Is Universal Usability Universal Only to Us?

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ABSTRACT
While the digital dividing lines of the world are broadening, different movements are being organized to empower currently technologically disadvantaged people. Universal usability is one term associated with an egalitarian opportunity to use current technology. We see that also a focus on the cultural level, a particular approach, is needed to support the universal understanding. Our model describes computer science and technology as a cultural phenomenon, concentrates on studying indigenous computational systems and applications, contributes to a better understanding of the relationship between technology, people, and culture, and aims at developing an ethnically fairer computing technology and computer science.

Categories and Subject Descriptors
K.0 [**Computing Milieu**]: Societal and cultural considerations – *ethnocomputing*, *culturally fair computing.*

General Terms
Human Factors

Keywords
Ethnocomputing, cultural considerations of computing technology

1.INTRODUCTION
As the CUU2003 call for participation states, computers are currently designed for the Western knowledge worker. This is mainly due to the history of computer science as an extension of the Western system of knowledge. Computers are cultural artifacts that are designed to meet and inherently exhibit the Western understanding of logic, inference, quantification, comparison, representation, measuring, and concepts of time and space, for example. A cultural redesign, the CUU2003 web page continues, has the potential of bridging the digital divide. We agree that universal usability may help in bridging the gap, but we argue that we should pursue the universals through particulars, through the ethnocomputing of different cultural groups.

2.BIAS ON NORTH AND WEST
Computer scientists and engineers usually separate their science from its social surroundings, dividing science into "pure" and "applied". A usual claim is that science and technology are pure and egalitarian *per se* but the current institutions and societal structures allow ethnically unfair distribution of their benefits. This is partly correct: current institutions and societal structures *do* have an impact on the distribution of the benefits. However, it is not that the institutions and societal structures would just distribute the benefits unequally, but they also bias the very focal points of technological research.

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Ever since the Second World War military applications, ciphering, and code breaking have been a major focus of computer technology research. The focus does not seem to be shifting: after its completion, the fastest supercomputer in the world, *RedStorm*, will be used for modeling nuclear detonations [1]. The most significant supercomputing advances have been spurred by governments, and are linked to nuclear weapons [1]. Current technologies are not even intended to equally benefit all the segments of society [2]. Priority in research is easily put on those research topics that have direct economic applications (for multinational corporations), have been hyped up by the media, or are funded heavily by governments – not on those applications that people might need most.

In correcting this bias, the focal point of research should be shifted towards the people; we should make computing technology available, understandable, and participable for everyone regardless of culture, gender, age, income, language, degree of disability, or ethnicity. The dialectic societal connection should be clearly shown, tying the history and development of computer science to its societal context [3]. Without showing the historical and current ties to military, economics, and academia, computer science and technology will continue to be perceived as something that can be developed only by a small élite, as tools used only by those who are "gifted", and as something that is meant especially for Western people. By making the technology more accessible to everyone, technology itself will definitely benefit from the diverse knowledge of all kinds of people of the reality they are living in.

3.CONCENTRATING ON PARTICULARS
We use the term *ethnocomputing* to refer to computational concepts, to their technological implementations, and to the use of technology – all in the cultural contexts in which they emerge. Technological improvements are a response to the needs of the society; at least some segments of society. Because different societies may have different needs for tools, different knowledge systems and values, or different scientific bases, the past, current, and up-and-coming computational ideas and artifacts may differ greatly among different cultures.

When learning to use or develop computer technology, non-Western students face bigger problems than their Western counterparts. They need to first get acquainted with a different world view before starting with the topic. This Western philosophy may be directly at odds with their perceptions of time and space, society, logic, values, problem solving methods, or even what problems are considered legitimate. Usability is often built on such metaphors and analogies that may not exist outside Western world. When the poor educational and resource situation of developing countries is added to this unnecessary cognitive overhead, the chances for crossing the digital divide are not too promising.

Aspects of knowledge and learning (generation of knowledge, its intellectual and social organization, and its diffusion) are usually studied in isolation from one another, and they are

identified with disciplines labeled cognition, epistemology, history, sociology, and education [4]. In our model, we look at knowledge in a holistic way (cf. [4]). We – computer scientists – need to trace back the historical and societal constructions of the computational practices of different cultural groups. We need to understand the philosophical framework of computational and technological concepts in the circumstances in which they emerge. We need to become acquainted with the needs and problems of the society in question. We need to examine the relationships between language, society, arts, tools, artifacts, and computing technology. We need to rethink how to teach the use and development of technological tools in culturally relevant ways. And we need to also apply all these to our own societies.

Our research group believes that by adopting this kind of an anthropological entry point into technology, we would gain a better understanding of how different cultural groups have different understanding of logic, aesthetics, design, symbols, or HCI in general, along with gaining a view on the local, experientially and socially constructed interpretations of technology, any technology. Then we might understand how these aspects of knowledge affect the design of technological tools. From our viewpoint, usability is much more than just the interface; we will have to see the whole big picture from theory to technology to people to society.

From the viewpoint of technological universality, it is auspicious that none of the hundreds of languages studied so far lack the ability to handle, for example, logical connectors *and*, *not*, *or*, *if...then*, and *iff* (see [5]). But even though there were no linguistic constraints for a universal technological understanding, it would not mean that different cultures would always come up with the same presentations or uses for the concepts. In searching for something that would be universal or close to universal we need to first understand the local. Before we know the cultural interpretations, implications, and societal interaction of our technology in many enough cultures, we cannot claim it to be universal. Our model requires the research to be done on the spot, not at campuses or facades. Certainly, without going to the grass-root level, we will not see the details of cultural influence on technological design, and what we claim to be universals may be just our universals.

4.HOW TO ACHIEVE UNIVERSALS

We have considered some pedagogical and psychological problems that computer science, and technology in general, face: (a) maintaining the status of technology as something that can be understood only by a few talented, "techies", who usually are male; (b) often forgetting the fact that technology holds only instrumental value; (c) thinking that emulating European or American social and scientific development will lead third world countries to prosperity (cf. the history of colonization); (d) concentrating on problems that our current tools can solve instead of trying to adapt our tools to solve the most urgent problems at hand; (e) not understanding the complexity and profoundness of cultural issues concerning technology and its uses; (f) trying to aim at universality without having enough knowledge on particular cultural contexts – universals are, after all, used locally. These are the problems that ought to be corrected first.

Shneiderman [6] states that positive steps are needed because there are strong forces that resist the shift from the "old computing" to the "new computing", integrated disciplines. Rather than understanding computer science and technology as something separate from society, culture, and other scientific disciplines, these positive steps from our perspective would be that students should better understand the interconnections between them. A holistic approach that we discussed earlier would serve to augment rather than fragment the students' understanding and imagination. ICT should not be treated as a value *per se*, but as a tool that offers new possibilities in all the realms of society if used in the right way.

We should set to work on the education of our technology professionals, beginning from the very first years of their schooling, to help (1) engineers to learn to appreciate the knowledge of the users; (2) system designers to understand the complexity of cultural issues in all the technology, its applications, and its design; (3) computer scientists to understand the cultural influences in their science; (4) designers and managers to understand that people from different cultural groups may have different needs for programs, different understanding of logic, aesthetics, design, symbols, or HCI in general, and that the needs of the target group need to be addressed – this thinking needs to reach all the levels of software industry; (5) the people in the industry to understand that computer technology has only instrumental value, and that the responsibility of software and hardware industry is to respond to the needs of the people – not to tell the people what they need; and finally, (6) everyone to learn to think that the development of technology is not in the hands of the industry, but in the hands of the people – they could master the technology rather than be at the mercy of technological élite (cf. [6], p.32).

We believe that both poles of the distinction are needed: universal usability as well as cultural contextualization. People do have commonalities as well as differences. There is a call for teaching "mainstream mental models", but also an urgent need to ease the unnecessary cognitive overhead that current Western bias causes. Rather than restricting research on one side of this dualism, these two viewpoints: universal and particular could support each other in a complementary way, and create synergy that would benefit (a) the people in the form of intuitive, minimal cognitive overhead technologies; (b) societies by allowing technological development without undermining local cultures or traditions, and (c) computing industry with better user satisfaction and larger markets.

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