Cultural Issues in HCI: Challenges and Opportunities

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Abstract. Culture strongly influences people's values, expectations, behavior, and even perceptions and cognitive reasoning. Although HCI researchers recognize culture as an important factor, the research about cultural issues and HCI needs to go further. This paper discusses why culture should not be viewed as a threat or something that is better to relegated to minor importance in Human-Computer Interaction, but that has a key role in the investigations and development of new theories, methods and techniques. In the light of the grand challenges prospected in GranDIHC-BR by the Brazilian HCI community, we explore some of the opportunities and challenges culture brought to HCI as a research area.

Keywords: HCI and culture · Cultural aspects of HCI · Research challenges in HCI

1 Introduction

In 1959, Hall [16] argued that technology is the most efficient way to introduce changes in culture and to redefine a society. Today, we live in a society mediated by information and communication technologies (ICTs). The changes introduced by this scenario are not only visible but have defined the way we work, study, eat, interact to each other, understand time and space, and live.

Among the main disciplines of Computer Science, Human-Computer Interaction (HCI) is the one that should deal with issues that are universal and transversal to the other areas of computing and, at the same time, should consider specific and situated aspects (e.g., cultural, social, economic, political, geographical) of the environment in which it is applied. It means that HCI has a fundamental (and complex) role in technology development and innovation, as well as a strong responsibility and ethics in the design, evaluation and implementation of interactive computing systems for human use.

In fact, as we live in an increasingly globalized world and we frequently interact with ubiquitous technology in many places and contexts (e.g., work, school, leisure, relationships, etc.), the HCI research should explore the cultural issues that permeate and influence the design, development, evaluation and use of interactive technologies. However, considering and dealing with cultural issues have become an even complex and critical challenge when thinking in terms of a culture mediated by ICTs. The very idea of culture, in its broadest sense, has suffered transformations that require us to revisit our theoretical and methodological grounds and practices.

Different initiatives have been conducted to identify and inspire future directions in HCI for the next years. In 2007, for instance, researchers from academy and industry, from several countries and with different backgrounds, joined efforts for discussing the HCI in 2020 [28]. The participants were unanimous when pointing out to the need for placing human values in the core of HCI area. In 2012, the HCI Brazilian community, in turn, presented an initiative to prospect 5 (five) Grand research challenges for HCI in the Brazilian context for the next 10 years [3, 7]: (1) Future, smart cities and sustainability; (2) Accessibility and digital inclusion; (3) Ubiquity, multiple devices and tangibility; (4) Human values; and (5) HCI education and industry. "Human values" is one of them. Values cannot be understood outside their cultural context, and the same is true for other social issues such as human needs, preferences, habits and behavioural patterns. While these issues reveals important aspects that should be considered when designing a technology, the cultural context will explain why they are important and indicate how to address them.

We have recently started a discussion about the 5 grand challenges identified by the Brazilian HCI community through the lenses of culture, arguing that culture is transversal to them and cannot be ignored if we desire to advance in these challenges [24]. In this paper, we analyze more deeply the cultural issues related to each 5 grand challenges. Although there are influential literature about culture in technology, recent literature regarding culture and HCI claims that the treatments given to culture in HCI research has been often fragmentary and guided by practical and specific problems [27]. So, in this paper, we extend the discussions presented in [24], approaching culture as an important subject that is transversal to some HCI challenges and hot topics (e.g., information visualization, wearable computing, big data, etc.). Additionally, we show that culture itself is a challenge for HCI, once it requires that our traditional HCI theories, methods and practices to be jointly rethought and redefined.

The paper is structured in five sections. Section 2 presents a brief literature review on the theme, from the definition for culture to some of the main works developed around the subject. Section 3 presents some challenges and hot topics in HCI discussed through the lenses of culture; in this section we highlight critical factors that are related to/dependent on culture for each challenge, and discusses on the general relation between culture and usability. Finally, Sect. 4 presents our final remarks and conclusions.

2   Background

Anthropological scientific research on culture started about 150 years ago [10]. Although there is not a single definition for culture, there is a consensus that the term emerged in 1871 as a synthesis of the "Kultur" and "Civilization" terms. Kultur was used to refer to all the spiritual aspects of a community; and Civilization referred to the material achievements of a people. Edward Tylor synthesized both terms in the term "Culture". Culture, or civilization, in its wide and ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society [29].

Culture can have a serious effect on the way people interact with, react to, and feel about symbols, terms and situations [5]. In HCI literature dealing with culture, Hofstede's perspective [19] is among the most known and cited [8, 13]. According to the author, culture is the sharing of beliefs, values and practices of a group of people; the collective programming of mind that distinguishes the members of one culture from the members of another. On the one hand, this approach has been advantageous for those interested in predicting the behavior of cultural groups, because it assumes the existence of generalized cultural traits [27]. On the other hand, Hofstede's approach does not favor the ones interested in identifying relevant cultural aspects that may emerge from, and be relevant for, a particular cultural context.

Hall [17] and Geertz [15] views of culture has also been adopted in research about practical and methodological culture and HCI. From a broader perspective, Hall understands culture as the way of life of people, their learned behavior patterns, attitudes, values and material goods. Hall analyzes culture as a form of communication giving emphasis on the non-verbal one (behaviors, values, intentions, needs, expectations, etc.). According to Hall, culture is related to the different ways of organizing life, thinking and understanding basic assumptions about the family, the state, the economic system, and even the human being, acting as a link between humans and the mean to interact with each other [16].

When talking about culture, Hall [17] believes that it is more important to look at the way things are put together than at specific theories. In this sense, the author proposed 10 (ten) primary messages systems (PMS), or areas, he named the basic building blocks of culture (interaction, association, learning, play, protection, exploitation, temporality, territoriality, classification, and subsistence), arguing that any culture could be characterized, analyzed and compared through a combination between these areas.

Geertz in his interpretive or symbolic anthropology, in turn, believes that man is suspended in webs of significance he himself has spun and take culture to be those webs. This view is in line with the third HCI paradigm discussed by Harrison and co-authors, in 2007 [18], which views interaction as a form of meaning making, and also with the view of Salgado [27] and colleagues about culture-sensitive meanings, as a large portion of the content communicated in cross-cultural systems.

The interest in culture in HCI research dates back to the 1980s, as explained by Marcus in [21]. Some authors have considered cultural issues in the creation of interactive technologies, particularly investigating its influence on usability evaluation

[4, 11, 30, 32, 35], and proposing (or revisiting) design methods from a cultural perspective [1, 13, 25, 26, 34]. Culture is also on the core of researches related to internationalization and globalization [21]. However, recommendations for the interface design for international users are often based on collective knowledge, personal experiences and few case studies [22].

In this sense, some authors [22, 25] argue that although HCI researchers recognize culture as an important factor, studies that explicitly consider cultural issues are still scarce. In fact, the treatments given to culture in HCI research have been mostly fragmentary and guided by practical and specific problems [27]. Therefore, it is necessary to discuss and generate new knowledge that will help HCI professionals to recognize the importance of cultural factors in the design and evaluation of interactive technologies. The very understanding of culture, its role in technology design, and existing theories and methods for dealing with cultural issues, are topics that need to be discussed, disseminated and revisited.

3   Challenges in Culture and HCI

Winograd and Flores [32] argued that the role of an interactive system designer goes beyond the construction of an interface to encompass all the interspace in which people live. The author advocates that it is necessary a shift from understanding the machinery to understand people life's while using it. In fact, the very definition of HCI provided by ACM (Association for Computing Machinery) indicates that this shift is not only necessary, but should be an already well-established concern and practice: "*a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them*"[1]. This definition represents the complexity and comprehensiveness of the area, and attributes to HCI the responsibility to consider not only technical issues, but also the ones related to the cultural context in which interactions occurs.

There are relevant works on the literature intended to identify, discuss and inspire current and future HCI research. Harrison and co-authors [18] discuss a new paradigm in HCI that must deal with the establishment and multiplicity of meaning in situated interactions. Bødker [6], in turn, speaks in terms of a new wave in HCI where new elements of human life are included, such as culture, emotion, and experience; and where the focus is on the cultural level and on an expansion of the cognitive to the emotional. Bannon [2] claims for a "re-imagination" of the HCI area, and Sellen and co-authors [28] and Baranauskas and co-authors [3] prospect challenges and opportunities for HCI in the near future.

The Five Grand Research Challenges proposed by the Brazilian community [3, 7] is a good starting point to show the challenge of dealing with culture in HCI. Brazil is a country of continental dimensions, with a heterogeneous population in terms of ethnicity, behaviors, geographic, etc., and marked by inequalities (in its widest) and chronic deficiencies (e.g., infrastructure, education, health, safety). We believe that

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[1] http://old.sigchi.org/cdg/cdg2.html#2_1, last access on February 10th, 2015.

although these challenges have been proposed specially for the Brazilian context, they may be considered relevant for the HCI field as a worldwide research area, and for a globalized society.

Following, we draw the 5 Grand Challenges and discuss them through the lenses of culture. Each topic requires research and advances in different perspectives that are equally challenging, covering technical, theoretical and methodological, and social issues. Our discussion is guided by these three perspectives and shows that all professionals in the HCI community have more than a direct or indirect relation with culture (regardless the adopted focus or topic investigated).

3.1   Future, Sustainability and Smart Cities

Discussed as a Grand Challenge, Future, Sustainability and Smart Cities bring into consideration that issues related to renewal, reuse and disposal of software and hardware should be considered as part of design requirements. Smart Cities is a hot topic for technology design, being both an additional challenge for sustainability and an ideal context to investigate solutions and solve critical problems.

There are several points that need to be considered when talking about sustainability and the future. Some of them require deep cultural changes in society. To promote sustainability, there must be a change in people's behavior. There are studies being carried out in the context of persuasive technologies that aim to promote people's sustainable behavior (e.g., saving water and electricity, recycling). Besides ethical issues (and values) involved in the design of technologies that want to promote a certain type of behavior, if there is not a deep understanding of how people organize themselves, survive and operate in society, then, it will be impossible this promotion to occur in the correct (desired?) direction.

A key step in designing a solution for promoting or inhibiting a sustainable action is to understand the needs and the behavior patterns of a social group and to know their origin. For example, if a given community does not separate the garbage for recycling, there maybe several possible reasons that explain this behavior, such as: (i) people are not aware of it, (ii) people are not motivated, (iii) they do not agree with the idea, (iv) they do not have resources to support garbage collection, etc.

Every possible reason has different explanations and leads to different understandings that influence the type of action for encouraging behavior change: social training and awareness activities/publicity; an incentive and reward program; providing the equipment and structures that enable the collection and recycling, etc. Each group of people develop their social organization strategy and is placed in a physical environment with opportunities and weaknesses. Understanding this situated context is central to analyze what is important (and necessary) to people and how to design something that can add to their life, well-being and dignity; and for this, we should consider the specificities of their culture.

From this first "Grand Challenge", thus, we argue that besides usability, adaptability and so on, HCI design and evaluation should deal with cultural sustainability, i.e., the quality of support sustainable behavior. HCI as a research area should advance the quality criteria concepts currently disseminated to include world's urgent needs.

3.2 Accessibility and Digital Inclusion

This topic makes it explicit the concern with accessibility issues and their role to promote digital inclusion, highlighting the need to build systems that can be used both on different devices and specialized for different users and their needs. Promoting accessibility is a basic requirement for supporting people's and a democratic society, guaranteeing that people will find no barriers for living and acting regardless their limitations and specificities.

In this sense, it is essential to consider cultural issues when thinking about accessibility. The way accessibility is understood and treated, the importance given to universal access of citizens to existing resources, and the strategies to ensure such access are closely linked with cultural issues. Economic resources, educational background, gender and age, the environment and the physical infrastructure, the need for information, etc., are examples of issues that vary greatly according to the group analyzed. These issues directly influence the accessibility, the type of strategy and technology to be adopted and results.

In [23, 25], the authors argue that accessibility should be discussed as a cultural value related to the exploitation of the world, and with different levels of formality. For instance, it is necessary to recognize that people have different needs, views, understandings and expectations regarding accessibility; different stakeholders value and react to accessibility in a different way. There are also social rules, laws and norms related to accessibility that must be understood and followed; there are accessibility standards and certifications, formal training and education, etc. Finally, there are physical structures, tools and technical devices for providing accessibility (e.g., assistive technologies), or that require accessibility; there are public and private services related to accessibility, technical procedures, frameworks, and so on.

For this challenge, it is important a mutual understanding in HCI between technology and users. In this context, designers and researchers cannot impose their points of view, for example, they should support to local culture to develop, and thereafter pass it in the technology. This mean approaching people to the technology without trample, because we need to know the different users' facets. Besides, there are often political and cultural decisions within technology, even when we think we are neutral, because we carry our personal believes and understanding about the world.

Nowadays, interactive systems can be anywhere and anytime. Therefore, today it is important to know how to deal with cultural issues, especially when developing or evaluating wide-access applications and interactive systems. Interactive systems for the web need to provide support for an ever increasing amount of material and make it available for local-language populations across the world. One of the main challenges for designers is to build/evaluate systems that aim explicitly at acknowledging the diversity of their users' cultural background and attending to a wider variety of needs and expectations [14, 27].

3.3 Ubiquity, Multiple Devices and Tangibility

This topic draws attention to a new range of interactive technologies and interactions possibilities, encompassing immersive and engagement aspects in interactions. Ubiquitous systems, simultaneous interaction with multiple devices, brain-computer

interfaces, tangible interfaces and gesture-based interfaces are examples of new forms of interaction.

Besides the issue of accessibility and other considerations presented previously, this challenge makes it explicit the need to understand how to design new forms of interaction that make sense to people and contribute to make their life easier. Identifying the kind of physical artifact to be designed, the feasibility of designing it, people's interesting using it, and the benefits that can be offered, are issues that need a cultural understanding to be clarified.

There are several cultural factors that influence this challenge, ranging from more known issues, such as gestures that are recognized by a group of people and the preferred types of devices to use, to more subtle issues, such as the knowledge to use them, the time and the location where the devices are available and how the interaction occurs, the possible impacts on emotional, affective and physical aspects of users, etc.

The security and privacy are one of the main burdens ways to accepting ubiquitous computing. They are dynamic and contextual, e.g. privacy laws and regulations vary widely all over the world, and individual participation (and his/her consent) is an important issue. In this way, the cultural needs are different, the access to the technology and to the cities are different, and a new perspective emerge - the human now interacts with all environment, not only with the computer. This is a new perspective that must be understood.

3.4   Human Values

The link between culture and human values is inseparable. A value cannot be understood outside its cultural context [25]: while a value indicates something that is important and needs to be taken into account, the cultural context explains why such value is important. What people like, consider importance and value is closely connected with the environment in which they live and their social relations. Therefore, the most important point here is the need to approach values and culture in an integrated and articulated way, including the concern for both concepts in the methods, practices and artifacts used to support the design of interactive technologies.

The explicitly consideration of values and culture is not only a challenge in theoretical, methodological and technical issues, but also a cultural challenge for the HCI community in its posture and practices. There is a tendency to leave these issues to the margins of the developed works, underestimating their importance or even neglecting them altogether. Therefore, we must make an explicit commitment to understanding and respecting values and culture in our research and practices.

Many open issues emerge when we discuss human values and culture itself in interaction design, and HCI, including:

- How can we understand and represent human values and use them appropriately in the interaction design?
- How do we obtain relevant cultural information about a specific community and how do you determine each is relevant?
- How do we generate design ideas from this cultural information?

- How important is culture among all other aspects being considered in an interaction design?
- How Brazilian HCI community, and other communities, can address cultural issues in their research?

This paper obviously has not an answer to these questions, it just tries to provide some directions of how culture in HCI still an open issue. Therefore, it is yet a limited journey into a territory that includes many other possible perspectives and paths to be explored.

3.5   HCI Education and Industry

HCI Education and Industry have a two-way relationship with cultural issues: on the one hand, cultural issues influence on what need to be taught, how it should be taught, what kinds of skills need to be developed, what strategies should be adopted, etc. On the other hand, the HCI education is usually the only opportunity that students of technology and computing courses have to be able to deal with social issues, such as culture and values. Therefore, the HCI education plays a key role in capacitating students to conduct a socially responsible work in academy as well as in industry.

As claimed by HCI researchers [28], computer technologies are not neutral – they are laden with human, cultural and social values. So, HCI disciplines should emphasize the interdisciplinary aspect of the field, involving different perspectives and people, creating something new by crossing boundaries.

Additionally, we should understand that the companies and organizations are not looking only for technical skills, but they are looking for creativity and talent. In Computerworld last research about the hottest IT skills for 2015, for instance, talent was explicitly included by John Reed: "The leaders who realize that IT talent trumps technology put hiring at the top of their priority list and create the urgency and enforce the message that bringing on top talent is of the utmost importance." [9].

Another challenge is to bridge the gap between what and the way we teach and the practice of computing. As claimed by Matt Leighton, director of recruitment at Mondo, a tech staffing agency, "there is a gap in terms of what the companies want to do and the talent that is out there to execute these initiatives" [9]. HCI education should motivate, therefore, initiatives to bring industry experts and academy (teachers and students) closer together. Strengthening the links between the two parts is an important way of ensuring mutual understanding.

3.6   Culture and Usability

Usability is a relative concept rather than an absolute one. You cannot say, for instance, that some design is usable or has good usability. You can say, however, that design 'X' is relatively more usable than design 'Y' based on some measure of effectiveness, efficiency, satisfaction, and learn ability [12]. Numerous usability evaluation techniques have emerged to measure these factors, and, nowadays, different researches have been studying these techniques and how they are adapted for different cultures [12, 30, 35].

Some researchers have gone beyond these more mechanical measures to focus on the emotional impacts of design, and many practitioners would now prefer to focus on what is the user experience (UX), rather than just usability. This recognizes that while usability is important and an often neglected part of design, the holistic nature of design is such that a successful design requires a balancing of all the different aspects of that design (usability, functionality, aesthetics, and why not culture?, etc) and not just concentrating on one to the neglect of the others. It recognizes that a finished design is a gestalt – the whole is greater than the sum of its parts [12]. Such view brings a new perspective about how to deal with cultural issues (e.g. in the design and the evaluation process, and analyzing all stakeholders cultures – i.e., designer, user, programmers, and so on). All people involved in the design or evaluation process have their particular cultural characteristics, and these could bias the interpretation of a design concept or an understanding on the evaluation.

Cultural awareness become central when we have to interact with people from other cultures. The quality of user experience is intricately related to the users' cultural characteristics [20]. System features appropriated for one culture may not be suitable for others; as well as system's design needs to be adapted for different cultures [20].

The influences of culture can be seen in products, by choices concerning use of colors, symbols, language set, and so on, and in the design process, e.g., culture influences higher level design issues, the design methods employed in building interfaces and in usability methods [11]. The cultural influence, if ignored, can compromise usability evaluations, therefore giving information that is inaccurate [31].

Although culture issues is becoming increasingly important to HCI, many of its concepts, techniques and approaches are not known by the designers. Besides this, culture is in a constant movement, and must be preserved and respected. It is not our goal to point out what is the best approach (if this answer is possible), but to make a stand in communicate to HCI practitioners and researchers to be aware of cultural issues involved in their design and solutions.

4   Conclusion

How can we turn HCI cross and/or intercultural issues into opportunities? UNESCO argues that cultural diversity needs to be addressed as an asset and not a threat, a source of renewal for public policies in service to development, social cohesion and peace [30]. The challenges cultural diversity may represent to ICT should be tamed in favor of a sustainable world.

Today, in the context of discussions about the future of HCI research area and the need to rethink the theories, methods and practices adopted to support the design of interactive and more innovative technologies, the concern with aspects related to cultural diversity is a trend and a challenge by itself. In fact, we must understand and acknowledge that these aspects directly influence the way an interactive technology is created, perceived, understood and used. Research on the impacts of cultural differences on HCI [4, 31, 33, 35] has led professionals to the creation of products that do not meet the demands of its users, does not make sense to them, and often cause unwanted effects on the environment in which they are introduced.

Therefore, we, as HCI designers, have an ethical responsibility to ensure that the solutions we design do not trigger unwanted effects on the environment in which they are inserted and on the different stakeholders involved. While researchers, in turn, we must assume a compromise to investigate and create solutions to support designers in industrial and academic contexts in this task. We hope this paper to promote discussions about the complexity in designing interactive technologies, and the need to direct efforts to solve fundamental problems that still affects society.

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