

Evaluating the Effects of Cultural Preferences on Website Use

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Abstract. Cultural diversity makes it impossible for designers developing web design depending on instinctive knowledge or personal experiences. Therefore, there is a need to investigate the requirements and preferences of target-culture users. Based on the results of local website auditing in the author's previous research [6], there are significantly different preferences for web interface design between Taiwanese and Australian cultures. Further, it is questioned that, if the cultural preferences are incorporated in the web, the effects of web communication can be improved. Thus, the aim of this paper is to evaluate the effects of cultural preferences on website use. The methodologies in this research would be introduced in the following. First, two cultures are selected. Second, hypotheses are constructed. Third, four experimental websites are constructed. Fourth, the usability test is established. Based on the results of the usability test, the findings would be presented to help web developers and enable designers to become aware of the possibilities of effective communications with a specific culture.

Keywords: cultural preferences, usability, interface design.

1 Introduction

The world has become a global marketplace. Globalization affects computer-based communications, and this is particularly obvious in web design applications, which can be accessed globally. Under the context of globalization, Hofstede [3] suggested that web developers could accommodate diverse cultural markets by applying localization as an alternative strategy to developing the global market. Therefore, there is a need to investigate the requirements and preferences of target-culture users. Based on the results of local website auditing in the previous research of Hsieh, Chen, and Hong [6], there are significantly different preferences for web interface design between Taiwanese and Australian cultures. Furthermore, it is questioned whether those cultural differences could be applied to improve web usability. Therefore, this research is to evaluate the effects of cultural preferences on website use.

2 Literature Review

2.1 Culture and Cultural Theories

Referring to Hofstede [4] definition of culture, in which personal patterns of thinking, feeling and behaviors were accumulated in the lifetime from the childhood and the ways of feeling, thinking, and mental programming would vary the received social environments. From the investigation of IBM employees in 53 countries from 1978 to 1983, Hofstede defined the patterns of differences and similarities among the responses of employees and proposed five dimensions for the culture theory, introduced as the follows.

Long-Term Orientation vs. Short-Term Orientation. Long-term orientation presented a critical part in Asian countries influenced by Confucianism that people from such countries strongly believed in the necessity of an unequal relationship for the stability of a society. The harmony between family and society was clearly defined in the hierarchical relationship, and virtuous behaviors were identified by hard work and perseverance. On the contrary, cultures with short-term orientation revealed opposite attributes [4] [7].

Individualism vs. Collectivism. Individualism in culture implied loose ties with which all inclined to care about themselves or their nuclear family and usually tended to independence from others. A collectivist culture tended to valuing more group welfare than individual one and group relationship in which the major factor was loyalty. Individualistic countries, on the other hand, valued the individual accomplishments while collectivistic countries stressed on the benefits of working in a group [4] [7].

Power Distance, referring to the extent of less powerful members in a society expecting and accepting unequal power distribution. Countries with higher power distance cultures presented the features of hierarchical structures in the organizations, with stricter relationships between superiors and the subordinates than in countries with low power distance. Low power distance cultures revealed the characteristics of more equal relationships between superiors and the subordinates and the more stable structure of an organization [4] [7].

Masculinity vs. Femininity, referring to gender roles in a culture. Countries with strong masculine cultures tended to focusing on challenge, social recognition, and the pursuit of welfare. On the contrary, countries with less defined masculine cultures tended to collapsing gender distinction, overlapping gender roles, and emphasizing security, care of others, and the environment [4] [7].

Uncertainty Avoidance, referring to the extent of people expecting to avoid uncertain conditions. People with low uncertainty avoidance cultures were more comfortable with uncertain situations, while the ones from cultures with higher uncertainty avoidance tended to preferring rules and rejecting changes because of the anxiety resulted from uncertainty [4] [7].

2.2 Culture and Web Usability

Using the word “culturability” which combined two words of “usability” and “culture”, Barber and Badre [1] constructed a cultural marker approach as a kind of systematic usability method to examine hundreds of websites and defined cultural markers, such as colors, fonts, icons, metaphors, geography, sounds, motions, flags, language, preferences for text and graphics, directionality of written language, help features, and navigation tools, in order to facilitate the user’s performance. By interviewing target culture people about their experiences, Sun [13] examined the effects of cultural markers (cultural preferences) on web usability and concluded that people preferred interactive interface with cultural markers from their own cultures as the web usability could be strengthened by cultural markers. Based on Baber and Badre’s cultural marker approach, Smith et al. [11] figured out the culturally preferred design elements in Taiwanese and Indian cultures and defined such design elements as cultural attractors, which were the interface design attributes of the websites, reflecting their denotations matching the expectations of the local culture. Cultural design preferences could directly map into culturally appropriate design elements for a website, but were usually inclined to the stereotype. When the cultural design preferences were successfully applied to a website, they could markedly increase the usability of websites and thus address the needs of the target culture audience. As Sun mentioned, exhaustive studies could be reduced when a company realized the type of cultural markers being used for a particular culture.

2.3 Web Characteristics for Effective Communication

According to Smart et al. [10], it was essential to identify several vital categories (i.e., typography, site structure and cognitive design, medium use, message content, appeal, accessibility) of web design characteristics for helping the designers convey desired meaning and the users more easily obtain the intended meaning. Based on the objective and requirement of this research, the key components of web for effective communications are illustrated as below.

1)Visual Presentation, including images, photos, symbols, icons and graphics. The attributes of visual representation can efficiently transmit a message to the viewer in an attracting manner. Russo and Boor [9] stated that images, similar to words, were the visual language of a culture, but could not always be translated. The images, symbols and icons recognized in the culture might have no meaning or even contrary signification in another culture. **2)Navigation**, referred to different kinds of navigational tools, menu formats, links, and search capabilities. Without precise assistance in attaining information, the users may get lost in a website. Marcus and Gould [7] declared the influences of culture on the navigation in web design. Audiences from cultures with a high uncertainty dimension tending to a navigation structure intended to prevent them from getting lost, while cultures with a low uncertainty dimension inclined to less control of navigation. **3)Links**. In the other works, Sun [13] investigated the users from America, Germany, China and Brazil with regard to their design preferences and found the existence of different preferences. It was discovered that the German audience preferred to the links in the navigation bar, which could be set

up in alphabetical order; but, such preference was not favored by Chinese and Brazilian users. Based on the above literature review, preferences for links differ across cultures. **4)Layout**, the display structure directing scanning information and reflecting the orderly flow of tasks. When the layout is properly designed, it is easier for the viewer accessing to information and comprehending the information within a contextual and structural model so as to facilitate the communication between the user and the system [13]. According to Barber and Badre [1], users from different cultural backgrounds presented different preferences for orientation and layout structure in web pages. **5)Multimedia**, referring to sounds, animation, moving text and streaming video. When the multimedia is properly utilized, the user's experiences can be enriched. Integrating multimedia into web interface design can be a very powerful means for transmitting information beyond that of text, visual representations, still images and pictures; it may also prove to be an effective means to mislead and distract the audience [2].

3 Methodologies

The methodologies in this research are introduced in this section. First, two cultures are selected. Second, hypotheses are constructed. Third, four experimental websites are constructed. Fourth, the usability test is established.

3.1 Two Cultures Are Selected

The cultural categories used in this study are based on national culture and operationalized with websites from Taiwan and Australia that possess different cultural attributes, based on Hofstede's country cultural dimensions [4] presented in Table 1.

Table 1. Hofstede's country cultural dimensions [4]

Cultural dimension	Power Distance		Individualism & Collectivism		Masculinity & Femininity		Uncertain Avoidance		Long term & short term time orientation	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Australia	41	36	2	90	16	61	37	51	15	31
Taiwan	29/30	58	44	17	32/33	45	26	69	3	87

3.2 Hypotheses

In the author's previous research [6], where local website auditing was constructed, it is found that there are significantly different preferences for web interface design between Taiwanese and Australian cultures (Table 2 and Table 3). The further related hypotheses are proposed - if the websites are embedded with culturally preferred elements and incorporated with their cultural dimensions, they can be more effective in communications. To testify the related hypotheses, a web experiment is constructed. In the website experiment, the culturally preferred design elements are embedded in websites and the communication effectiveness (usability) would be evaluated from

four aspects including learnability, efficiency, minimal errors, and satisfaction. The details of the hypotheses are shown as below.

1. If the Nantou government website is embedded with culturally preferred design elements that reflect Taiwanese culture, it can be more effective in the communication for Taiwanese users
2. If the Geelong government website is embedded with culturally preferred design elements that reflect Australian culture, it can be more effective in the communication for Australian users.

Table 2. Significant Taiwanese culturally preferred attributes

Variables	Components
Visual representation	Iconic symbols
	Images of leader
	Photo of accomplishment
	Images of group
Navigation	Cute style illustration
	Accessibility icon
Links	Popup a new window
	Dynamic button
Layout	Three-column
	Horizontal menu on top
Multimedia	Stream video
	Flash animation
	Moving picture
	Moving text
	Opening

Table 3. Significant Australian culturally preferred attributes

Variables	Components
Visual representation	Images of daily life
	Banner within color shape
Navigation	Search
	Accessibility on text
Links	Mouse over-underlined
	Stay in the same window
Layout	Two-column
	Flexible width design
	Info. guide on bottom

3.3 Four Experimental Websites being Constructed

Websites of the government genre are chosen. The Nantou county government website is selected as one of the templates to develop the website. This is because the Nantou county government website represents typical Taiwanese cultural features based on Hofsted's cultural model[4]. The Geelong city council website is selected as

the other template to develop the website. This is because the Geelong city council website represents typical Australian cultural features based on Hofsted's cultural model[4].The content of the selected websites (the Geelong council and the Nantou county government) are applied to create Taiwanese style and Australian style for each city. Four experimental websites are constructed and introduced as below.

- Chinese version of the Nantou website is embedded with Taiwanese culturally preferred attributes.
- English version of the Geelong website is embedded with Taiwanese culturally preferred attributes.
- Chinese version of the Nantou website is embedded with Australian culturally preferred attributes.
- English version of the Geelong website is embedded with Australian culturally preferred attributes.

3.4 Evaluation Criteria for Usability Test

Based on Nielsen [8], four evaluation criteria are interpreted as the following. 1) Efficiency can be the assessment of the time needed for carrying out a task. The process of more rapidly executing a task implies the greater efficiency. 2) Learnability points out the easiness to learn the system. 3) Minimal errors indicate the evaluation criteria of errors being defined as users making as few errors as possible when using the system. 4) Satisfaction refers to the extent of the users preferring the system.

4 Construction of Web Experiment and Usability Test

4.1 Participants and Experiment Procedure

Fifteen Australian participants were recruited in this experiment, and these participants were native English speakers, averagely aged 30 years old, stayed in Taiwan less than 3 months, taught English, and were born and brought up in Australia. Taiwanese participants were native Chinese speakers, the PhD and Master students from National Yunlin University of Science and Technology, and aged 30 years old averagely. Each participant was invited to Laboratory DA405 in National Yunlin University of Science and Technology to participate in the web experiment. The Taiwanese participants were asked to carry out the tasks assigned on the two versions of the Nantou websites, and the Australian participants were asked to carry out the tasks assigned on the two versions of the Geelong websites according to the instruction and task assigned. When the participants executed the tasks, they interacted and navigated with the websites, during which the time and clicks for carrying out each task were captured and recorded. Finally, the usability questionnaires were used for their responses, subjective opinions, and satisfaction from the participants.

4.2 Task Assigned

Using Spool et al.’s method [12], the questions were designed so that the answer comprised a single fact and only one correct answer. Four sets of tasks were constructed for each website. The tasks were equivalent for Chinese version of the Nantou website which was embedded with Taiwanese culturally preferred attributes and English version of the Geelong government website which was embedded with Taiwanese culturally preferred attributes; and, the tasks were equivalent for Chinese version of the Nantou website which was embedded with Australian culturally preferred attributes and English version of the Geelong website which was embedded with Australian culturally preferred attributes. Taiwanese participants needed to locate requested pages on both styles of the Nantou website, and Australian participants needed to locate requested pages on both styles of the Geelong website.

Table 4. Tasks assigned for the Chinese version Nantou website

Evaluation criteria	Web components	Task assigned for the Nantou web embedded with Taiwanese culturally preferred attributes	Task assigned the Nantou web embedded with Australian culturally preferred attributes
Efficiency	Links	Taiwanese culturally preferred attributes : open a new window Task assigned: What is the number one product in Top Ten Souvenirs in Nantou?	Australian culturally preferred attributes : stay in the same window Task assigned: How many tourism factories are there in Nantou?
		Taiwanese culturally preferred attributes : three columns Task assigned: What is the e-mail address of the government?	Australian culturally preferred attributes : two columns Task assigned: What is the contact telephone number of the government?
errors	Multimedia	Taiwanese culturally preferred attributes : flash animation Task assigned: What activities are taken place in Nantou in 2014?	

Table 5. Tasks assigned for the English version Geelong website

Evaluation criteria	Web components	Task assigned for the Geelong web embedded with Taiwanese culturally preferred attributes	Task assigned for the Geelong web embedded with Australian culturally preferred attributes
Efficiency	Links	Taiwanese culturally preferred attributes : open a new window Task assigned: Pretend you are a visitor and need to find the tourism service number. What is it?	Australian culturally preferred attributes : stay in the same window Task assigned: If you're a visitor, could you find the tourism service number on visiting page?
		Taiwanese culturally preferred attributes : three columns Task assigned: Could you find the email of Geelong government?	Australian culturally preferred attributes : two columns Task assigned: Could you find the contact number for Geelong's government?
errors	Multimedia	Taiwanese culturally preferred attributes : flash animation Task assigned: What activities will be held in 2014 in Geelong?	

Task Design for Efficiency: the operation tasks of different links between two cultures (opening a new window as preferred in Taiwanese websites, while opening at the same page was preferred in Australian ones) were observed the effects on efficiency. For example, an icon for “Nantou Souvenirs” was shown on the front page of

Chinese Version in Nantou websites, and a new window would be opened after clicking on the icon. The text button, on the other hand, was shown on the front page of Australian websites, and the window was opened at the same page for the link.

Task Design for Learnability: The web design for the two cultures (three columns were preferred in Taiwanese websites, while double columns were preferred in Australian ones) and the two versions helped understand the effects of cultures on learnability, and the evaluation was recorded with the task timing.

Task Design for Error: Embedding media elements into Taiwanese websites with culturally preferred attributes, the participants of the two cultures were observed the effects on usability, which was recorded by the number of clicks with a mouse.

Questionnaire Design for Satisfaction: the use's responses to the real perception needed to be observed with other setting questions. The subjective satisfaction was recorded the subjective perception of the user with Likert's 7-point scale.

5 Results

Table 6. Taiwanese's response between website reflecting Taiwanese culture and website reflecting Australian culture

Evaluation criteria	Nantou prototype reflecting Taiwanese culture	Nantou prototype reflecting Australian culture
Efficiency (sec)	10.6	18
Learnability (sec)	18.9	24.5
Errors (clicks)	5.5	--
Satisfaction (mean of questionnaire)	5.6	5.1

Table 7. Australian users' response between prototype reflecting Taiwanese culture and website reflecting Australian culture

Evaluation criteria	Geelong prototype reflecting Taiwanese culture	Geelong prototype reflecting Australian culture
Efficiency (sec)	43	40
Learnability (sec)	29.7	28.1
Errors (clicks)	6.1	--
Satisfaction (mean of questionnaire)	5.1	4.6

5.1 Efficiency

Table 8 shows the efficiency results of Taiwanese users between two styles of the Nantou websites, where Taiwanese participants spend averagely 10.6 sec on websites embedded with Taiwanese culturally preferred elements, while it takes averagely 18 sec for the ones embedded with Australian culturally preferred elements.

Table 8. Paired T-test of the efficiency of Taiwanese users between two styles of the Nantou websites

Evaluation criteria	Mean	SD	SEM	t	f	Sig (two tailed)
Efficiency (TW-AU)	10.6/18	14.0368	3.6243	2.044	14	.060

Table 9 shows the efficiency results of Australian users between two styles of the Geelong websites, where Australian participants spend averagely 43 sec on the websites embedded with Taiwanese culturally preferred elements, while it takes averagely 40 sec for the ones embedded with Australian culturally preferred elements.

Table 9. Paired T-test of the efficiency of Australian users between two styles of the Geelong websites

Evaluation criteria	Mean	SD	SEM	t	f	Sig (two tailed)
Efficiency (TW-AU)	43/40	33.0424	8.5315	.352	14	.730

5.2 Learnability

Table 10 shows the learnability results of Taiwanese users between two styles of the Nantou websites, where Taiwanese participants spend averagely 18.9 sec on the websites embedded with Taiwanese culturally preferred elements, while it takes averagely 24.5 sec for the ones embedded with Australian culturally preferred elements.

Table 10. Paired T-test of the learnability of Taiwanese users between two styles of the Nantou websites

Evaluation criteria	Mean	SD	SEM	t	f	Sig (two tailed)
Learnability (TW-AU)	18.9/24.5	26.3083	6.7928	-.816	14	.428

Table 11 shows the learnability results of Australian users between two styles of the Geelong websites, where Australian participants spend averagely 29.7 sec on the websites embedded with Taiwanese culturally preferred elements, while it takes averagely 28.1 sec for the ones embedded with Australian culturally preferred elements.

Table 11. Paired T-test of the learnability of Australian users between two styles of the Geelong websites

Evaluation criteria	Mean	SD	SEM	t	f	Sig (two tailed)
Learnability(TW-AU)	29.7/28.1	29.70 45	7.6697	.2 14	14	.834

5.3 Errors (Clicks)

In regard to the test of error, where multimedia elements are embedded to the websites with Taiwanese culturally preferred elements, Taiwanese participants take averagely 5.5 clicks and Australian participants take averagely 6.1 clicks, Table 6 & 7. The T-test results of multimedia do not appear the significant standard, but Taiwanese participants reveal less clicks than Australian ones do.

5.4 Satisfaction (Mean of Questionnaire)

The following table shows the subjective satisfaction of Taiwanese participants with websites embedded with Taiwanese culturally preferred elements and Australian culturally preferred elements. From the table, Visual Representation achieves the significant difference ($p < 0.05$). Although other items do not appear remarkable differences, Navigation, Visual Representation, and Overall Satisfaction reveal better satisfaction on embedded Taiwanese culturally preferred elements, while Links and Layout show better satisfaction on embedded Australian culturally preferred elements.

Table 12. Paired T-test of satisfaction of Taiwanese users between two styles of the Nantou websites

		Mean	SD	SEM	t	Degree of freedom	Sig (two tailed)
Links	(TW-AU)	5.1/5.7	1.995	.515	-1.035	14	.318
Layout	(TW-AU)	5.4/5.6	1.781	.460	-.435	14	.670
Navigation	(TW-AU)	5.7/5.2	2.100	.542	.984	14	.342
Visual representation	(TW-AU)	6.1/4.6	2.031	.524	2.797	14	.014
Overall satisfaction	(TW-AU)	5.6/5.1	1.727	.446	1.047	14	.313

The following figure shows the subjective satisfaction of Australian participants between websites embedded with Taiwanese culturally preferred elements and Australian culturally preferred elements. From the table, Links and Visual Representation achieves the significant difference ($p < 0.05$). Although other items do not appear remarkable differences, Links and Layout reveal better satisfaction on embedded Australian culturally preferred elements, while Navigation, Visual Representation, and Overall Satisfaction show better satisfaction on embedded Taiwanese culturally preferred elements.

Table 13. Paired T-test of satisfaction Australian users between two styles of the Geelong websites

		Mean	SD	SEM	t	Degree of freedom	Sig (two tailed)
Links	(TW-AU)	4.2/5.9	2.187	.565	-3.070	14	.008
Layout	(TW-AU)	4.5/5.5	2.187	.565	-1.653	14	.121
Navigation	(TW-AU)	5.3/4.7	2.613	.675	.889	14	.389
Visual representation	(TW-AU)	5.6/4.1	1.642	.424	3.460	14	.004
Overall satisfaction	(TW-AU)	5.1/4.6	1.995	.515	1.035	14	.318

6 Discussion and Conclusion

Related to the results of efficiency test (Table 8 and Table9), Taiwanese participants take 10.6 seconds on the Nantou website reflecting Taiwanese style, but 18seconds on the Nantou website reflecting Australian style. On the contrary, Australian users take 40 seconds on the Geelong website reflecting Australian style, whilst 43 seconds on the Geelong website reflecting Taiwanese style. With regard to learnability test (Table10 and Table11), Taiwanese users take a shorter time on the Nantou website incorporating with Taiwanese cultural preferences than on the Nantou site reflecting Australian style. Australian users, on the other hand, perform better in the Geelong website incorporating with Australian culturally preferences than in the Geelong site reflecting Taiwanese style.

Regarding to errors test (Table 6 and Table7), Taiwanese users take less clicks (5.5 times) on the Nantou website reflecting Taiwanese culture, comparing with Australian users using 6.1 clicks for the Geelong website reflecting Taiwanese culture. The results reveal that Taiwanese users perform better in the website embedded with Taiwanese cultural preferences. With regard to Satisfaction test (Table 6, Table7, Table12, and Table13), Taiwanese users are more satisfied with Taiwanese style web, based on the results of the overall satisfaction questionnaires, particularly satisfied with the visual representation of Taiwanese style. But Taiwanese users are highly satisfied with staying at the same window that is not expected as the hypothesis. Australian users are also satisfied with Taiwanese style visual representation that is not consistent with the hypothesis, either. The possible assumption for the above condition is that cultures keep on evolving; particularly, the young generation in the Internet era is influenced by other culture easily. Generally, the results are aligned with the hypothesis that if the Nantou website is embedded with culturally preferred design elements reflecting Taiwanese culture, it can be more effective in the communication for Taiwanese users. Also, If the website is embedded with culturally preferred design elements reflecting Australian culture, it can be more effective in the communication for Australian users. This research has the potential to help web developers and designers develop a web interface design that is culturally appropriate.

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