective communication between user and the web page [7, 13]. Such design attributes are Layout, Navigation, Links, Multimedia, Visual Representation, Colour, and Text. Previous work [14] investigated these design attributes, by organising design elements into a set of identified design attributes. The results showed significant differences in the design of Australian, Chinese and Saudi Arabian web pages. The evaluation of design attribute usage demonstrated that many website design elements are culturally specific. The study provided quantitative evidence of cultural differences in website design elements.

4.2 Identify Prominent Design Elements

According to Fraternali and Tisi [6], due to influential cultural factors, cultures carry some prominent design elements. These prominent design elements can be used to match the cultural needs, expectations, and preferences of the users from different cultures [7]. Therefore, to strengthen the proposed guidelines, prominent design elements were derived by applying rules regarding previously identified statistically significant design elements to determine the prominent design elements.

A design element is marked as a prominent design element if the difference, in rate of occurrence, between two cultural groups is greater than or equal to 40%. Table 1 lists the discovered prominent design elements. They are used to directly map to the existing cultural factors and HCI factors to create cross-cultural web design guidelines.

Table 1. Prominent Design Elements

Design attributes	Prominent design elements	A	C	SA
Layout	High use of visible items[+]		✓	
Layout	High display density[-]		✓	
Navigation	Dynamic type of main menu (Mm)	✓		✓[*]
Navigation	More than 10 visible links in the Mm		✓	✓
Navigation	Level of 2 choices in the Mm	✓		
Navigation	Fat footer	✓		✓
Links	High use of links		✓	
Links	Links open in a new window		✓	
Links	External links		✓	
Multimedia	Image/ text animation		✓	
Multimedia	Image/ text scrolling		✓	
Multimedia	Use of images		✓	
Vis. Rep.	Image of young individuals	✓		
Vis. Rep.	Images of leader			✓
Vis. Rep.	Image of political		✓	✓
Colour	Bright colours with traditional colours		✓	✓[#]
Text	Use of bold		✓	
Text	Use of headings		✓	

Where: Vis. Rep. = Visual representation, Mm= Main menu, A=Australia, C=China, and SA=Saudi Arabia.

Note: [+] Use of items includes: headings, links, and images.

[-] Display density = total number of items / web page length.

[*] For the design attribute navigation, in the Saudi Arabian culture, the usage differences of both: 'Static' and 'Dynamic' were more than 40%. It was then decided to take the highest value.

[#] Moderate use of bright colours.

4.3 Organising Cultural Factors

Some cultural standards are established by Thomas [15], which expresses the cultural norm in terms of perceptions, thoughts, judgments, and actions. As described by Heimgärtner [4] anthropological cultural models such as, Hofstede et al.'s [2] and Hall and Hall's [1] cultural factors serve as a basis for the identification of cultural standards. As shown in Table 2, the expression of cultural factors in the two models can vary enormously between cultures.

Table 2. Cultural Distance between Countries

Cultural factors	Australia	China	Saudi Arabia
Power distance	Low (36)	High (80)	High (95)
Individualism	High (90)	Low (20)	Low (25)
Uncertainty avoidance	Medium (51)	Low (30)	High (80)
Long-term orientation	Low (21)	High (87)	Low (36)
Context	Low	High	High
Time perception	Monochronic	Polychronic	Polychronic

As the culturally dependent interpretation of values, context, and time influences all aspects of day-to-day activity [6], they are important to account for in website design [4, 8]. In research on cross-cultural website usability, Hofstede et al.'s [2] and Hall and Hall's [1] models are dominant [7]. Therefore, this research adopts Hofstede et al.'s [2] and Hall and Hall's [1] cultural factors. That are suggested by Hsieh, Holland and Young [5], and Heimgärtner [4].

4.4 Organising HCI Factors

The HCI factors are chosen to describe the style of information processing and the interactional style of users with web pages. Website users' information processing and interaction style differ between cultures [4]. Users' information processing and interaction style can be derived by considering physical factors, including: frequency, speed, density, redundancy, and sequentiality. By differentiating at least one of the identified physical factors, website users' culturally specific information processing and interaction style can be derived.

The HCI factors can be connected to culturally dependent concepts of context, time orientation, and mental aspects. Time can be connected to interaction speed, frequency, and sequentiality. Context can be connected to information speed, frequency, density, and sequentiality. Mental aspects can be connected to relations, redundancy, tradition, and thoughts. HCI factors are strongly linked with time, context, and mental aspects. Therefore, to find the information processing and interaction style of users from different cultural backgrounds, this research adopts the following definitions, as suggested by Heimgärtner [16].

- Information speed is the duration of information presentation [17].
- Information density is the number of information elements at a single point in time [17].
- Information frequency is the number of information elements present per time unit [17].
- Information sequentiality is the sequence arrangement of information [17].
- Information redundancy is repetition of information.

4.5 Developing Cross-Cultural Design Guidelines

Cultural influence on website design, in HCI, can be viewed through design elements, cultural factors, and HCI factors. The identified prominent design elements, from Section 4.2, are used to map with cultural factors and the HCI factors discussed in Section 4.3, and Section 4.4 respectively.

As shown in Figure 1, with the support of the prior published literature, correlations between prominent design elements, cultural factors, and HCI factors are identified and offered as cross-cultural website design guidelines. The assumed relationship is placed in Table 3 and 4. The Table 3 denotes the level of culture and HCI for the target culture, and the Table 4 details the web features that are suitable for the target culture. Both tables together create a procedure that helps web designers to easily pick suitable web features for any arbitrary culture.
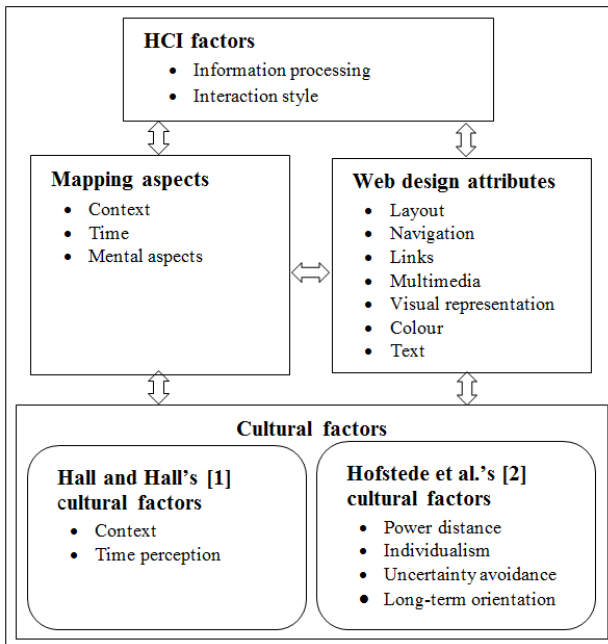

Figure 1. Connection among culture, HCI, and web design

5. DESIGNING CULTURALLY SPECIFIC WEBSITES IN HCI

The developed cross-cultural web design guidelines, which assumed relationships among prominent design elements, cultural factors, and HCI factors are based on the literature Hofstede et al. [2], Hall and Hall [1], and Alexander et al. [3].

To design websites for a particular culture, website designers should calculate the cultural factor values of the country [18]. et al.'s [2] cultural factor values can be calculated from . The decimal values can be given a range to labels: 'L' (low), for 0 - 40, 'M' (medium), for 41 - 60, and 'H' (high), for 61 - 100. The Hall and Hall's [1] high-context vs. low-context values should be labeled: 'L', for low, and 'H', for high, and the monochronic vs. polychronic time perception value should be labeled: 'H', for monochronic, and 'L', for polychronic. In the USA, the calculated cultural factor values are: 'L' (40) for Power distance, 'H' (91) for Individualism, 'M' (46) for Uncertainty avoidance, 'L' (26) for Long-term orientation, 'L' (low) for Context, and 'H' for (monochromic) Time perception.

All calculated cultural factor values should be mapped in Tables 3 and 4. So the USA's 'L' or low for Power distance (PDI) can be used to identify both the HCI factors, in Table 3, and associated web feature, in Table 4. In our example of the USA, the derived HCI factors, in Table 3, are 'L' (low) information speed, and frequency, as well as interaction speed and frequency. This gives the appropriate 'web feature' in Table 4; for 'L' (low) Power distance (PDI), and the 'L' (low) information speed, and frequency, as well as interaction speed and frequency, a comparatively lower presence human presences should be used.

If any cultural factor has value 'H', then the values should be changed vice versa for all connections in Table 3 and 4. For example, USA's Individualism (IDV), in Table 3. If the IDV value is 'H' (high), then the information speed, and frequency, as well as interaction speed and frequency, are 'L' (low). This informs of the appropriate 'web feature' in Table 4. High focus on the user's goals as opposed to the organization is desired. In this way cultural factors, HCI factors, and web features can be identified to accommodate a culturally specific look, feel and aesthetics in web pages.

Table 3. Level of Culture and HCI for Web Design

HCI Factors	(L) PDI	(L) IDV	(L) UAI	(L) LTO	(L) CTX	(L) TPC
InfoSpd	(L)	(H)		(L)	(L)	
InfoDen				(L)	(L)	
InfoFrq	(L)	(H)	(H)	(L)	(L)	(H)
InfoRen			(H)			
InfoSeq			(L)			(L)
InteSeq			(L)			(L)
InteExt			(L)			
InteSpd	(L)	(H)		(L)	(L)	
InteFrq	(L)	(H)	(H)	(L)	(L)	(H)

Where: L: Low, H: High, PDI: Power distance, IDV: Individualism, UAI: Uncertainty avoidance, LTO: Long-term orientation, CTX: Context, TPC: Time perception, InfoSpd: Information speed, InfoDen: Information density, InfoFrq: Information frequency, InfoRen: Information redundancy, InfoSeq: Information sequentiality, InteSeq: Interaction sequentiality, InteExt: Interaction exactness, InteSpd: Interaction speed, InteFrq: Interaction frequency.

Table 4. Web Features for Culturally Specific Website Design

Cultural factors	Web attributes	Web feature
(L) PDI	Visual representation	(L) Human presence in images
(L) IDV	Visual representation	(H) Human presence in images
(L) IDV	Links	(L) Focus on the user's goals
(L) IDV	Links	(H) Focus on organization
(L) UAI	Navigation	(L) Guidance and navigation control
(L) UAI	Navigation	(L) Additional support, in structured way
(L) UAI	Navigation	(H) Redundant pieces of information
(L) LTO	Navigation	(H) Deep, to flat, hierarchical structure
(L) LTO	Layout	(L) Information complexity
(L) CTX	Multimedia	(L) Visual information such as images and animations
(L) CTX	Colour and Text	(L) Colour-embed information
(L) TPC	Links	(L) Linear navigation

Different cultures will have different cultural factors and HCI factors and the requisite web features will be different. The cultural factors, HCI factors, and web features are not bounded by the border of a nation. A cultural group is determined by the cultural characteristics of group of users. Quantitative and/ or qualita-

tive data can be collected with random samples per cultural group to determine HCI factors.

6. DISCUSSION

This research has drawn from large scale empirical results of website design preferences [14], and integrated these with design guidelines. These guidelines are appropriate for various cultural groups, and based on research. The guidelines presented in this paper describe the relationship between prominent design elements, cultural factors, and HCI factors. Prior work [14] investigating the use of the design attributes in website design was used as a starting point to determine the relationship among prominent design elements, cultural factors, and HCI factors. Cross-cultural differences including different cognitive styles, reading and scanning patterns, or color are used to consider the implications of the identified differences in designing cross-cultural websites. Relevant Hofstede et al.'s [2] and Hall and Hall's [1] cultural factors are used for cross-cultural website design to explain the reason for the observed preferences. The values of cultural factors show that culturally-dependent variations can be exploited for cross-cultural website design. However, if the assumed connections are not empirically verified, the design guidelines remain hypothetical. Much research effort is still necessary to validate, refine, and optimize the guidelines and a large-scale user test to investigate cross-cultural website usability is an important next step. Findings from this subsequent work will facilitate the optimization of the design guidelines and ultimately yield a model which is generic enough to be applied to arbitrary cultural groups.

7. CONCLUSION AND FUTURE WORK

This paper proposes new web design guidelines. This work demonstrates a strong relationship between cultural theory and practical website design in cross-cultural website development. The result are guidelines on design attributes including: layout, navigation, links, multimedia, visual representation, colour, and text. Every design guideline contains cultural factors and HCI factors, which relates to the level of cultural adaptation. Therefore, using these guidelines, the cross-cultural website can be constructed, for each culture.

In the future, we plan to carry out a user test to investigate the cross-cultural web design guidelines. We will design cross-cultural websites, and perform a cross-cultural usability study to evaluate the efficacy of real cross-cultural websites. The goal of user testing is to acquire behavioural data including: effectiveness (task success rate), efficiency (average time on task), and errors (average number of clicks for a task), and attitudinal data including perceived navigability, perceived aesthetics, and satisfaction based on completion of specified tasks. From the behavioural and attitudinal data user performance and user perception will be measured.

It is hoped that these advances in cross-cultural web usability will support a new generation of globalized and effective web content. For effective communication with diverse cultural groups and a global audience, simple language translation is not sufficient. The work described in this paper is a step toward the provision of tailored, accessible and effective communication for all cultural groups and regions.

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