

# Impact of Culture on the choice of relevant UX Scales

A comparison between Germany and Indonesia

Martin Schrepp  
User Experience  
SAP SE  
Walldorf, Germany  
martin.schrepp@sap.com

Harry Budi Santoso  
Faculty of Computer Science  
Universitas Indonesia  
Depok, Java Barat, Indonesia  
harrybs@cs.ui.ac.id

## ABSTRACT

We investigate if the cultural background of a person influences the subjective importance of UX aspects for several common product categories. To clarify this, we replicated a published study with German students in Indonesia. Results show significant differences concerning the rated importance of UX aspects for many product categories. However, a detailed analysis of the results demonstrates that both samples show quite similar rankings of the importance of UX aspects. The product type has a much bigger impact than cultural differences. In addition, the data show that the impact of culture is considerably lower than the impact of interindividual differences between persons inside the same cultural group.

## KEYWORDS

Culture, User Experience, Importance of UX aspects, UX quality, UX questionnaires

## 1 Introduction

Many UX questionnaires are translated to a substantial number of languages. For example, the System Usability Scale (short SUS) [1] is available in a huge number of languages (there seems to be no central governance or storage, so it is hard to say how many languages are actually available), SUMI [2] in 20 languages and the User Experience Questionnaire (short UEQ) [3,4] in 22 languages. This guarantees that the corresponding UX questionnaire can be used for product evaluation in different countries.

Existing translations are especially important if products designed for an international audience should be evaluated with a UX questionnaire, since investigations in all target markets of the product may be required. In such a scenario UX researchers typically compare the results in different countries to detect a potential need for a cultural adoption of the user interface of the

product. However, such a comparison depends on the implicit assumption that the items of the questionnaire are properly translated and that the scales cover the important UX aspects of the product in all countries, i.e. that the selection of the adequate scales to measure UX does not depend on culture.

There is a high number of different UX questionnaires [5] available. Each questionnaire measures with its scales a distinct set of UX aspects or UX quality criteria. For example, SUS [1] measures usability of a product (and if we look at the items then usability is understood by the SUS authors obviously as a combination of ease of learning and efficiency of task completion) with a single scale. VISAWI [6] measures the visual appeal of a product with 4 subscales (*Simplicity*, *Diversity*, *Colorfulness*, *Craftsmanship*) and UEQ [3,4] tries to cover a broader range of pragmatic and hedonic UX aspects with 6 quite general scales (*Attractiveness*, *Efficiency*, *Perspicuity*, *Dependability*, *Stimulation*, *Novelty*).

Thus, a UX researcher has a wide range of UX questionnaires to choose from. Which questionnaire is finally selected for the evaluation of a product depends naturally on the research question, i.e. which UX aspects the researcher needs to measure to answer his or her questions.

In practical applications of a UX questionnaire we usually want to answer the question if typical users are satisfied with the UX quality of a product. Thus, we want to measure those UX aspects that are considered to be important by members of the target group of the application. It does in practical evaluations typically not make any sense to measure UX aspects that are not relevant for the overall UX impression of users towards a product.

In such studies, researchers need to consider the type of product that is evaluated.

For example, for a business software that is used several hours during a typical work day, clearly efficiency of use and controllability will be of very high importance for users. For a rarely used self-service, for example an application to submit a leave request, intuitive use will be the most important UX aspect, while efficiency does play only a minor role (if you use an application only once a month some additional clicks do not hurt, but if you use it 50 times a day things are different).

For games or social networks hedonic UX aspects, like fun of use, will be of much higher importance for users than for classical tools used mainly for work purposes.

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Thus, the type of product determines to some extent which UX aspects or UX quality criteria are important and should thus be measured. The choice of the UX questionnaire used to evaluate the product will be influenced heavily by the product type [8, 9, 5].

We deal in this paper with the question if in addition to this well-known dependency to the type of product also the cultural background has an influence on the importance of UX aspects. Thus, given a certain product, are the important UX aspects the same for user groups with different cultural backgrounds?

Why is this important? Assume we have a product which is sold in several different countries with quite different cultures. Thus, if an evaluation with a questionnaire is planned a researcher will try to use the same UX questionnaire to be able to compare the results of different countries. This implicitly makes the assumption that the scales of the questionnaire represent UX aspects which are equally important in the different cultural groups. If this is not the case, then a meaningful comparison between results obtained in different cultural groups is not possible.

To investigate this question, we replicate a study [8] performed with a sample of German students with a sample of Indonesian students.

## 2 The role of culture

Why should the cultural background of a person show an impact to her or his subjective importance of certain UX quality criteria? To answer this question, we must clarify the concept of culture.

There are several approaches that define cultural dimensions to explain differences between cultural groups [10,11,12,13]. The dimensions identified differ to some extent between these approaches. As an example, we describe in the following the cultural dimensions of Hofstede [10], which seems to be in the moment the most prominent model to describe and measure differences between cultural groups.

The dimensions of Hofstede are based on extensive empirical research and are extracted empirically from a large data set. There is also some criticism [14] concerning Hofstede's and other dimension-based models of culture. Critics argue that these models are too stereotypical, but they do not offer any alternative approach.

Hofstede assumes that differences between cultures result from different basic values shared by members of a culture. These values are learned traits, which influence the reactions of persons to specific situations. Thus, the likelihood that a person reacts in a special way to a situation differs between different cultural groups.

Hofstede defines the following 6 cultural dimensions:

- *Power Distance*: Level of acceptance of an unequal power distribution in a society.
- *Individualism vs. Collectivism*: Extent to which members of a culture prioritize their individual goals over the goals of the group.

- *Masculine vs. Feminine*: A masculine culture is mainly driven by competition, while in a feminine culture cooperation and carrying for others are the more important values (this is a somewhat strange naming of that dimension, but we refer here to the original naming used by Hofstede).
- *Uncertainty avoidance*: Desire to accept or avoid unknown or uncertain situations.
- *Long term orientation*: Is planning and action more based on long- or short-term goals?
- *Indulgence vs. Restraint*: Extent to which people try to control their desires and impulses.

In general, we have to mention that the cultural dimensions of Hofstede or other models of this type describe how people in a specific culture tend to interact with other people. It is a bit speculative to derive some predictions concerning the expectations concerning the UX qualities of products from these dimensions. But the impact of culture on various aspects of UX obviously got the attention of many researchers and is already investigated in many papers.

A study [15] point in the direction that users show a better performance if the user interface of an application matches their cultural profile (in the sense of Hofstede's model). Another study [16] showed that the users subjective cultural profile had an impact on the acceptance of specific technologies for some typical tasks. Another study [17] demonstrated that the perceived usability of a web site increased when it was originally conceived in the user's native language.

But there are also results which point in the direction that the purpose or goal of a user is the main factor that influences the user experience and that culture plays only a minor role [18].

Due to the increasing globalization people get used to react on interactive products designed from designers with a different cultural background, thus design patterns become more and more familiar and the impact of the cultural background will decrease over time [19].

Thus, there is obviously not a clear picture concerning the impact of culture on the subjective perception of UX qualities.

Concerning UX aspects or UX scales used in questionnaires an impact of culture is at least somehow plausible from a theoretical point of view. If a culture can be classified, for example, by a high level of uncertainty avoidance, this may result in a high subjective importance of the UX aspect controllability or related aspects, like for example trust. If a culture is heavily driven by competition, then it is plausible that efficiency and usefulness are highly valued UX aspects. In a more individualistic culture hedonic UX aspects may be of higher subjective importance than in a more collectivistic culture.

There are many more "plausible" dependencies of cultural values and the importance of certain UX aspects. But are they really existing or just speculation based on the fact that the cultural dimensions are quite abstract and originally developed to describe the interaction between people and not the interaction of people and technology? To find that out we compare the subjective importance of UX aspects in two quite different cultures.

### 3 A study concerning the importance of UX aspects for different product categories

In a study with 58 German students [8] the importance of several well-known UX aspects was investigated for different product categories.

The 16 UX aspects were extracted from a deep literature review, an analysis of existing UX questionnaires and especially their scales and by querying some experts.

The UX aspects used in the study are *Content Quality*, *Customization*, *Perspicuity*, *Efficiency*, *Immersion*, *Intuitive Usage*, *Usefulness*, *Novelty*, *Beauty*, *Identity*, *Controllability*, *Stimulation*, *Clarity*, *Loyalty*, *Trust* and *Value*.

Each UX aspect was described by a name and a short description. For example:

- *Perspicuity*: It is easy to understand and learn how to use the product.
- *Stimulation*: I find the product stimulating and exiting. It is fun to deal with the product.
- *Trust*: My data is in safe hands. The data will not be misused to harm me.
- *Beauty*: The product is beautiful and attractive.
- *Value*: I find the product makes a high-quality and professional impression.

A detailed description of all the 16 UX aspects used in the study and their short descriptions can be found in [8].

In addition, 15 typical product categories were defined. These categories are: *Word Processing*, *Spreadsheet*, *Messenger*, *Social Network*, *Video Conferencing*, *Web Shops*, *News Portals*, *Booking Systems*, *Info web pages*, *Learning platforms*, *Programming tools*, *Image processing*, *Online Banking*, *Video portals*, and *Games*.

Each product category was described by its name and some typical concrete products from that category. For example:

- *Messenger*: WhatsApp, Facebook Messenger, Snapchat
- *Social Network*: Facebook, Xing, LinkedIn
- *News Portals*: Spiegel.de, Zeit.de, Sueddeutsche.de
- *Games*: WOW, Minecraft

Again, see [8] for a full description of all categories.

Participants had the task to rate the importance of each UX aspect for all 15 product categories on a 7-point Likert-Scale with the answer categories: *Meaningless* (this should be used if the UX dimension did not make sense at all for the product category, these values are handled like missing data in the analysis), *Extremely unimportant* (1), *Somewhat unimportant* (2), *Slightly unimportant* (3), *Neutral* (4), *Slightly important* (5), *Somewhat important* (6), and *Extremely important* (7).

With 16 UX dimensions and 15 product categories the participants had to make 240 decisions, which is obviously time-consuming.

An MS Excel file which contained the UX dimensions as rows and the product categories as column headers was sent to the participants per mail. Participants had one week to fill out the Excel and send it back. They got some course credits for their participation in the study.

### 4 Replication in Indonesia

The goal of our study is to find out if cultural differences have an impact on the relative importance of some UX aspects. Thus, we replicate the German study with participants in Indonesia. But this makes only sense if there are substantial cultural differences between these countries.

Hofstede's research provides a concrete scoring of different cultures concerning his dimensions. According to these scores, Germany and Indonesia show quite different profiles.

Indonesia is described as strong collectivistic, while German culture is highly individualistic. Indonesia shows a high level of power distance, while this value is much lower for Germany. Concerning indulgence vs. restraint both countries show a similar value. For the other three dimensions the German scores are a bit higher than the Indonesian scores. Thus, Germans live in a more masculine culture, show a higher degree of uncertainty avoidance and a higher score concerning long-term orientation.

Thus, if we apply the Hofstede model of cultural dimensions, then we can conclude that both countries are sufficiently different concerning their cultural values. Thus, our choice of Indonesia for a replication seems to be justified.

We tried to be as close as possible to the experimental procedure used in the German study. Of course, the textual information (instructions, names and descriptions of the UX aspects) had to be translated from German to Bahasa Indonesia.

For the examples used to explain the product types an additional problem needed to be solved. Some of the examples used in the German study were unknown in Indonesia. These examples had thus to be replaced with products that were popular and well-known by Indonesian students.

One 114 students of the Faculty of Computer Science, Universitas Indonesia (64 male, 50 female) participated in the study. The students enrolled in Human-Computer Interaction course and got some credit points for participation in the study. The mean age was 21.34 years.

Concerning all other aspects of the study we followed strictly the procedure used in [8].

### 5 Results

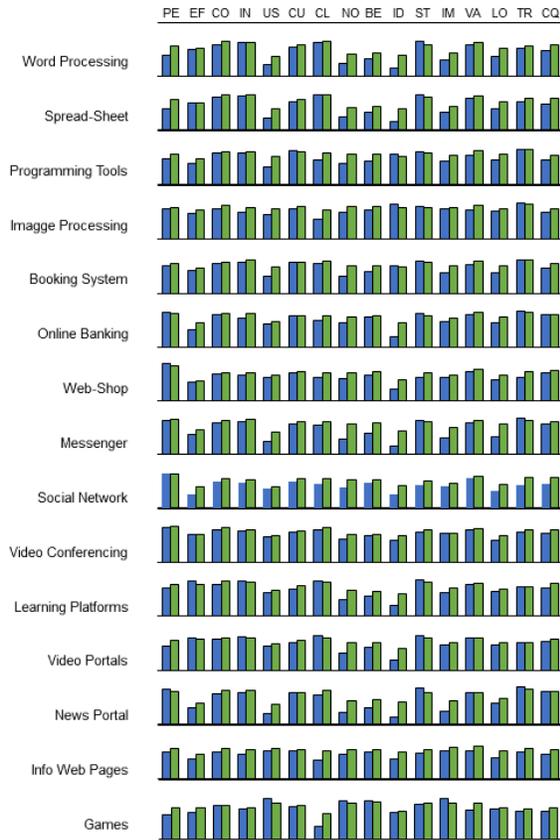
If we look just at the mean importance ratings per product type and UX aspect we found many significant differences on the 0.05 level (t-test, two-sided). There is a slight tendency that hedonic UX aspects are rated higher in the Indonesian sample than in the German sample, but there was also a general answer tendency in the sense that the Indonesian participants tend to give overall higher importance ratings than the German participants.

In the following we abbreviate the UX aspects by a two letter combination (see the values in brackets) to keep the graphics and tables readable: *Perspicuity* (PE), *Efficiency* (EF), *Controllability* (CO), *Intuitive Use* (IN), *Usefulness* (US), *Customization* (CU), *Clarity* (CL), *Novelty* (NO), *Beauty* (BE), *Identity* (ID), *Stimulation* (ST), *Immersion* (IM), *Value* (VA), *Loyalty* (LO), *Trust* (TR), and *Content Quality* (CQ).

Since the mean importance ratings are not so important for our research question we sketch them by a graphic to give at least some impression. Figure 1 shows the mean importance ratings per UX aspect and product type.

As we can see from the figure each product category has a specific pattern of importance ratings. Product categories that are similar concerning their use cases (for example, *Word Processing* and *Spread-Sheet*, or *Image Processing* and *Programming Tools*, or *Messenger* and *Video Conferencing*) show quite similar patterns. This is true for both samples.

We can see also a tendency that especially the hedonic UX aspects (*Novelty, Beauty, Identity, Stimulation, Immersion, Value*) show higher importance ratings in the Indonesian sample than in the German sample.



**Figure 1: Mean importance ratings for the product categories. Blue bars (left) represent the German sample, green bars (right) the Indonesian sample.**

However, for our research question it is not important to compare the absolute importance ratings. Instead, we are mainly interested in the relative importance of different UX aspects for a product category. The main question is, if the most important UX aspects per product category are similar in both samples (these are then in fact the UX aspects which determine the overall UX impression of the product).

The following Table 1 shows the correlations and rank correlations of the German and Indonesian importance ratings for each product category. As we can see these are all extremely high. Thus, a UX aspect that is seen as important for a product category by German students is also seen as important for Indonesian students and vice versa. In addition, the order of the importance (i.e. if we replace the mean values by a rank) is highly similar.

This is a first indicator that the importance seems to be mainly determined by the product category and not so much by culture. Again, the high rank correlations indicate that the ranking of the UX aspects in both samples is highly similar, i.e. there is a high impact of the product type (see Figure 1), but a limited impact of culture.

Product Type	Correlation	Rank Correlation
Word Processing	0.94	0.91
Spreadsheet	0.95	0.94
Programming Tools	0.92	0.90
Image Processing	0.91	0.85
Booking system	0.89	0.89
Online banking	0.94	0.76
Web-Shop	0.91	0.86
Messenger	0.76	0.71
Social Network	0.65	0.59
Video Conferencing	0.83	0.81
Learning Platforms	0.84	0.93
Video Portals	0.84	0.83
News Portal	0.91	0.85
Info Web Pages	0.93	0.84
Games	0.89	0.82

**Table 1: Correlations and rank correlations of the importance ratings from both samples for all product categories.**

For designers it is interesting to understand which UX aspects are important and which can be neglected for a given product category. Of course, a simple procedure to detect this is to set a threshold and consider all UX aspects as important, which show ratings above this threshold. Still, the definition of such a threshold must be done separately by sample and there is no method to do it objectively.

Therefore, a cluster analysis was performed per product category and per sample (k-means clustering) to split the UX aspects into two groups. These groups correspond concerning their semantic meaning to important and unimportant UX aspects for the given product category and sample.

K-means clustering of a set of objects into  $n$  clusters tries to define  $n$  groups in a way that the members within a group are as homogeneous as possible and members of different groups show a distinguished difference concerning the metric used for clustering. In our case  $n$  is equal to 2 and we use the normal distance measure for real numbers as a distance measure for the clustering. Thus, we split the UX aspects per product category and per sample into two groups. Groups are built by the k-means

Product Type	PE	EF	CO	IN	US	CU	CL	NO	BE	ID	ST	IM	VA	LO	TR	CQ
Word Processing	+	+	+	+	+	+	+	-	-	-	-	-	+	-	+	-
	+	+	+	+	+	+	+	-	-	-	-	-	+	+	+	-
Spreadsheet	+	+	+	+	+	+	+	-	-	-	-	-	+	-	+	-
	+	+	+	+	+	-	+	-	-	-	-	-	+	-	+	+
Programming Tools	+	+	+	+	+	+	+	-	-	-	-	-	+	-	+	+
	+	+	+	+	+	+	+	-	-	-	-	-	+	-	+	+
Image Processing	+	+	+	+	+	+	+	-	-	-	-	-	+	-	+	-
	+	+	+	-	+	+	+	-	-	-	-	-	+	-	-	-
Booking system	+	+	+	+	+	-	+	-	-	-	-	-	+	-	+	+
	+	+	+	+	+	-	+	+	-	-	-	-	+	+	+	+
Online banking	+	+	+	+	+	-	+	-	-	-	-	-	+	-	+	+
	+	+	+	+	+	-	+	-	-	-	-	-	+	-	+	+
Web-Shop	+	+	+	+	-	-	+	+	-	-	-	-	+	-	+	+
	+	+	+	+	+	-	+	+	+	+	+	+	-	+	+	+
Messenger	+	+	+	+	-	-	+	-	-	+	-	-	-	-	+	-
	+	+	+	+	+	-	+	-	-	-	-	-	-	-	+	-
Social Network	+	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
	+	+	+	+	-	-	+	+	-	-	-	-	-	-	+	+
Video Conferencing	+	+	+	+	+	-	+	-	-	-	-	-	-	-	+	+
	+	+	+	+	+	-	+	-	-	-	-	-	-	-	+	+
Learning Platforms	+	+	+	+	+	-	+	-	-	-	-	-	+	-	+	+
	+	+	+	+	+	-	+	-	-	-	-	-	+	-	+	+
Video Portals	+	+	+	+	-	-	+	+	-	+	+	+	-	+	+	+
	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+
News Portal	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+
	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+
Info Web Pages	+	+	+	+	+	-	+	+	-	+	-	+	-	+	+	+
	+	+	+	+	+	-	+	+	-	+	-	+	-	+	+	+
Games	+	-	+	+	-	-	-	+	+	-	+	+	-	-	-	-
	+	-	+	+	-	-	-	+	+	-	+	+	-	-	-	-

**Table 2: Results of the k-means clustering algorithm. The + signs indicate the group with the higher importance ratings and the - sign the group with the lower importance ratings.**

clustering algorithm based on the distances between all the importance ratings within a product category and sample.

The results of this analysis are shown in Table 3. Again, we see that the results for both samples are quite similar. With a few exceptions UX aspects that are classified as important in Germany are also classified as important in Indonesia and vice versa. Differences seem to be lower for tools (for example, *Word Processing* or *Programming Tools*) that are associated clearly to work tasks. The biggest deviations are seen for applications (for example, *Social Network*, *Web Shop*, or *News Portal*) that are more related to spare time activities.

If we consider the UX aspects that are marked with a + as the UX aspects that are important for a product category, then these are obviously the UX aspects that we should try to measure with a UX questionnaire. As our data indicate such a questionnaire will work in both countries.

Of course, there are also interindividual differences between subjects inside one cultural group. How big is the impact of such personal attributes and styles compared to the cultural background?

To clarify this question an analysis of variance was performed. For each combination of product type and UX aspect

the total variance VAR over the complete data set (German and Indonesian data) was calculated. Then the variance VAR(G,I) based on the assumption that all persons inside a cultural group would show the same importance rating was determined. Therefore, a new data set is calculated in which the rating of a subject is replaced by the mean value of the ratings from its group. VAR(G,I) is then simply the variance of this generated data set. Thus, VAR(G,I)/VAR is the relative amount of variance explained by the cultural groups compared to the complete variance. The resulting values are all quite small (biggest value 0.25, but most of the values are below 0,1). Thus, we can conclude that the impact of culture is quite small compared to the impact of differences on individual level.

### 6 Consequences

Our results indicate that the importance of UX aspects for a given product is mainly determined by the product category. The culture of the target group has no real impact on this. Thus, the selection of the UX aspects and therefore the scales used for measurements depends heavily on the product type and is nearly identical for different target groups of users that differ only in culture. The typical tasks seem to determine which UX aspects are important and culture seems to have only a neglectable impact.

Thus, if a product is sold in different cultures it is sufficient to evaluate it with the same UX questionnaire (obviously with proper translations) in all cultures. The results can be compared in a meaningful way.

In addition, compared to interindividual differences between subjects in a culture, the cultural group itself seems to be of minor relevance for the subjective importance of UX aspects.

Finally, we have to mention some restrictions of our results. First, we only have data from two countries. Accordingly to Hofstede's model these countries differ massively concerning their cultural profile, so if culture had an impact we would expect to see it in our data. But, of course our findings should be replicated in more countries.

Second, our participants evaluated the importance of the given UX aspects for abstract product categories and not for concrete products they use. This may have an impact on the results, which needs to be clarified in further studies.

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