

IMPACTS OF CULTURE ON WEB USABILITY

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Abstract. This paper describes an experimental study examining the impacts of culture on web site design and usability, in terms of localisation and internationalisation. A pilot study has been undertaken to determine the effectiveness of the research design, methodology and the following enhancements for a much larger study, addressing the cultural differences among people and issues in relation to the localisation/internationalisation of web sites. The rationale is to investigate whether web sites are useful for specific cultural groups or for a general population of users. This paper presents an overview of the experimental study and reports on the results of a main study phase.

1. Introduction

This experimental study aims to examine the role of cultural differences in the usability of web sites. The impacts of culture on web site usability are investigated to determine how web sites can be designed to suit various cultures, by addressing specific factors that affect localisation and internationalisation of web sites and user preferences.

A pilot study has been carried out to test the effectiveness of the research methodology and design. The results have showed that the materials and protocols were appropriate for the main study, following specific modifications. Although the results are only indicative due to the small number of participants in each group, the mainly insignificant statistical results confirm that a larger number of participants were necessary for the main study. The pilot study was very effective in improving materials and protocols for the main study.

The constructs of interest in an earlier research were culture and the individual attributes of gender, age, computer experience and disabilities (Lim, 1999). Those constructs were examined to explore how they could impact on people's preferences for different aspects of interaction design. Evers and Day (1997) examined the role of culture in interface acceptance. Evers (2001) examined the cultural aspects of interface understanding, using international user groups to carry out an empirical assessment of an e-learning web site. Researches from countries such as Australia, China/Japan, South Africa, North America, Netherlands and Venezuela were involved in this international collaboration. Other relevant work have also been taken on by Murrell (1998), Stander (1998), Yeo (2003) who highlighted that language translation is inadequate for the

course of localisation, and Kralisch, Yeo & Nurfaiza (2006) who emphasised that linguistic and cultural differences are present in the grouping of information, with the impact of such differences pertaining to web sites.

According to Hongladarom (1998), although the Internet is basically a Western product, there is possible conflict between non-Western cultures and Internet technologies. However, due to the availability of the web to a global audience, culture plays a vital role on the web to explain this potential difference. Another possibility that could arise is a community culture which is independent of each individual culture's historical background, when individuals from diverse cultural backgrounds interact on the web. Therefore, the issue of usability of web sites in terms of localisation (the individual user's cultural background) and internationalisation (the web culture formed among online communities) of web sites, and which one dominates preference on the web is important. It was theorised by Turk (2000) that a "world wide web culture" may be appearing from web users that would strengthen the notion of internationalisation of web sites rather than a "world wide web of cultures" designed specifically for individual cultures in the localisation of web sites.

Hence, the research problem for this experimental study consists of the impact of culture in terms of user preferences, and localisation and internationalisation of web sites. In this experimental study, a web culture comprises individuals despite their cultural origins, forming a culture due to having considerable exposure to the web, motivating the design of web sites for all web users.

2. Overview of Experimental Study

2.1. EXPERIMENTAL DESIGN

This experimental study involved an experiment that required participants to visit two versions of a web site (one localised and one internationalised), to collect and analyse user preferences for aspects of local and international versions of a virtual restaurant web site.

The main study employed the same experimental design as the pilot study, where participants were asked to provide responses to demographic questions, to engage in various usability tasks, and to respond to questions concerning the usability tasks (Table 1.), with improved materials and protocols. Distinctions among the Australian, Chinese and International web site versions were made more obvious in terms of theme, navigation bar, hypertext links, search tool, language, icons, colours and symbols. Other improvements not specific to differentiating the web site versions were also made. The instructions provided on each web site version in the main study were improved to include a link directing participants to a separate set of instructions to reduce the chance of "missing out" the second web site version and to guide participants through the sequence of tasks.

Table 1. Experimental groups and web site versions.

	Australian Web Site	Chinese Web Site	International Web Site
Group 1 (Australian Participants)	✓		✓
Group 2 (Chinese Participants)		✓	✓
Group 3 (International Participants)	✓		✓

2.2. NATURE OF PARTICIPANTS

The participants recruited for the pilot study were not used again in the main study in order to ensure independent observations. A total of 301 participants (99 Australians; 98 Chinese; 104 International) were recruited from within and outside Australia for the main study. Due to the recruitment method, it was not possible to achieve a gender balance, without extending the period of recruitment to an unreasonable length of time. All were aged between 18 and 70 years (mean of 36.4 years), with 197 males and 104 females.

The objective of this experimental study is to obtain a better understanding of an internationalised web culture. In the past two decades, due to job and educational opportunities in other countries, many people have moved from their place of birth. As the progress of the web also took place when relocation was increasing during the last twenty years, the influence of the English language was also rising. The widespread use of the English language is the outcome of the web coming from the U.S. and web sites using English as the principal means of distributing information online. This partially explains the likelihood of people who came from non-English speaking countries being able to understand English, especially among the younger generation who grew up using computers and the web, even though some may be living in their birth countries. In the main study, there was a greater opportunity of getting a multicultural sample, due to the interchange of people within the region and the recruitment method.

2.3. DATA COLLECTION

The main study utilised an Australian (Localised) version, a Chinese (Localised) version and an Internationalised version of the web site. Data was collected from demographic questions, web site usability tasks and questions concerning the tasks. Unlike the pilot study, the main study was conducted over a period of five months. During this period of time, data was collected until the participant numbers were considered adequate. No post-experiment interviews were conducted in the main study.

2.4. DATA ANALYSIS

The Nationality, Country and Culture variables were combined to result in the construct Dominant Culture. This was attained when each participant chose the same option (Australian, Chinese or Other) for two or three of the Nationality, Country and Culture

variables. If a different option was chosen for three of the mentioned variables, the option chosen for the Culture variable dominates the Dominant Culture construct.

The Language construct includes Mother Tongue and Preferred Language. In the online questionnaire as part of the demographic data, the participants were asked to choose from three options of Mother Tongue (Australian English, Mandarin, Other). Preferred Language (Australian English; Mandarin; International English) may be different from the Mother Tongue of participants. For instance, an individual whose Mother Tongue is Korean may prefer Australian English because he/she has spent most of his/her life in Australia. In this experimental study, participants were allocated to one of three groups as a result of their selection of Preferred Language because it was chosen as the dominant aspect of culture for the demographic represented by the participants, despite differing from their Mother Tongue. Thus, Mother Tongue represents the Language construct.

The Religion construct is represented by seven options (None, Buddhism, Christianity, Hinduism, Islam, Judaism and Other). Halal and vegetarian dishes had symbols assigned to them in the web site versions. Symbols for meat and beef were also assigned to clearly distinguish between vegetarian and non-vegetarian menu items on the virtual restaurant web site versions.

The Overall Culture encompasses the Mother Tongue, Religion and Dominant Culture of participants. They correspond to the cultural background of participants and assist the examination of the impacts of culture on web design and usability of the versions of Australian, Chinese and International web sites.

Independent variables comprised demographic factors: Computer Experience, Computer Usage, Web Experience, Web Usage, Nationality, Country Lived, Identified Culture, Years Living In Australia, Mother Tongue, Standard of English, Religion, Age and Gender. The dependent variables pertain to usability aspects of web site design which were assessed by participant performance and preferences, and consist of web task responses, web design responses, and open-ended survey responses. The relationship between independent and dependent variables is illustrated in Figure 1.

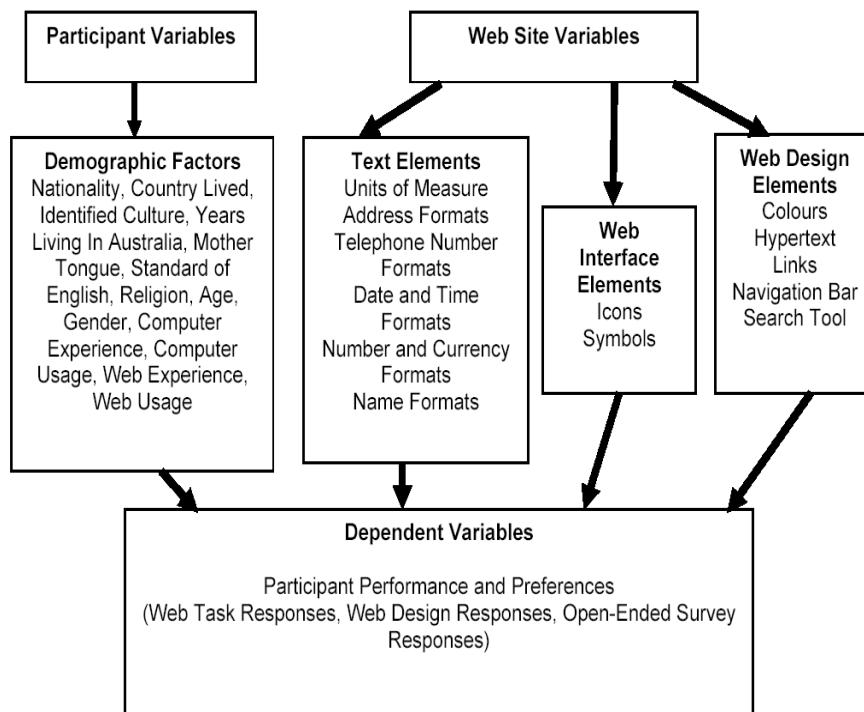


Figure 1. Relationship between Independent and Dependent Variables

An examination of the demographic factors was performed in terms of evaluating the data acquired for each set of the demographic variables. This provides some principal comparisons between variables from the different sets. The main aspects of the results from the evaluation of the data collected and the primary associations between variables from the different sets are summarised. A review of demographic variables provided a better understanding of the nature of the participants in the three experimental groups in the main study and informed the quantitative and qualitative data analyses carried out. The method of quantitative data analysis employed the same two-stage approach, including a reduction of data complexity process, as the pilot study. Quantitative and qualitative data analyses were performed using descriptive statistics, means, paired t-tests, chi-square tests and scenario-based content analysis. Paired t-tests were also used to measure the impact of Mother Tongue, Religion, Dominant Culture and Overall Culture.

3. Summary of Key Findings

3.1. SUMMARY OF DEMOGRAPHIC FACTORS

The three groups of language (Australian English, Mandarin and American (International) English) examined, were related to the language preferences of participants, rather than their Mother Tongue, and were used to allocate participants to the three cultural groups (Australian, Chinese and International). The aim was to investigate their impacts on web design and usability of the localised and internationalised versions of the web site.

As none of the International Group has spent most of their lives in Australia or China or has Nationality from those countries, the participants comprise an international sample. In addition, the Dominant Culture (derived) indicates that 60% of participants are associated with an International culture and a significant proportion (38%) of participants in the Australian Group has spent little time in Australia. Interestingly, only the Chinese group has a significant proportion (34%) of participants who have actually spent most of their lives in China.

As most participants have many years of experience with computers and the web, they are very heavy users of these technologies. Therefore, the results for these participants may be generalised for heavy web users but the same cannot be said for low users of web technology.

3.2. QUANTITATIVE AND QUALITATIVE DATA ANALYSES RESULTS

A comparison of paired t-test values of responses to web design items for the three experimental groups on the Australian, Chinese and International web site versions to assess the significance in differences between responses to web design items was performed. The preference for the International web site version was greater for most of the web design items (except Language) for the Chinese group than the Australian group. The rationale could be the Chinese group having an international sample, as pointed out by the summary of demographic factors in the previous subsection.

Overall, the Australian and Chinese participants provided more positive responses to open-ended survey questions on the International web site version than their own localised version (Australian and Chinese, respectively), may be because they are experienced and heavy users of the web. Additionally, most of the participants have had some practice with their targeted (localised) web site version first, so they found the second (International) web site version easier. On the contrary, the International participants provided more positive responses to open-ended survey questions on the International web site version than the Australian web site version, although the Australian version was looked at after the International version.

3.3. IMPACTS OF CULTURE

Comparisons of paired t-test values were carried out for the three experimental groups to assess the impact of the constructs Mother Tongue, Religion, Dominant Culture and Overall Culture using a summary score of the specific sets of web task responses, web design responses and comments which concern each of these constructs. The

performance of each group on two of the three web site versions is compared, to show the difference in preference for the Localised and Internationalised web site versions. The data utilised for comparisons concerning each of the four constructs is listed in Table 2. For assessing the construct "Overall Culture", all of the data used in the former three constructs were employed.

Table 2. Derivation of summary score of responses to tasks and questions related to each construct on each web site version by each experimental group.

	Web Tasks	Close-Ended Survey Questions	Open-Ended Survey Question
Mother Tongue	Web Task Responses (Text Elements)	Web Design Responses (Language)	
Religion	Web Task Responses (Symbols, Colours)	Web Design Responses (Web Interface Elements (Symbols, Icons), Web Design Elements (Colours))	
Dominant Culture	Web Task Responses (Colours)	Web Design Responses (Colours, Hypertext Links, Navigation Bar, Search Tool)	
Overall Culture	Web Task Responses (Text Elements, Symbols, Colours)	Web Design Responses (Language, Web Interface Elements, Web Design Elements)	Open-Ended Survey Responses (Comments)

The impact of Mother Tongue on web site versions is displayed in Table 3. and is assessed using a summary score of web task responses from the web tasks and web design responses from the close-ended survey questions pertaining to Mother Tongue on each web site version by each group of participants. This means that the Australian, Chinese and International groups prefer a web site in American (International) English (the International version of the web site) for measures pertaining to the construct Mother Tongue.

Table 3. Impact of Mother Tongue on web site versions for each group.

Groups	Web Site Versions	t	df	Sig. (2-tailed)
Australian	Australian and International	-8.954	98	.000**
Chinese	Chinese and International	-10.036	97	.000**
International	International and Australian	24.615	103	.000**

** = Significant difference at $p < 0.01$

The measure of the impact of Religion on web site versions is shown in Table 4. A summary score of web task responses and web design responses associated with the construct Religion are used to establish this impact on each web site version by each group of participants. The significant results show that the Chinese group prefers the International web site version (the International web site version scores significantly higher than the Chinese web site version for the Chinese group), while the International group prefers the Australian web site version (the Australian web site version scores

significantly higher than the International web site version for the International group) for usability measures related to Religion.

Table 4. Impact of Religion on web site versions for each group.

Groups	Web Site Versions	t	df	Sig. (2-tailed)
Australian	Australian and International	.120	98	.905
Chinese	Chinese and International	-2.355	97	.021*
International	International and Australian	-4.687	103	.000**

* = Significant difference at $p < 0.05$

** = Significant difference at $p < 0.01$

The impact of measures pertaining to Dominant Culture on web site versions is tabulated in Table 5. This assessment of the impact is measured using a summary score of web task responses and web design responses related to Dominant Culture on each web site version by each group of participants. Similarly, the significant results show that, for usability measures associated with Dominant Culture, the Chinese group favours the International web site version (the Chinese group prefers a web site that uses American cultural items than a web site that uses Chinese cultural items) and the International group favours the Australian web site version (the International group prefers a web site that uses Australian cultural items than a web site that uses American cultural items).

Table 5. Impact of Dominant Culture on web site versions for each group.

Groups	Web Site Versions	t	df	Sig. (2-tailed)
Australian	Australian and International	-1.323	98	.189
Chinese	Chinese and International	-7.197	97	.000**
International	International and Australian	-2.258	103	.026*

* = Significant difference at $p < 0.05$

** = Significant difference at $p < 0.01$

The impact of Overall Culture on web site versions is shown in Table 6. The results disclose that the Australian, Chinese and International groups all prefer a web site that uses American web design elements, text elements and web interface elements.

Table 6. Impact of Overall Culture on web site versions for each experimental group.

Groups	Web Site Versions	t	df	Sig. (2-tailed)
Australian	Australian and International	-6.210	98	.000**
Chinese	Chinese and International	-11.138	97	.000**
International	International and Australian	6.137	103	.000**

** = Significant difference at $p < 0.01$

3.4. SUMMARY OF FINDINGS IN THE CONTEXT OF HYPOTHESES

This experimental study aims to investigate the differences in usability of web sites for users from different cultures. A summary of findings in the context of hypotheses shows that only three of the thirteen hypotheses were supported (Table 7). The impact of Overall Culture contributes to the support of the hypotheses.

Table 7. Summary of Findings in the Context of Hypotheses.

Hypothesis Number	Hypothesis Description	Constructs	Finding
H1	An Australian (Localised) version of a web site is more usable than an Internationalised version for Australian users.	Overall Culture	Not Supported
H2	A Chinese (Localised) version of a web site is more usable than an Internationalised version for Chinese users.		Not Supported
H3	An Internationalised version of a web site is more usable than an Australian (Localised) version for users other than Australians and Chinese.		Supported
H4	A web site in Australian English is more usable to an Australian user than a web site in International English.	Mother Tongue	Not Supported
H5	A web site in Mandarin is more usable to a Chinese user than a web site in International English.		Not Supported
H6	A web site in International English is more usable to a non-Australian user and a non-Chinese user than a web site in Australian English.		Supported
H7	There is a potential relationship between religion of the user and usability of a web site (for example, a web site including an Islamic religious Symbol is more usable to a Muslim user).	Religion	Not Supported
H8	A web site which reflects Australian cultural items is more usable to an Australian user than a web site which reflects International cultural items.	Dominant Culture	Not Supported
H9	A web site which reflects Chinese cultural items is more usable to a Chinese user than a web site which reflects International cultural items.		Not Supported
H10	A web site which reflects International cultural items is more usable to a person other than an Australian user and a Chinese user than a web site which reflects Australian cultural items.		Not Supported
H11	An Australian web site which uses a local version of web design, text and web interface elements is more usable to an Australian user than an International web site which uses International web design, text and web interface elements.	Text Elements, Web Interface Elements, Web Design Elements	Not Supported
H12	A Chinese web site which uses a local version of web design, text and web interface elements is more usable to a Chinese user than an International web site which uses International web design, text and web interface elements.		Not Supported
H13	An International web site which uses an International version of web design, text and web interface elements is more usable to an International user than an Australian web site which uses local web design, text and web interface elements.		Supported

The results show that there is a higher possibility for a “world wide web culture” than a “world wide web of cultures” for the kinds of users characterised by participants in this study (Turk, 2000), having significant exposure to web sites. A review of demographic factors indicates that the users in each experimental group are experienced and heavy users of the web, which may explain their preference for the internationalised versions of the web site. Overall, the results show significant differences in responses to the three different web site versions by participants from the three different cultural groups, with each group favouring American (International) English and the Internationalised web site version.

4. Conclusion

This paper reports on the main study phase of the experimental study. An overview of the experimental study was provided using the experimental design, nature of participants, data collection and data analysis. A review of demographic factors obtained from the responses of the participants distinguished the data analysis method used for the main study from that for the pilot study. Finally, a summary of key findings of the main study was presented, in the context of hypotheses. A summary of demographic factors was also provided to help understand the nature of the participants in the three experimental groups. The details will appear in a later publication.

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