CULTURAL DIFFERENCES BETWEEN TAIWANESE AND GERMAN WEB USER

Challenges for Intercultural User Testing

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Abstract: Measuring the performance of a user with a web site reveals that the culture of a user is an important factor. A test of Taiwanese and German students resulted in various significant differences in effectiveness, efficiency and satisfaction. Task design and results of the experiment are presented. Human-computer interaction can be evaluated by different means. The paper discusses how methods need to be interpreted in international user test settings. For example, time might not be a valid measure in long-term oriented cultures for all interaction tasks.

1 INTRODUCTION

Culture determines the way people deal with their environment and how they interact in social groups. The role of superiors in a society and the perception of time are examples for issues which are dealt with differently in different nations. Culture affects the design of information systems as well. Optimal design of information systems for users from other cultures requires an understanding of the concept of culture and the factors that contribute to its existence. In a globalized world, such an analysis can ultimately lead to better information systems. A good understanding of the cultural differences between web pages and their perception can support system designers in optimally modifying their pages for a particular culture.

Finding out differences about web site perception is important and at the same time difficult. User testing in human-computer interaction usually randomly selects users and assigns them to (often two) different system designs in order to determine the superior design. Doing this, comparable user populations can be created. However, culture is a variable which cannot be randomly assigned to the users. Therefore, culture might have effects on the test situation which cannot be controlled. Such test are sometimes called quasi-experimental (Borth & Döring, 1995). The interpretation of intercultural user tests needs to take care of these issues. Some of these issues are discussed in this paper. They are as far-reaching as measures of success are concerned.

The remainder of this paper is organized as follows. Section two defines culture for the purpose of this paper. The next section briefly reports the state of the art on cultural research within web design. Section four explains the experimental setup. Section four five elaborates the results which are followed by a discussion and the paper ends with a conclusion.

2 CULTURAL DIFFERENCES BETWEEN TAIWAN AND GERMANY

There are many definitions of culture (Kroeber & Kluckhofen, 1952). The influential Dutch anthropologist Hofstede defined culture as learned patterns of ”thinking, feeling, and potential acting” that form the mental program or the ”software of the mind” (Hofstede & Hofstede, 2005) of an individual. This particular ”software” affects our way of thinking and acting in the world. National or social cultures define how people interact with each other, e.g. in groups and their environment.

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Culture is often illustrated by using the metaphor of an onion: the most visible outer layers are easier to access than the hidden inner core, which is difficult to identify (Trompenaars & Hampden-Turner, 1997). Visible aspects of a culture are easily recognizable for anyone. The invisible ways of thinking and dealing with the world are much more difficult to access. This leads to many misunderstandings in intercultural encounters. For example, while the greeting behaviour can be easily observed in a different culture, it is much more difficult to find out how a culture deals with unavoidable uncertainties of our existence.

Cultures are often classified in accordance to their relative positions on a number of polar scales which cultural anthropology commonly calls cultural dimensions. The position of a culture on those scales is determined by the dominant value orientations. Such quantified models of culture are difficult to find. Hofstede originally defined four dimensions of culture (Hofstede & Hofstede, 2005):

1. **Power distance** measures the extent to which subordinates (employees, students) respond to power and authority (managers, teachers) and how they expect and accept unequal power distribution. In high power distance cultures, individuals pay more respect to superiors.
2. **Individualism vs. Collectivism**: these value orientations refer to the ties among individuals in a society. In collectivist cultures, individuals define themselves more as members of a social group. They are expected to share their belongings with the group and can rely on the backup within the group.
3. **Uncertainty avoidance** describes the extent to which individuals feel threatened by uncertain or unknown situations. High uncertainty avoidance cultures try to avoid or prepare for risks.
4. **Masculinity vs. Femininity**: these two extreme values of this dimension focus on the differences between the social roles attributed to men and women and the expected behaviour of the two sexes. Masculine values are related to competitiveness and feminine values are related to quality of life.

After much criticism about the Western orientation of the whole model, Hofstede added a fifth dimension which origins from East Asian cultures and which is related to time: Long-term vs. short term orientation. Long-term oriented societies are willing to invest and wait longer for the return. In short-term oriented cultures, individuals want to get the return for their investment very fast (Hofstede & Hofstede, 2005).

Trompenaars introduced another dimension which is important: universalism vs. particularism. Universalism means that rules are to be followed under all circumstances. Under particularism, the members of a culture follow relax rules according to the circumstances (Trompenaars & Hampden-Turner, 1997).

A dimension strongly related to individualism vs. collectivism dimension is high vs. low context. In a culture of low context information must be explicitly stated. In a high context culture, information is transferred to a large extent by context and requires knowledge of the culture in order to read the context information (Beneke, 2001).

There has been much criticism on the cultural dimensions as proposed by Hofstede and others. For example, Hofstede only considered national cultures. However, there are often heterogeneous sub-cultures within countries which should be considered independently. Despite the criticism, the dimension remain an appealing approach for researchers in information technology because they provide a quantitative model and they are very plausible.

The main differences between Germany and Taiwan can be seen in table 1. We also display the values for the USA, because the web sites of American universities were used in the user test. It can be observed that Germany and the USA are much closer than Taiwan to any of the two other cultures.

Table 1: Values of Cultural Dimension (http://www.geert-hofstede.com).

Dimension	Germany	USA	Taiwan
Long-term Orientation	31	29	87
Individualism	67	91	17
Power Distance	35	40	58
Masculinity	66	62	46
Uncertainty Avoidance	65	46	69

As an illustration for the differences between both countries, we show the text of a Taiwanese traffic ticket which exemplifies the values of keeping face and the collectivistic orientation: "*We beg your pardon that we need to charge a fee from you in order to follow the laws to maintain public order and the security of the traffic. We hope that you understand that and that you will see to follow the*

traffic rules in the future. We wish you health and peace." (Chen 2004).

3 CULTURE AND WEB PAGE DESIGN

People form their environment and create artefacts under the influence of culture. This is also true for information technology and especially software. People from different cultures have different points of views on how good systems look like (Mandl & de la Cruz, 2008). In order to achieve good usability and success on the market, system designers should consider these cultural factors and adopt systems to the target culture.

Consequently, web pages and e-commerce sites also need to be adapted to the language and culture of the potential user or customer. This process is referred to as localization (Aykin 2005). Many suggestions for the adaptation refer to simple facts like formats, colors or symbols. Moreover, localization also needs to consider hidden aspects of culture (del Galdo 1996, Sturm 2005).

For research on the localization of information systems, cultural dimensions have often been a starting point because they provide a plausible and quantified culture model. Marcus et al. 2003 presented examples for differences for all cultural dimensions which are convincing. However, their findings are based on a small and pre-selected set of web sites. Moreover, it is not clear how cultural dimensions may contribute to research on intercultural web design. Some authors noted that the assumptions made on the basis of cultural dimensions were misleading (Griffith 1998).

An early study of Barber & Badre (1998) tried to find typical cultural markers in an inductive approach. The approach of Marcus et al. (2003) started with knowledge on cultural dimension in general and intended to locate effects within web sites. This could be labelled a deductive approach. Cultural markers are also procured by Sun (2001). His study which included interviews about certain homepages showed that the presence of cultural markers increased the aesthetic satisfaction with a web site. However, only few users were interviewed (Sun 2001).

The methodology for intercultural research is especially problematic. What is measured in a human-computer interaction experiment in an intercultural setting? Can good vs. bad design be determined or can usability or typical design for one culture or another be identified? Empirically convincing studies are difficult to set up from a methodological point of view. In common quantitative human-computer interaction studies, two versions of a user interface are presented to two user groups who are selected from the same culture and who are believed to be homogeneous. For comparative studies in international web design analysis, the user groups are different and their reaction to the system is under investigation. However, it is difficult to leave the system constant. The system cannot be presented to two groups of users from different countries without modification. The system needs to be translated and culturally adapted. For example, the investigated task may be embedded completely differently in the two cultures. Typical user groups like university students may have quite different features like social group in different societies. Hence, the system often needs to be changed significantly in order to be adequate for a real-life experiment which makes comparability difficult (Evers 2002). This is a general problem is intercultural research (Eckensberger & Plath, 2003).

In order to overcome these problems, sometimes expatriates are used as test users (Sheppard & Scholtz,, 1999). For tests with e-learning systems, foreign students can be used (Kamentz & Womser-Hacker, 2003, Kamentz & Mandl, 2003). This method may relax the problem of the language barrier, however, it needs to be emphasized that language competency in a second language is not comparable with the language competence in a native language. Another way to overcome the methodological problems is the use of mock-up systems instead of real-life web pages (e.g. in Sheppard & Scholtz 1999, Hodemacher 2005). The drawback lies in the artificiality of the experiment. One further method is the use of pages which are in a foreign language for all test users (e.g. Schmitz 2005, Dormann & Chisalita 2002). Dormann & Chisalita try to quantify the differences between the perception of test users from different cultures and the design of web sites from other countries. Their analysis is focused on the dimension femininity vs. masculinity for university web sites in Italy and Scandinavia.

A different methodological approach is adopted by Kralisch & Berendt (2004). They used web log mining to infer preferences of users. Web log mining exploits the log files which ware automatically collected when users access web sites. They could show, for example, that users from long-term oriented cultures are more likely to use browsing than keyword search (Kralisch & Berendt, 2004).

Key word search leads to the goal faster, however, browsing through an ontology might help the user with orientation within an information system at future search tasks. The time invested for getting to know the system is invested and the users hope for a return in the future. They assume that knowing the system will facilitate their future searches. Long-term oriented cultures are more willing to invest this extra effort whereas short-term oriented cultures tend to value quick access to information more highly. They rely more on key word searching.

The ultimate goal of studies which intend to reveal effects of culture on web site design and perception is the design of optimal systems. The influence of culture needs to be measured and later applied to user interface design.

4 EXPERIMENTAL DESIGN

We conducted a user test in Taiwan and Germany in order to determine differences in the perception of web sites and preferred navigation techniques. We chose university students as test subjects because they are easy to recruit. Students are usually considered to be a group which has comparable socio-economic features. However, even that may not be the case in cultures which are far apart. Although the const of living for students is much higher than in Germany and tuition is also higher, the percentage of students within the society is higher in Taiwan.

The tasks for the user test were chosen to be natural for university students. We created a scenario in which the student wants to study abroad and needs to acquire information from American universities. This is a natural task for both German and Taiwanese students because from both groups many individuals study in the USA at some point in time. Nevertheless, Taiwanese students are likely to gather such information from informal sources like personal contacts rather than from web sites. By choosing queries on American universities (Babson College, Adams College, Cedarville University) as natural tasks, we also managed to have comparable information systems for the user test. We needed no artificial web sites nor translation of web sites from one language to another. We selected only students with at least good English language skills. The selected universities are the Babson College, the Adams College and the Cedarville University. These three sites differ in their web site design and represent conservative as well as innovative designs. The site of the Butler University was used in addition because it displays its main menu on the right side. This might be preferred by Taiwanese students because it goes along with the Chinese reading direction from right to left. The site of the American education ministry was included in one search task.

The groups of test persons in Germany as well as in Taiwan needed to interact with web sites which were in a foreign language and which were not developed for their particular culture. We believe that this is a good strategy to determine differences in web site perception in a comparative test. Certainly, it is not an adequate strategy to determine the most appropriate design for one specific culture.

For this study, 24 students both from Taiwan and Germany were recruited. All test persons were between 20 and 30 years old. The majority fell into the age group between 23 and 24. In both test groups, both sexes were almost equally represented. Almost one third of the Taiwanese students and one fifth of the German students had visited the USA prior to the test. Nevertheless, the Taiwanese students graded their English competence almost one grade lower than the German students. The test in Taiwan and Germany was conducted in English which seems to be a valid method (Dray, 1996). A control group of additional German students was tested in English in order to measure the quality of the foreign language material.

The test consisted of a pre-interview, two search tasks for all three universities and finally an interview and a questionnaire about the sites, tasks and performance. Thinking aloud was encouraged before the test. Six search tasks typical for the information needs of foreign students were designed. A typical test task was: *Which MBA programs are offered at College X*? A time limit of three minutes was set for this task. Another task was: *Which kinds of stipends are offered at College Y*?

5 RESULTS

The results are based on the objective measures and the subjective ratings provided by test subjects.

5.1 Performance Measures

Task completion was measured for all six tasks. Overall, the performance was satisfying and Taiwanese students performed worse as shown in table 2. For one task, the difference was significant with a error probability below 1%.

Table 2: Task Completion. Significant difference between groups is marked with *.

Task	Taiwanese students	German students
1	75%	87.5 %
2	29.2%	50%
3	83.3%	100%
4*	41.7%	83.3%
5	75%	87.5 %
6	75%	87.5 %

This confirms the hypothesis that German students get along better with the American web sites because the two cultures are similar. This result is confirmed by remarks of Taiwanese test students who found the American sites "completely different" than Chinese or Taiwanese sites. The same cultural adequacy is supported by the completion time of those test subjects who finished the tasks. It can be seen that the German students were mostly faster. For four tasks, the difference is statistically significant according to a T-test.

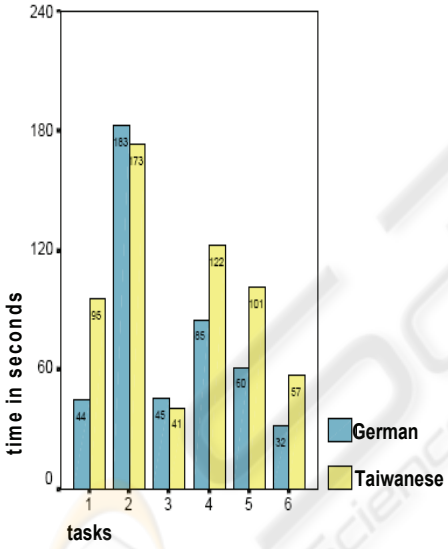

Figure 1: Task Completion Time.

To investigate the influence of testing in a foreign language, a German verification group was tested with the test material in their native tongue. Within this group, the task completion time was only for two tasks below the task completion time in the test with English. The only statistically significant difference was found for a task for which the German group was slower.

It was expected that the Taiwanese would take longer to complete the tasks. At the same time, it was assumed that they would tolerate the longer completion time due to the long-term orientation of their culture. This was examined with a post test questionnaire. Test subjects were asked whether they agree with the following statement: "I found all necessary information in due time".

Contrary to the hypothesis, Germans tend to agree stronger with this statement on a six-point scale. The difference is even statistically significant. However, this result must be interpreted under consideration of the task completion figures. The agreement with the statement correlates strongly with success of the test person for the corresponding task. The following figure shows the answers of Taiwanese students for task six. The students who finished the task and the students who did not finish the task are marked with different colours.
There are not enough students who finished the task to conduct a statistical test. The hypothesis that Taiwanese students as members of a long-term oriented culture are more patient during their search tasks and that they are willing to invest more time cannot be proven statistically. However, we tend accept this hypothesis. The Taiwanese students took also more time to fill out the questionnaire and ended up with a longer overall test time (75 minutes compared to 45 minutes). They invest more time and expect a better performance in the future. They are more oriented toward long-term success than short-term performance.

5.2 Preferred Search Method

Based on results from previous research, we formulated a hypothesis that Taiwanese students would use browsing options more often for finding the result. Long-term oriented cultures seem to tend to use links in order to have better orientation whereas members of short-term oriented cultures tend to use keyword searches more often because they emphasise short-term success over long-term learning.

This hypothesis could not be verified. Germans relied more on links than the Taiwanese students who tended to use site search functions more often. However, the differences shown in table 3 are not statistically significant. The utterances during the test confirm that the hypothesis needs to be rejected. Taiwanese students explicitly stated that they used keyword search because it is faster. At the same time, Germans stated that they want to get orientation. Maybe uncertainty avoidance also influences the search options used. In addition, bad experiences with search systems need to be considered as well. Further research is necessary.

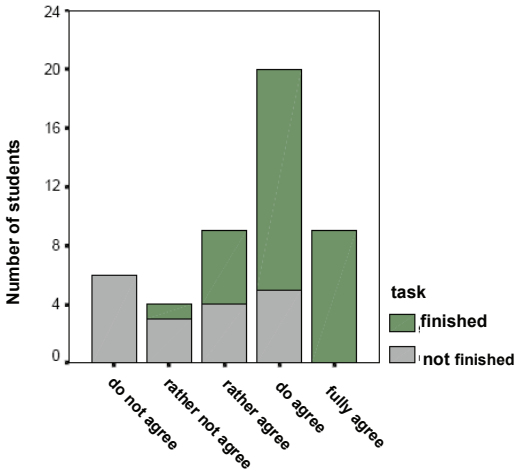

Figure 2: Task completion and subjective rating.

Table 3: Search Options.

Search Options	mainly keyword search	keyword search as well as links	mainly links
Taiwanese students	25.0 %	20.8 %	54.2 %
German students	16.7 %	8.3 %	75,0 %

The links followed during the test were categorized as text or graphic links. A hypothesis was formulated, that Taiwanese students would rather use graphic links because they are from a high context culture. The pages contained few graphic links overall. Consequently, most links used were text links. However, five out of 24 Taiwanese students used graphic links and only one out of 24 Germans. The data supports the hypothesis but statistically significance cannot be achieved.

For one search task, the test persons had the choice of either using a standard search engine like Yahoo and Google or the search page of the ministry of education. The high power distance in Taiwan suggests that Taiwanese students would rather use the authoritative search engines from the ministry. This is indeed the case. Only 52.4 % of the Germans used the ministry search compared to 62.5 % of the Taiwanese. However, the difference is not statistically significant (T-Test).

5.3 Information Design

Two questions on the questionnaire tried to find out whether the users were satisfied with the information present on the pages. High context cultures might require less information than low context cultures like Germany. Test persons were asked whether there was sufficient information on the pages and whether there was too much information. No significant result supporting the hypothesis was found. This might be due to the test design. Germans might have been satisfied with the level of information because they are from a culture similar to the culture of the web sites. The Taiwanese students might have been satisfied with even less information but did not feel that it was too much. Too little information on a page might be seen as more negative. A test with pages from a culture with even higher context might be helpful. Not all deviations from the preferred model are interpreted equally. This result has also been obtained by other experiments (Dormann & Chisalita, 2002).

Students were asked whether they find information on the administration of a university to be important. Students from Taiwan with a higher power distance might find such authoritative information more important. This is indeed the case. Taiwanese students assigned an importance grade of 3.63 on the six point scale from 0 to 5.0 whereas the Germans assigned a lower average grade of 2.0. The observed difference proved to be statistically significant (T-Test, 1% error probability).

One web site had a menu on the right side. The attitude towards this for Westerners unusual position was queried in the questionnaire. Taiwanese students overwhelmingly thought that this position is acceptable (87.5 %) while only about half of the Germans found it acceptable (47.8 %). The difference is statistically significant (T-Test, 1% error probability).

Animations were used on one site and they were evaluated much more negatively by Taiwanese students.

6 CHALLENGES FOR INTERCULTURAL USER TESTS

The test showed that cultural distance seems to lead to a decrease in performance during the human-computer interaction with web sites. Some differences might be caused by cultural reasons other than the perception of the web site. These problems make such test difficult and need to be considered during test design.

Students were asked to grade their knowledge of English. On average, the Taiwanese students selected almost one grade lower than the German

students although the Asians have more travel experience in the USA. This is likely to be due to the modesty required by the culture which is rooted in collectivism. This assumption is supported by utterances during the test. One student from Taiwan said: "I can't take very good, can I?" Modesty leads generally to a situation in which Asians tend to assign less extreme grades in questionnaires (Evers 2002). This effect may have skewed some of the results obtained by questionnaire. It seems necessary to modify the scales offered for both groups. This is done for social science surveys (Iwai, 2005).

The main problems caused for the test in Taiwan were due to the importance of face keeping in the culture. Test subjects were reluctant to use the thinking aloud method because they might reveal a personal mistake. Similar observations have been reported before (Evers, 2002). Group tests are sometimes mentioned as a means to alleviate these issues, however, they might be seen as a competitive test situation and make test subjects even more uncomfortable. The test situation might even have led to some discomfort because a woman was conducting the user test in Taiwan.

An important factor is that also objective data and its relation to subjective data needs to be interpreted within the context of the culture. Subjective and objective data measure different aspects of usability and do not always lead to the same preference (Hornbæk & Law, 2007). In intercultural user test settings, the relation depends on the culture. For non-repetitive tasks like explorative searching, the time spent on the task might not be felt as negative by long-term oriented cultures.

7 CONCLUSIONS AND OUTLOOK

Our study clearly indicated that users from different cultures perform tasks differently on the same web sites. The differences can often be interpreted within cultural models like the dimension of Hofstede. Some previous findings on cultural differences could be confirmed, others could not be supported by our findings. The preferences of search options based on long- vs. short-term cultures as well as the preference of high context cultures for rich representations could not be supported. On the other hand, the effect of power distance on the content of a web site was confirmed. The users from a culture more similar to the culture of the tested sites had better results which might be due to their cultural closeness.

Many difficulties of international user testing were identified. Results need to be interpreted within the culture of the users. Merely statistical analysis might give to misleading results. However, many more studies are necessary to gain more insight into the consequences of different cultures on the creation and usage of software systems. In the context of the globalization, the topic is more and more important.

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