

# CULTURAL ASPECTS IN INTERACTIVE APPLICATION USABILITY

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**ABSTRACT**—Cultural difference are usually not considered in the development of any kind of interactive and information applications. There is always a mismatch between system usability and user's background. The reason of this problem is that while many HCI scientists improve and evaluate the methodologies of design process, little or no attention is paid to whether these methods cater the expectations of users from non-Western countries. Another reason is the lack of research for analyzing and finding better solutions of this issue by researchers. The best existing way to deal with it is by integrating the culture into the design process. This report identifies the cultural difference and discussed some solutions such as investigating culture differences, involving the user in the design process, and empowered design to be considered while developing an interactive application. The study identifies there is a need of standard framework that contains all different aspects relating to cultures, which can be used by designers to create a global product, or product to serve certain society needs.

**Keywords**— Cultural Difference; HCI; Design process; Empowered Desig

## INTRODUCTION

At the beginning of the computer age, users learnt to adapt to computer systems: they learned how to interact with these devices by learning machine language. Nowadays, computer systems are developed to be an integral part of daily life and they have become adaptive to the user's needs, expectations as well as feelings. However, these developments do not consider cultural differences between users [1]. Consequently, in many places around the world, it is people who have to adapt to applications and interfaces.

Understanding the needs of users from various cultures plays a vital role in the design process. Even though the user has been integrated into the design process by many design methodologies, most of these methods have been developed in Western Europe and the United States and they consider the needs of only people inhabiting these places [2]. One of the main objectives of this report is to highlight the importance of applying these methods to people living in other countries and cultures, so that the expectations of a much broader range of consumers can be met. We described the most common methods to identify cultural differences with the elaboration to which extents these differences are used during design process. We identified some solution that could be incorporated during the design process of interactive applications. Furthermore, case studies are presented which used aforementioned solutions in its design process.

## INTERNATIONALIZATION AND CULTURAL DIFFERENCES LEVELS

The most common method to deal with this issue is a called internationalization [3], which can be defined as “the inclusion of culture-neutral design specifications and the creation of a cross-cultural design” [4]. The basis of internationalization is identifying cultural elements that an application or a system should accommodate and facilitating the task of making the product adaptive to a particular culture [5]. In terms of usability, cultural differences can be classified into more than one level, such as Surface level, Infrastructure level and Fundamental level. Therefore, internationalize of a product can be done at any level.

An example of the use of internalization in the Surface level can be seen in the Google search engine, which gives different suggestions according to the location (country) of the user. This means that when a user from the UK inserts the search word ‘bank’ in google.co.uk, he/she will get a list of the most

popular related suggestions for this word in the UK. When the user uses google.com.sa (sa stands for Saudi Arabia) and inserts the same word, a different list of suggestions appears. Generally, this level of variations and other elements, such as the direction of typing and translation of web page interfaces, have been fixed by developers. However, infrastructure level variations between cultures are still mostly unsolved issues [1].

An example of issues with infrastructure level of differences is seen in GPS systems. A majority of Western European countries and the United States have a certain type of address system, to which GPS devices are adapted. However, in countries like Saudi Arabia, for instance, where there is a completely different type of address system (for example, there is no post code); these devices are not as useful. Such example shows non-internationalized product that does not consider the fact that there are many different types of addressing systems around the world.

Another variation to be considered by designers is fundamental differences between cultures, which are crucial. These differences range from the ability of individuals to afford a computer (because of financial problems) to the ability to access certain types of websites or applications (because of legal restrictions in certain countries).

## DIFFERENCES BETWEEN CULTURES

Variations between two different environments can be seen from many points of view; one of them is discussed in the cultural theory, which is based on traditions, norms, beliefs, language, religion and values [6]. One way of investigating and studying cultural diversity is by the ethnographic approach. ‘Ethnography is a collection of qualitative methods used in the social sciences that focus on the close observation of social practices and interactions. These qualitative methods enable the researcher to interpret and build theories about how and why a social process occurs, and they deeply examine the context in which activities occur’ [7]. This means that looking at a culture from an ethnographic approach could involve exploring the way in which people live and perform their activities. Additionally, an ethnographer could illustrate the difficulties that a society may face; for instance, some poorer countries may have difficulties accessing technological devices, internet or electricity. Also, education type and level are other aspects that can be studied by ethnography science. Furthermore, the ability to gain access to certain types of

applications or websites is another example of cultural differences, which can be termed 'Politics.' For instance, in Saudi Arabia, all websites with anti-government material as well as with adult content are banned. In China too people do not have access to Twitter for similar reasons.

### **HOW MUCH CONSIDERATION DO SYSTEM DESIGNERS GIVE THESE DIFFERENCES?**

Recently, users have been involved in the design process and even the pre-design (e.g. defining the problem) and post-design stages (e.g. evaluation stage) [8]. However, during the improvements of the designs methods, multicultural aspects have generally been disregarded [1]. In Addition, users involved in the design process should have basic knowledgeable about how digital technology functions [9], which cannot be guaranteed in many situation around the world, such as developing countries.

This is because most design methodologies have been developed in Western Europe and the United States, and the implementation of these methods has been examined only for people of these areas [2]. In fact, importing Western systems or products to non-Western society is believed to inadvertently include the import of Western beliefs, values and culture [1]. Consequently, there will be a mismatch between the culture of the recipient community and usability of imported applications. In this case, users from non-Western society have two options: adapt to the content and interface of the current application [1], which is what happens in majority of the cases, or to build systems that are adaptive to the needs and abilities of particular groups. The main goal of this report is elaborate on the second option.

### **CULTURAL AND TECHNOLOGY MISMATCH SOLUTIONS**

This section will present some solutions that could help to resolve the mismatch between cultures and technological systems:

#### **Investigating and comparing cultural differences**

There are many ways of discovering cultural features, one of which could be via the ethnographic approach [10]. The importance of revealing and comparing these variations is to provide designers the ability to build and develop methods that consider this diversity.

Hofstede Cultural Dimensions is a popular (ready-to-use) dimensions that designers rely on when developing products that have to be culturally acceptable [11] [4, 12]. Hofstede G. [13] recognized the first model of dimensions of national culture. These dimensions are:

*Long-term vs. short term orientation (LTO):* Having a long-term orientation means working with a society seeking out virtue. Here, people are flexible and look carefully at the time, context and situation before making a decision. They tend to save money and work hard to get the result they want. Short-term orientation is concerned with determining absolute truths by using normative thinking. People with this outlook uphold traditions, do not focus on future saving, and are determined on getting fast results.

*Uncertainty avoidance (UAI):* This is defined as the extent to which a person does not like ambiguity and uncertainty. What is important here is the manner in which society deals with

the unknown future: to let it occur naturally or attempt to influence it? Nations with weak UAI have relaxed attitudes regarding practices and principles. Strong UAI nations maintain strict beliefs and are not open to unorthodox ideas.

*Masculinity vs. femininity (MAS):* Femininity is opting for values like life quality, caring for weaker members, modesty and cooperation. On the opposite end, we have masculinity, i.e. opting for assertiveness, heroism, wanting material rewards for successes and achievement. In the first case, society is consensus-oriented, while in the latter, it is competitive.

*Individualism vs. collectivism (IDV):* Individualism is a feature of an easy-going social structure where people have to take care of their own needs only. On the other hand, we have collectivism, which is the desire to be part of a social framework where everyone is close together and look after each other. It is easy to understand this aspect by noticing whether a person uses the term 'we' or 'I'.

*Power distance (PDI):* This is defined as the extent to which a member of society accepts and expects power to have unequal distribution. The key point here is the manner in which the society deals with the inequalities present in it. It is easy to see large extents of power distance in a society, unless a hierarchy is in place where everyone is aware of their position. Societies that have low levels of power distance have people working for equal power distribution and justifications for unequal distributions.

#### **Involving the user in design process**

Allowing users to be part of building a system or application could be another solution for integrating the diversity of users' backgrounds into a system to ensure higher level of usability. However, using these methodologies imposes some restrictions on the involved users, such as having adequate knowledge of what digital technology does. There are many such design methods, four of which are listed in this section:

*User-centered design:* Made by Karen Holtzblatt and Hugh Beyer [14] as a substitute for feature driven and engineering models, this process uses ethnographic techniques for data gathering, which is used for rationalizing workflow, making human-computer interfaces and field studies Researchers collect and arrange the information taken from field customers and apply their findings to the end product. This method is characterized by its focus on what needs to be designed (service, interface, space, object, etc.), with an additional focus on meeting user needs. Here, the researcher is the middle man between the designer and the user, collecting primary and secondary data to learn user needs.

The interpreted data are presented as design criteria by the researcher. This is passed on to the designer, who uses it to make scenarios or concept sketches. With the main focus remaining on design development, there is a chance that the user and research may not be part of usability testing. The designer and researcher work on their own, with the user being represented by the researcher [14].

*Contextual design:* This method focuses on making user-centric ICT (Information and Communication Technology) systems that use forms that have been made part of work practices. This method comes from knowing how customers

work. The contextual design process tries to work out what people want, how it can be turned into a product, and if they will buy it or not. This can only be done with a proper understanding of technology and user needs. When product designers are included in the collection and interpretation of customer data, they gain a better understanding of user needs, thereby producing a superior design [3].

Based on the necessary information, different methods can be used; however, interviews are preferred. This includes semi-structured, unstructured and structured interviews, and observation and focus groups [15]. There are several top-level stages to this process: prototyping, user environment design, storyboarding, visioning, data consolidation, interpretation and contextual inquiry [16].

**Participatory design:** Previously called cooperative design, this method tries to include all stakeholders (users, society, supply chain, employees, etc.) into the designing process so that everyone's needs are met [8]. The purpose of this method is to create an ideal product that everyone can use.

Participants, be they future, potential or putative, work with the developers, researchers and designers through various steps of the innovation process. Their participation is involved in the defining of the problem at the beginning, problem solving, product development, and finally evaluation of the suggestions provided [17].

**Empathic design:** This method is a mix of Western and Eastern ideals and is based on psychology, aesthetics and philosophy. This means that it is not applicable to design, but rather towards creation, spatial display and communication media [18].

### **Empowered design**

Gary Marsden is a computer scientist who worked in mobile interaction design in London with companies such as Orange. He moved to South Africa in 1999, and while working there as an assistant professor at the Department of Computer Science, University of Cape Town South Africa, Gary came up with an approach called Empowered Design in 2008. According to Gary, 'the idea of this approach is to create technology that allows people in Africa to create their own applications, rather than having researchers dictating which applications people in Africa should have.' This approach can be applied in any region around the world. A case study will be shown in the next section by the same researcher.

### **CASE STUDIES**

The first case study describes how Gary *et al.* [19] designed a software that met the needs of nurses in Eastern Cape (a very poor and rural part of South Africa) and the types of issues they faced.

Firstly, the researchers decided to use a user-centred design method by involving a nurse in a participatory design session. They asked her two things: (1) the type of help she required from a computer, and (2) to draw a picture reflecting her expectations from the system. Because the nurse did not have any computer knowledge, she was not sure how to answer these questions. Despite this setback, the designers proceeded toward building an initial prototype of the system according to their observation of the nurses' needs.

After building the initial prototype, another issue was how to get the nurses to use the system. Since most of the workers there did not know how to use a computer, the designers had to conduct some training sessions, first on basics such as mouse movement, files, windows, etc., and then on how to use the system they had designed.

After six months of training, the nurses were ready to use the system, but usability problems starting showing up at this time. When the designers decided to update the system, they dealt with the usability concerns raised by the nurses. The nurses were also worried about having another training trial after the system was updated. Gary's team made many efforts to solve this issue, one of which was to publish the updated version of the system in one of the nearest clinics (there were 10 clinics around the current one). Then, they repeated this process of updating it until they established the best version of the system.

One of the realizations that came from this experiment was 'it is hard to conceptualize what technology might be able to do for you if you are not familiar with what it does or how it is created'. To resolve this, they come up with Human Access Point (HAP) solution. An HAP is a person who belongs to a target culture or society, who has adequate or wide computer knowledge (i.e. a student sent to school that had computers), which means they are able to perform better in the participatory design process. There could be enough of them to act as access points between the users and the designers. With regard to HAP, the researchers stated that 'This allowed us to create a more appropriate prototype than we could have created on our own'. In fact, the designers used HAP for other purposes, such as designing ideas and initializing testing of prototypes.

This experiment shows how Gary and his team configure a connection between local user ability and using one of the design methods that developed to be applied in different context. When the nurse (as an end user) was not able to participate in the design process, researchers find another way to observe clinic needs from the computer by HAP.

The Second case study Gary *et al.* [20] tried to apply the Empowered Design approach on one of the projects that were being conducted on the advantages of the mobile phone. Since it is difficult for people to use internet facilities (because of the cost), the aim of this project was to enable users to exchange media information without incurring any cost and without any modification of the mobile device. The idea was to create an electronic notice board containing folders for different media. Based on the free Bluetooth service, the researchers built a software program that could connect the user with this board without the need for internet access or a computer. Once users were connected to the notice board, they could download and upload media files to different folders.

At this point, users have camera-enabled mobiles and the exchange system, so they were able to create their own media and then share it using the notice board. According to Gary, The point is that a community can now create an information exchange system without the need for any programming.

They can structure how that information is managed, accessed and updated without relying on a programmer.'

### DISCUSSION

One of the main objectives of this report is to highlight the importance of applying design methods developed in Western countries to people living in other countries, so that the expectations of such people can be accommodated.

There are many issues related to cultural differences and system design. One of the most important is that researchers concentrate on surface-level differences, such as language translation, more than infrastructural or fundamental levels of variations. As a result, their effort is directed more toward user interfaces than the content of the system. The differences between populations that are considered to build user interfaces that are globally acceptable are different from those that have to be taken in account to build a system that meets particular cultural requirements. Unfortunately, little work has been done toward reducing the mismatch between user cultures and software usability. This report was written with the aim of bridging this gap.

It would be difficult for designers to design an application that can be used by specific groups of user as well as be globally acceptable. This is because 'The understanding of ICT and its needs for people in the developing world are hugely different from those for people who live in a technology-rich environment' [21]. Therefore, one suggestion is that anthropologists and HCI scientists cooperate to create a framework that covers all cultures and background differences that affect product usability.

Using this framework, designers will be able to accommodate such differences in the design process. Hofstede Dimensions [22] is an example of this framework; however, Hofstede looked at cultural differences from the point of view of human interaction. In fact, there are other angles that can reflect cultural differences, such as the ethnographic view, which involves exploring another society's abilities. Difficulties in accessing the internet or obtaining electronic devices in some rural African regions are examples.

Another potential suggestion is to build a database that contains all different dimensions. By using intelligent systems with this database, we could answer some questions, such as: either the way in which children are disciplined by their parents or in which they were taught in school affect their interactions with technology (i.e. their search strategy)?

### CONCLUSION

This report highlights the issue of mismatch between culture and product usability and reveals some of the existing ways of dealing with it. One of them is to investigate and compare cultural differences and consider them in the design process. Another way is to use a design methodology that involves users in the design process: some examples of these methods are user-centred design, contextual design, participatory design, and empathic design. However, this solution (involving users in the designing) has its limitations in that users who are involved need to have good knowledge of computers. This means that this type of approach is not appropriate for use in some societies such as poorer areas

around the world where the education level is low. The third way is to apply Empowered Design, which means giving people of certain communities the ability to build their own application instead of conducting studies that discover relevant applications. There is not enough research on this approach; however, it can be considered as the best existing solution to fill the mismatch between culture and system designs.

This report illustrates some examples which show the problems that occur when a system is used in different environments or contexts from the one that it has been created in. Since no sufficient analysis or solutions have been created to deal with this issue, further work in this direction.

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