

A Cultural Approach to Interface Design

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ABSTRACT

Throughout the development of computing technology, there have been five shifts of focus in interface design, each shift distancing the emphasis further away from the actual machine. As computing machinery reaches an increasing number of people, the user base is gradually becoming dominantly non-Western and culturally diverse. Although the user base is multicultural, pluralistic, and international, interface design is not. In this paper, we argue that research on interface design needs to shift one more time, this time towards understanding the impact of culture on design. We end with an overview of our new perspective on interface design.

Keywords

Culture; Interface design; Cultural HCI

1. INTRODUCTION

When Jonathan Grudin wrote his paper about the history of interface design in 1990, the development of interface design was in the beginning of a new phase [3]. Today designers are witnessing an era that in many ways resembles the one that Grudin described fifteen years ago. Interface design is yet again reaching outward, learning more of the human world.

But this time the change may well be even more pronounced. The archetypical user today is no longer a middle-aged Western office worker as was the case in the 1980s. The continuous expansion of the computer industry to new market areas is increasingly diversifying the user base of educational technologies: it includes people of different ethnic groups, genders, strata, geographical locations, groups with special needs, generations, languages, and so forth. The research and design approaches that responded to the challenges of the 1990s, are not well-suited for the new challenges of the third millennium.

In this paper, we argue for a new approach to interface design – an approach that is a natural continuation of Grudin's five stages of interface design. We begin by sketching Grudin's model of interface design; in Section Three we clarify our view on culture; in the fourth section we discuss the changes that have taken place since the introduction of Grudin's model and argue that another, sixth level of interface design is already taking place; and in Section Five we define the main characteristics of this sixth level and propose necessary additions to interface design and research.

2. FIVE LEVELS OF INTERFACE DESIGN

In 1990 Jonathan Grudin [3] introduced a model of how interface design has historically developed (see Table 1). His model consists of five levels, each of which expands on the previous level.

In Grudin's model, the focus of interface design shifted from hardware to software to terminal *etc.* in about one-decade intervals. One of the main reasons for the transition between the levels has been the changes in user base – from technicians to programmers to end users in the 1970s, and from individuals to groups in the 1990s. Even though the levels are distinct, they are neither exclusive nor successive: research can and should be done at different levels at the same time.

The first level of Grudin's model, which occurred in the 1950s, was characterized by a focus on hardware. The principal users were engineers who knew computing equipment well. Computing performance was central to this level. In the 1960s, as software engineering gradually gained a foothold, the focus turned to programmers as principal users. Usability enhancements such as high-level programming languages, environments and operating systems increased the productivity of programmers.

In the 1970s, several hobbyist groups brought the computer out of the laboratory, making computing available to the public [7]. As the computer spread to Western society, the development of computer systems that were better suited for "end users" began. At first the focus was on perception and motor skills, and later shifted to fields such as cognitive psychology and ergonomics. The 1980s a trend towards interface designers focusing on high-level cognitive aspects, such as learning, modeling, and user-system dialog. The research methods diversified respectively to such methods as user thinking aloud.

Grudin's fifth level arose from the realization that since most work occurs in a social context, computers will support it more successfully if they implicitly or explicitly incorporate social and organizational knowledge [3]. This level puts social context, organizational level, and groups in the foreground and recognizes that no two individuals are alike. The intellectual frameworks used in research at this level include social psychology and anthropology.

3. WHAT IS CULTURE?

"Culture" is notorious for being a concept that is very difficult to define. Even anthropologists have not reached an agreement on its definition. Therefore, we do not aim at giving a comprehensive definition of culture here, but rather mention some of the ideas that are relevant for the concept of culture as we see it.

Culture is often seen as principally a *mental* phenomenon, that is, a phenomenon consisting of values, ideas, mental models and so forth. However, culture also includes *material* and *social* phenomena, which we feel should be considered as equally important parts of culture.

Culture is also commonly used as a *label* for the group of individuals that share certain characteristics. In this meaning it

Table 1: Summary of the distinctions across levels of interface focus [3]

	<i>Level 1: Interface as Hardware</i>	<i>Level 2: Interface as Software</i>	<i>Level 3: Interface as Terminal</i>	<i>Level 4: Interface as Dialogue</i>	<i>Level 5: Interface as Work Setting</i>
Principal users	Engineers / Programmers	Programmers	“End Users”	“End Users”	Groups of End Users
Interface specialist disciplines	Electrical engineering	Computer science	Human factors, cognitive psychology, graphic design	Cognitive psychology, cognitive science	Social psychology, anthropology, organizational...
Research methods	Largely informal	Largely informal	Laboratory experiment	Wizard of Oz, thinking aloud, data capture	Ethnogr., contextual, participant observer
Duration of basic events studied	Microseconds/hours	Milliseconds/hours	Seconds	Minutes	Days
Cost	Lowest	Low	Moderate	High	Highest
Precision, generality	Highest	High	Moderate	Low	Lowest
Major focus	1950s	1960s-1970s	1970s-1990s	1980s –	1990s –

makes sense to talk about “cultures” in plural form. This view of culture is typical of cross-cultural psychology (see, e.g., [8]). Other researchers argue that culture should not be seen as any collection of things but as a *process*, because the things that are often considered as culture are actually only a residue of this process [6].

There are various opinions about the level at which cultures exist. Many anthropologists are not comfortable with the wide variety of phenomena that are referred to as “cultures”. On the other hand, some anthropologists consider an individual as “a junction point for an infinite number of partially overlapping cultures” [12], claiming that culture is a fuzzy concept and that no strict boundaries can be drawn between individual and cultural. In the case of the sixth level, we are especially interested in cultural phenomena that go beyond the level of organizations.

In addition to the previous points, we would like to emphasize that culture has many controversial characteristics. Thus, culture can be both coherent and diverse, extensive and restricted, durable and variable, motivational and unmotivational [12]. In software localization, for instance, culture is often seen as fixed, as something into which software needs to be molded. This viewpoint underplays the dynamic aspect of culture and its role in helping humans to adapt to new conditions [5].

4. WHY IS ANOTHER LEVEL NEEDED?

Changes in the User Base

Grudin's model documented well one major shift in the user base of computing machinery. This shift was the change from engineers and programmers to “end users” in general. Although there is plenty of intra-group variation within the category of engineers and programmers, the shift was still one from a *relatively homogeneous* group of people to a *much more heterogeneous* group of people. During the transition from the fourth to fifth level the principal users changed from “end users” to “groups of end users”, but the category of “end users”, remained the same.

A lot has happened since the 1990s when the growth of computer networks led to workgroup computing, *i.e.*, the fifth level of interface design. Computers, ICT in general, and the Internet are no more the exclusive privilege of rich countries.

Currently, according to CIA World Factbook¹, there are 185M (million) Internet users in the U.S., and the following countries are China (100M), Japan (78M), Germany (42M), India (37M), UK (33M) and South Korea (32M).

The growth potential does not lie in industrialized countries where the markets are becoming increasingly saturated. The population of China and India alone account for one third of the world's population, but the percentage of the population who use the Internet is 3.4% for India and 7.6% for China compared to roughly 60% for the United States. There is a plenty of room for growth in developing countries.

We argue that a second major shift in the user base is happening as we speak. The ongoing diffusion of computing technology in developing countries is increasingly diversifying the user base. We note that there is considerable intra-group variation in the categories we call the “Western” users and “non-Western” users. However, according to a number of studies, the inter-group variation, that is, the differences between these groups is considerable [4]. We argue that there is currently an ongoing shift from a *culturally homogeneous* user base to a *culturally heterogeneous* user base.

A Cultural Clash or a Cultural Fit?

Everett Rogers' four decades of research on the diffusion of innovations has showed that in order to succeed in a community, technology needs to be relevant in a number of ways [10]. Of Rogers' different aspects of relevance, two are specifically important from our point of view. First, new innovations have to be relevant to local users. Systems that are hard to use are adopted slower than those that are easy to use, or they may be rejected altogether. The more new skill and understanding a technology requires the adopter to develop, the slower it is adopted, compared to a technology that links to knowledge the user already has.

Second, new innovations have to be relevant to the local culture and society [10]. The structure of a social system may facilitate or impede the diffusion of technologies. Rogers' study shows that the adoption of an incompatible innovation often requires prior adoption of a new value system, which is a relatively slow process.

The heterogeneity of the international, multicultural, pluralistic user base of the 2000s sets new challenges to interface

¹ www.cia.gov/cia/publications/factbook/ (23rd Sept. 2005)

design. The design and research tools associated with Grudin's fifth level are a reaction to a need to support groupworking in organizations, at the workplace. Grudin writes that on the fifth level, one needs to take into account social, motivational, economic, and political factors [3]. Yet, the tools associated with Grudin's fifth level may prove inadequate to meet the new, unforeseen challenges that the diversification of end user base involves.

Global Software Engineering

In the 1980s the market niche of major software products started a gradual broadening from large corporations, institutions, and organizations to include small and medium enterprises, homes, and now personal, portable devices. From a cultural point of view, there is an equally dramatic change due to the globalization, which has expanded the market area of software products to developing countries and brought along global software production.

Software houses have already seen the challenges that the diversifying user base brings, and they attempt to rise to the challenge through the internationalization-localization process. The adaptation of software to different target cultures has raised many questions for which today's software engineering has no predetermined answers: Is it possible to design truly global software? If not, how do engineers adapt software so that it would cater to the specific conditions of a culture? What should be the priorities in software localization? How do engineers find out what will work out and what will not? Finding answers to such questions requires broadening the current viewpoint of software engineering.

One of the central problems in software engineering has been the gap between developers and end users. The problem that developers do not know enough about the end user is accentuated in the field of global software engineering, in which all the stakeholders may come from different cultures. Consequently, the probability of misunderstandings, surprises and lost opportunities in software projects increases.

Educational Technology for Multicultural Learning Settings

Educational technology has been in the forefront of groupware and workgroup computing. New technologies enable, for instance, virtual and mobile learning [9], and the latest network technologies are frequently used in the implementation of online learning environments. Technologies that are used with international, multilingual, or multicultural learning groups share the same problems that global software engineering in general shares. The users often come from a number of different cultures, and they may not share the same feelings about technology.

Educational technology can benefit from focusing on culture in interface design. As the lines of the digital divide are drawn between ethnic groups, genders, strata, geographical locations, groups with special needs, generations, and languages [1], successful design of educational software has to start with such aspects in mind. Superficial cultural adaptations to end products may be temporary remedies to some of the problems, but for long-term improvements, new approaches to the software construction process may be needed.

5. THE SIXTH LEVEL: INTERFACE AS CULTURE

Principal Users

On the sixth level, attention is drawn to the cultural diversity of the users. Due to the emergence of the international software industry and the rising number of users around the world, the possible gap between the designer and the end user is widened even further. They may not be separated by expertise or profession alone, but also by pervasive cultural factors.

Research Methods

The problem with culture at the national, ethnic *etc.* level is that people have been a part of the cultural process since they were born. They are used to certain ways of doing things and they have absorbed certain cultural values. The learning of culture has been largely an unconscious process and it includes many aspects of which people are not aware, thus making them difficult to discuss.

The methods on the fifth level are often based on observation in the work context. However, these methods may be insufficient on the sixth level. While observation in the work context may give some clues to the larger subcultures of users, it provides a very incomplete description of their total subcultures, of the larger functions of the organizations, or of the meaning of the organization in relation to larger systems [11].

Although culture at the national level is distinguishable from subcultural levels and should be researched with different methods that the methods used for subcultural levels, the levels are so functionally interdependent that they cannot be properly understood in isolation [11]. Consequently, national cultures should be viewed in relation to lower cultural levels (and vice versa).

Reference Disciplines

Interface design on the sixth level is multi-disciplinary by nature. Anthropology, which became important on the fifth level, continues to be one of the focal disciplines, as it is the "home field" of culture. However, as technology has never really been the main interest of anthropologists, Science and Technology Studies (STS) could provide a more technological viewpoint to the matter. In addition to STS, other social sciences are needed to offer insights into the functioning of societies, national institutions and global structures. In the field of psychology, the theories and methods of cross-cultural psychology and cultural psychology may prove useful.

As a result of the wide variety of required methods and reference disciplines, the role of the interface designer is changing from an engineer to a "bricoleur", with which Norman Denzin and Yvonna Lincoln [2] associate, *inter alia*, the following characteristics:

- flexible and responsive: a willingness to deploy whatever research strategies, methods or empirical materials are at hand, to get the job done; "if new tools have to be invented, or pieced together, the researcher will do this"
- technically curious and multi-competent: skilled at using different methods (interviews, observation, personal documents, *etc.*)
- intellectually informed: reads widely and is knowledgeable about different interpretive paradigms.

Duration of Events Studied

According to Grudin, the duration of events studied can be measured in days on the fifth level, though he mentions that

“many social processes unfold over weeks or months” in the work setting [3]. On the sixth level, designers are interested in events with even greater time spans. When they start to consider things such as the diffusion of technologies to societies, they are dealing with processes that may take anything from months to several generations.

Precision, Generality

On the sixth level, generalizing becomes increasingly difficult. The higher level processes are not well understood and the number of potential problems to be solved increases. Although one may find some kinds of generalizations that apply to many if not all cultures, such generalizations have to be applied with great care.

Cost

The costs of cross-cultural studies are high, which will cause problems in software engineering and limit the range of methods that can be put to use in software design. The costs can be cut down by the reuse of information in later projects.

Major Focus

Grudin’s timeline describes the focus of each level, *i.e.*, the time when it became reasonably widespread in the computing world. Thus, although the 1990s saw some signs of the sixth level in interface design, the sixth level will probably continue to increase its foothold during the 2000s.

6.DISCUSSION

The sixth level, interface as culture, is similar to the five earlier levels in that it is a new addition to the continuum rather than a distinct level. As such, it does not question the value of the earlier levels, nor is it a sufficient approach on its own. Instead, it offers new perspectives into the other levels of interface design, helping the designers to get a deeper understanding of what really matters to the users, and why.

Research on the sixth level is still in its infancy, but judging by the number of studies published during the past few years, the interest in cultural matters in interface design is clearly growing. Current research efforts have mainly concentrated on the effects that national cultures may have on the issues of levels one to five, such as perception, cognitive styles and group support systems. This type of research is valuable and offers new insights into many research areas in interface design.

There are, however, many interesting questions concerning the sixth level that are currently left unanswered in interface design. In our research, we address some of those questions by studying the following topics:

- Meaning of culture in interface design – defining and understanding culture as a phenomenon in the context of interface design
- Interplay of culture and technology - how culture shapes and is shaped by technology
- Methods for cross-cultural software design - evaluation of current design approaches from a cultural point of view and the introduction of new ones

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