



**Aaron Marcus and Associates, Inc.**  
1196 Euclid Avenue, Suite 1F  
Berkeley, CA 94708-1640, USA

**Experience Intelligent Design**  
User-Interface Development  
Information Visualization

Email: Aaron.Marcus@AMandA.com  
Tel: +1-510-601-0994, Fax: +1-510-527-1994  
Web: www.AMandA.com

AM+A White Paper:

# A Practical Set of Culture Dimensions for Global User- Interface Development

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## Abstract

User-interface design is influenced by cultural differences. Cultures around the world have different patterns of social behavior and interaction that have led anthropologists and scientists of communication to develop culture models whose dimensions describe these differences. This paper describes an effort to collect expert opinion about these cultural dimensions and how they influence user-interface design. The goal was to determine the most important dimensions. Data collected from over 50 experts in the field of user-interface design are presented in this survey. This paper is an edited extract of a much longer thesis by one of the authors [Baumgartner].

## Author

Mr. Aaron Marcus, President  
Aaron Marcus and Associates, Inc.  
1196 Euclid Street, Suite F  
Berkeley, CA 94708-1640, USA  
Tel: +1-510-601-0994, Fax: +1-510-527-1994  
Email: Aaron@AMandA.com

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## Introduction

People from different countries/cultures use user-interfaces (UIs) in different ways, prefer different graphical layouts, and have different expectations and patterns in behavior. Therefore user-interfaces must be adapted to the needs of different locales to provide an optimum user experience.

Localization, for example of Web sites or software applications, includes changing metaphors, mental models, navigation, interaction, and appearance [Marcus, 22ff). Much research is done on the topic of localization regarding technical approaches (e.g. display different character sets, multi-language handling, and memory-based translation software). To facilitate the work of translators and multi-language site providers, content management systems (CMS) were invented that support different cultures, but only regarding text and translation. In fact, current CMS are not really able to handle most other aspects of content and therefore cultural differences automatically, especially regarding graphical appearance. Today, if a company or organization decides to adapt a UI to a certain culture, much time and money must be spent to accomplish this task well: besides all the terminology/measurement changes and translation, one must hire cultural experts for all the targeted countries to account for all UI-component changes. Nielsen [Nielsen, 1996] admits that international usability engineering is a challenging and often avoided area because of the many issues that have to be covered when one wants to serve an international audience. [Nielsen, Engineering, 1)

To facilitate and lower the costs of localizing, the development of a CMS that could handle the expanded requirements of localization would be helpful. To support an eventual development of such a CMS, it is desirable to identify the most important dimensions of culture regarding UI development. This idea is based on the work Marcus has done using Geert Hofstede's cultural dimensions and applying them to the field of UI design [Marcus and Gould]. This current research goes further and seeks to find out if Hofstede's dimensions, or others, are appropriate to use for culture-oriented evaluation of UIs.

Many researchers in the field of anthropology have studied patterns of behavior and thinking that differentiate one culture from another. Some of them have compiled these patterns into culture models. To gather expert opinions about which of the dimensions of these models are important when localizing UIs, a set of dimensions extracted from primary references were presented to experts in the form of a questionnaire. The experts were asked to rank the dimensions according to their perceptions of importance. The outcome of the ranking is the basis of an analysis about which dimensions are important for the field of UI design

and why they are important. Clearly, which dimensions are the most important can be controversial. Nearly every participant made statements pointing to this controversy: everything depends on the purpose of the UI and the locale itself. Nevertheless, the goal was to derive a concrete result that provides a basis for further discussion.

## Culture Dimensions and User-Interface Design

The meaning of the term *culture* is complex and used in different ways among many professions. One of the many definitions found in the *Merriam-Webster OnLine Dictionary* is the following: Culture is “the set of shared attitudes, values, goals, and practices ...” (Webster, online). Del Galdo adds: “In addition, culture can also be affected by nationality, language, history, and level of technical development.” [del Galdo, 78]. We can use categories to differentiate one culture or country from others. *Dimensions of culture* are “...categories that organize cultural data.” (Hoft, Developing, 41) “The notion of cultural dimensions originated in cross-cultural communication research done by Edward Hall and Florence Kluckhohn and Fred L. Strodbeck in the 1950s.” [Gould *et al*, 3]. Many anthropologists have done research in the field of cultural dimensions. One of the most cited studies is that by Geert Hofstede. In the 1970s and 80s he did a survey at IBM that “dealt mainly with the employees’ personal *values* related to work situation...” Within this study he covered 72 national subsidiaries, 38 occupations, 20 languages, all in all about 116,000 people. [Hofstede, Cultures, 251]. Based on this survey he came up with five dimensions of culture. Other anthropologists and communication scientists also did studies or academic research to determine different cultural dimensions.

This present study derives from the work of one co-author (Marcus). Marcus combined the scheme of Hofstede’s five cultural dimensions and the scheme of five UI design components to create a five-by-five matrix that allows for 25 fields of interest. An article by Marcus and Gould [Marcus and Gould] points out possible implications of Hofstede’s dimensions for UI components. During an internship at Marcus’ firm, Baumgartner was involved in a study that attempted to find out if these assumptions match with “real life”: *i.e.*, can examples be found in localized Web sites? For this analysis, we attempted to be generally inclusive under constraints of time and chose reasonably complex, different “B2B” and “B2C” Websites from three different continents (North America, Europe, and Asia). The exact circumstances of each Web site design could not be determined; however, we examined evidence from the sites themselves. The results of this study, presented at IWIPS03 [Marcus and Baumgartner] are the following: (1) The matrix-oriented method helps to organize and analyze data collection and (2) initial observations suggest that cultural habits run deeply and operate even under constraints of global design specifications. In high individualistic and low power-distance countries, variations from standard practice seem likely to be most frequently observed.



Economic progress	Meaning of life	Time perception
Experience of technology	Nonverbal communication	Uncertainty avoidance
Face-saving	Political decentralization	Universal vs.particularism
Gender roles	Power distance	

The experts used in the survey included, among others, the following:

Adelman, Denny	Hugo, Jacques	Robinowitz, Christina J.
Amend, Sabine	Jettmar, Eva	Schlatter, Tania
Begley, Suzanne	Kalbach, James	Scholts, Stijn
Beu, Andreas	Khan, Zayera	Schutz, Bart
Bonnaudet, Jean-Marc	Knapheide, Claus	Scott, Josephine
Campbell, Tanya	Kumar, Ripul	Sheridan, E.F.
Chen, Eugene	Laurel, Brenda	Simlinger, Peter
Cole, Melissa	Lee, Junghwa	Simons, George
Deaton, Mary	Marcus, Aaron	Southerton, Laurie
El Said, Ghada Refaat	Martlage, Aaron	Stamboulie, Mary
Epstein, Andre	Massey, Anne	Sturm, Christian
Gargeshwari, Malinirao	McAllister, Pamela	Vöhringer-Kuhnt, Thomas
Gould, Emilie	Meek, Amanda	Wright, Matthew
Guan, Larry	Mitra, Romit	Yankee, Everyl
Hedges, Andrew	Müller-Prove, Matthias	Yunker, John
Hidasi, Judit	Nowell, Jessica	Zimmermann, Claus
Hoffmann, Anja	Paulsen, Susan	
Hoplaros, Costas	Penn, Dick	

## Survey, Results, and Ideas for Practical Use

After studying the described 29 dimensions by nine authors, a questionnaire was compiled that described the dimensions briefly. This questionnaire became a tool to get expert opinion quickly and in a structured form. Although the questionnaire might appear like one produced for a quantitative study (use of a Likert Scale), the real purpose was to get ideas about thinking directions of UI designers and analysts, which were obtained through an online questionnaire. The questionnaire gained background information about the participants, presented brief descriptions of each dimension and the rating system, listed the dimensions to be rated, and provided fields for extra comments by participants. To find out if the structure of the questionnaire was appropriate and the estimated time to fill out the form was correct, a pretest was conducted with a group of UI design students at the Fachhochschule Joanneum, Graz, Austria. In order to get valuable input for the survey, experts were contacted in four ways: research within specialized literature to find expert's names combined with Internet research for email addresses, mailing lists in the field of UI design and cultural matters, relevant companies, and relevant conference. Regarding feedback, personal contact and contact via expert mailing lists were the most efficient and effective.

The objective for the survey was to get 30 expert opinions. By the deadline for the survey 57 experts had completed the questionnaire. The participants are from 21 different countries across the world (Australia, Austria, Belgium, Canada, China, Cyprus, Egypt, France, Germany, Hungary, India, Japan, Mexico, Netherlands, Pakistan, Scotland, South Africa, Switzerland, Sweden, UK, and the United States). 19 respondees work in a different country from which they were born (and raised) in. Approximately 43% of the participants originally came from North America and 39% from Europe. They currently work in North America (47%) and Europe (37%). Regarding the participants experience in the field of UI design, 27 had 3-7 years and 14 had 7-11 years of experience. The participants are from more than 40 different institutions including global companies (e.g. Siemens, Peoplesoft, and Ogilvy), universities (Kanda University of International Studies, Stanford University, The George Washington University) and many smaller, specialized companies.

The expert's comments on the survey were positive. Many mentioned that the set of 29 dimensions itself would form a helpful tool in their

future work to understand cultural differences. The statement “None of them seemed unimportant” by one expert confirms this impression. However, at least three experts stated that these cultural dimensions do not really have influence on their daily work. This attitude seems ascribable to cultural ignorance, but this opinion must be validated through further research. As already stated, nearly everyone mentioned that “everything depends” on the purpose of the UI itself and the domain of the users. To analyze the data from a statistical point of view is risky; as stated earlier, the study is basically a qualitative one, not quantitative. Concepts like deviation and variance in the raw data are not very meaningful. Ordinal values must be considered instead of metrical. Thus we include a factor analysis, as shown in Figure 1.

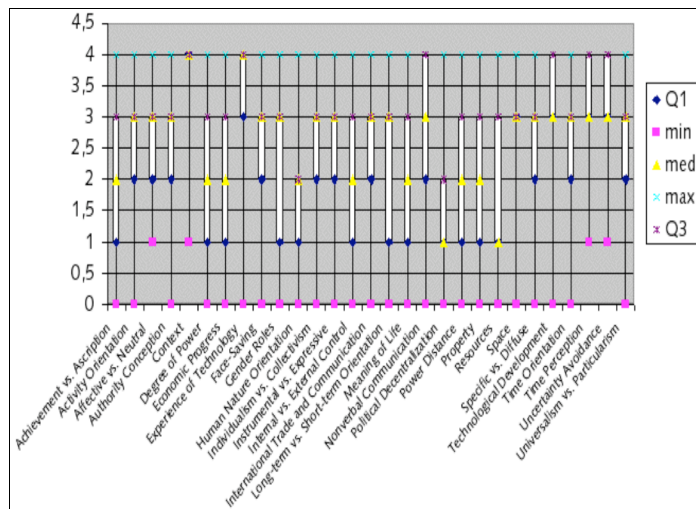


Figure 1. Boxplot or whisker diagram of the data gained through the questionnaire

The boxplot in Figure 1 tries to visualize the distribution of expert ratings. To analyze ordinal values, parameters like first quartile (Q1), third quartile (Q3), minimum (min), median (med), and maximum (max) are used. A boxplot provides a simple graphical summary of a set of data. It shows a measure of central location (the median), two measures of dispersion (the range and inter-quartile range), the skewness (from the orientation of the median relative to the quartiles) and potential outliers (marked individually). Boxplots are especially useful when comparing two or more sets of data. As stated previously, the survey was intended to deliver directions of thinking; it is not mainly a quantitative survey. The comments most of the participants offered were very valuable and gave insight into the expert’s mental models and experience. Nearly all participants pointed out that a general opinion on this topic is very hard to provide: “everything depends” was a very common comment.

Nevertheless, each of the participants provided a ranking of the dimensions.

To filter out the most important dimensions in a general sense, one draws a “line,” which seems best after the dimension of *Authority Conception*. The statistical reasoning for this decision is the following: There are just five dimensions that are clearly located in the space between “very important” (4) and “important” (3): context, environment and technology, technological development, time perception, and uncertainty avoidance. As authority conception is, in the average, still very high and in the statistical ranking of the experts with more than five years of experience even at rank 5, it seemed reasonable to include this dimension in the top five dimensions. The following list summarizes the results for the most important culture dimensions [Baumgartner]:

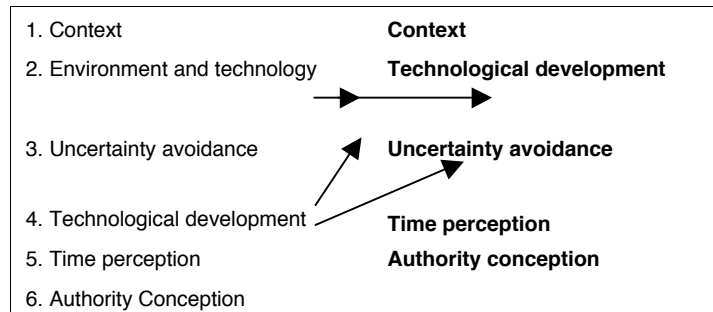


Table 1: Ranking of the most important cultural dimensions

The dimension of *Context* heads the ranking shown in Table 1. Described as “the amount and specificity of information in a given situation,” this dimension has an average rating of 3.73 among all participants and an average of 3.79 among the participants that have more than 5 years of experience in UI design. Among the latter group nobody rated this dimension lower than 3 out of 4 possible grades. The second most important dimension is *Experience of technology*. It is proposed to combine this dimension with *Technological development*, which is rated on position four, and name this dimension Technological development. Both dimensions are rated as very important (3.30 and 3.18) for UI design and have to do with the development and attitude of the members of a certain society towards technological development. The dimension *Uncertainty avoidance* is number three on the list of important dimensions, with an average rating of 3.21 out of 4, and no one rated the dimension as unimportant. One can assume that nearly every UI must take into account the behavior of the user regarding uncertain or unknown situations. Time perception is also ranked among the top six, with an average ranking of 3.14. Again, no one considered this dimension as unimportant. *Authority conception* had an average of rating of 2.86. It is interesting that the concept of Power distance, which is very

similar, is statistically ranked only at position number 22. A very simple explanation of this contradiction could be the wording: Authority conception denotes with its name what this dimension is about; Power distance does not fulfill this need. One can also assume that the idea of how people think of authority heavily influences their behavior in handling a UI.

## Practical Use of the Set

One purpose of this project was to present ideas for how the findings of this survey might be used for practical work. As already stated, it is a very difficult venture to determine the most important dimensions for UI design in general. More research must be done to filter out which dimensions are the most important for special fields of UI design; for example, the design of medical instruments might demand different cultural emphases than a general telecommunication tool. Although it would be ideal if every localization project would take into account all 29 dimensions, this is not likely. Therefore, we provide a grouped and ranked list of dimensions:

No.	Name
1	D05 Context
2	D25 Technological development, D08 Experience of technology
3	D28 Uncertainty avoidance
4	D27 Time perception
5	D27 Authority conception, D20 Power distance
6	D03 Affective vs. neutral
7	D09 Face-saving, D24 Specific vs. diffuse, D13 Instrumental vs. expressive
8	D02 Activity orientation, D17 Meaning of life
9	D18 Nonverbal communication, D23 Space
10	D12 Individualism vs. collectivism
11	D26 Time orientation, D16 Long-term vs. short-term orientation
12	D29 Universalism vs. particularism
13	D15 International trade and communication
14	D10 Gender roles
15	D01 Achievement vs. ascription
16	D21 Property
17	D07 Economic progress
18	D14 Internal vs. external control
19	D22 Resources
20	D06 Degree of power
21	D11 Human nature orientation
22	D19 Political decentralization

The list above tries to give an overview of how the dimensions are related to each other and how they could be grouped together. Listed in the order of their statistical average (gained through the expert questionnaire) and grouped together (for reasons to be described later), they can form a practical tool to decide which dimension must be focused on in the next step to cover the most important differences.

When one thinks of a localization project, one may need to focus on the top six dimensions of the list. If, suddenly, more money is available for this part of the project and now the project manager must decide which dimension should be focused on next, the list offers a helpful decision support. Tying to group the dimensions above is a very difficult task. One requires more empirical studies about how cultural background influences UI design. Currently, most of the ideas on this issue are based on assumptions. There are still tests and studies to be done to provide valuable material. Nevertheless, we provide groupings and within the following paragraphs describe the reasons for the groupings. The groupings are based on the idea that the problems the UI designer face by paying attention to the dimension might awake similar thoughts and directions of thinking.

**Group 1:** D08 Experience of technology, D25 Technological development: These are clearly similar in relation to technology.

**Group 2:** D27 Authority conception, D20 Power distance: As Hoft [Hoft, online] describes these two dimensions as very similar. Although the two dimensions have not been ranked by the experts on similar levels, we can assume that cultural differences in this field have the same impact on UI design as they are so similar.

**Group 3:** D09 Face-saving, D24 Specific vs. diffuse, D13 Instrumental vs. expressive: all three dimensions cope with the problems of interpersonal relationships. The UI component influenced mainly by these dimensions is interaction and the examples mentioned within the very same chapters point in the direction of community tools. Same impacts on the design of the UIs design are therefore to expect.

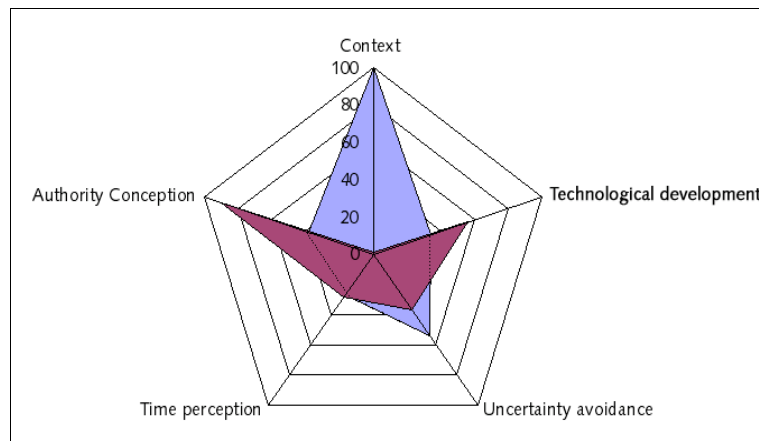
**Group 4:** D02 Activity orientation, D17 Meaning of life: Regarding metaphor building we can assume that societies that focus on material goals value doing more than being, the opposite might be true for spiritual oriented cultures. As already stated, this is just an assumption and has to be verified through more research and convenient tests.

**Group 5:** D18 Nonverbal communication, D23 Space: The dimension of space is mentioned within the dimension of nonverbal communication, called proxemics.

**Group 6:** D26 Time orientation, D16 Long-term vs. Short-term orientation: In a way these two dimensions are complementary: The first mainly affects metaphors and navigation, the latter mental models and interaction. Within the statistical ranking of the average value, the two dimensions are followed by each other. The dimensions seem to cover

different areas of a society, but some implications on UI design might be the same, for example, future-oriented cultures are likely to be willing to learn how to use a UI if they know that it will be necessary to know how to use it in the future. The same can be true for long-term oriented societies.

If we had empirically researched values for all the cultural dimensions mentioned above of a certain country, it would be very easy to generate a tool that could answer the question: "Is it necessary to change the UI for a certain culture/country?" and "Regarding which dimensions must changes be considered?." The basic idea for this tool is the use of star charts in the form of a pentagon, but expandable to more dimensions if needed, depending on how complex the localization project is. The diagram illustrates the cultural values of a targeted culture. Figure 2 shows a theoretical comparison. These diagrams can what changes are necessary and in what dimension, as Smith has demonstrated [Smith] but with different dimensions.



## Conclusions and Recommendations for Further Research

Generating a set of the most important 7±2 cultural dimensions for localizing Uis is a difficult task. The experts commented that everything depends on knowing the domain and purpose of the UI. Nevertheless, this survey sought to rank culture dimensions in relation to UI design components and to filter out the most important ones, the five dimensions of Context, Technological development, Uncertainty avoidance, Time perception, and Authority conception. Moreover, the original thesis work of Baumgartner provides a compilation of 29 culture dimensions annotated with detailed descriptions and concrete examples of what influence they have on certain domains of UI, and showing the UI design components that are especially affected.

The practical result is a grouped and ranked list of cultural dimensions that could form a decision making tool kit in a localization process. A second possible use of the findings is the idea of a diagram tool that could facilitate determining the culture-related changes necessary for localizing to a specific target country. We have also suggested the concept of a culturebase that could automatically or semi-automatically handle cultural changes for content management systems based on these dimensions. In the future, determining the top dimensions for special fields of UI design might be an interesting area of study that could contribute and verify the findings of this work. Developing a database with examples for the implication on each design component by each cultural dimension and gathering cultural values of each country/culture through empirical research could be a supporting work for the culturebase concept. Much remains to be researched. This study is a start.

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**Aaron Marcus and Associates, Inc.**  
1196 Euclid Avenue, Suite 1F  
Berkeley, CA 94708-1640, USA

Email: [Aaron.Marcus@AMandA.com](mailto:Aaron.Marcus@AMandA.com)  
Tel: +1-510-601-0994, Fax: +1-510-527-1994  
Web: [www.AMandA.com](http://www.AMandA.com)

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