The Expanding Focus of HCI: Case Culture

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ABSTRACT
The focus of the research in human-computer interaction (HCI) continues to expand. One example of this is the growing interest in national and ethnic culture as a research topic. In this review, we examine the emerging field of cultural HCI by systematically analysing culture-related literature from five major HCI forums and past sixteen years. We focus on research methodology, technologies and cultures covered, theoretical underpinnings and referencing practices. We also discuss problems found on the basis of the review and provide perspectives on the future research into cultural issues.

Author Keywords
Culture, design, HCI, review

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
In 1990, Grudin [4] presented his framework of the development of user interface design. According to him, the focus of user interface design had been extending outwards throughout its history, and at the time the fifth level of the framework, that of work context and organisation, had just started to attract more interest in the field.

During the past sixteen years, Grudin's fifth level has become a common and acknowledged topic in HCI. At the same time the focus of design has kept expanding, as the researchers have identified new aspects that they feel HCI is still lacking. Some examples of the new approaches reflecting such concerns include emotional design [11], value-centred HCI [2] and culture-centred design [14].

The interest in national and ethnic culture in HCI rose around the middle of the 1990's. The most frequently cited early sources include Russo and Boor's [13] paper "How Fluent is Your Interface?" and a book "International User Interfaces", edited by del Galdo and Nielsen [3]. The reasons why designers got interested in cultural matters can be traced back to changes in both technology and the user base. Internet and computer technology spread outside the Western countries and the new global software markets became quickly an important part of software developers' business. Consequently, the user base diversified from mainly Western users to the users representing varied cultural backgrounds. The cultural gap between the designers and the users was suddenly not only a gap between experts and novices, but between different cultural traditions.

The cultural diversity has become a new challenge for HCI, which until now has largely been dominated by Western ideas and values. The studies that are taking up the challenge are still relatively few and far between. In addition, the research on the topic is fragmentary, introducing many different approaches, methods and concepts. While many authors have given examples of the relevant research in their studies (and some authors have even published more lengthy discussions on the topic, see e.g. [1, 9, 15]), we are not aware of any studies that would have reviewed and evaluated the study of culture in HCI in a systematic way.

We believe that the emergent area of cultural HCI could benefit from a systematic meta-review by several ways. First, such review would show the research topic as a part of the general development in HCI, illustrating its entrance into the field. Secondly, it would help in categorising the scattered research efforts under several approaches and highlighting the emerging trends. Finally, it would pinpoint both the pitfalls and promising directions for the future research.

In our analysis we will review culture-related studies from four prominent HCI journals and one HCI conference during the past sixteen years. Our aim is to provide an overview of the current research by classifying the studies based on the theoretical approaches and methods they use, topics they deal with, and the sources from which they borrow their cultural theory.

METHOD
As we wanted to analyse systematically the occurrence and characteristics of the studies of culture in HCI, we regarded quantitative content analysis as an appropriate method. This

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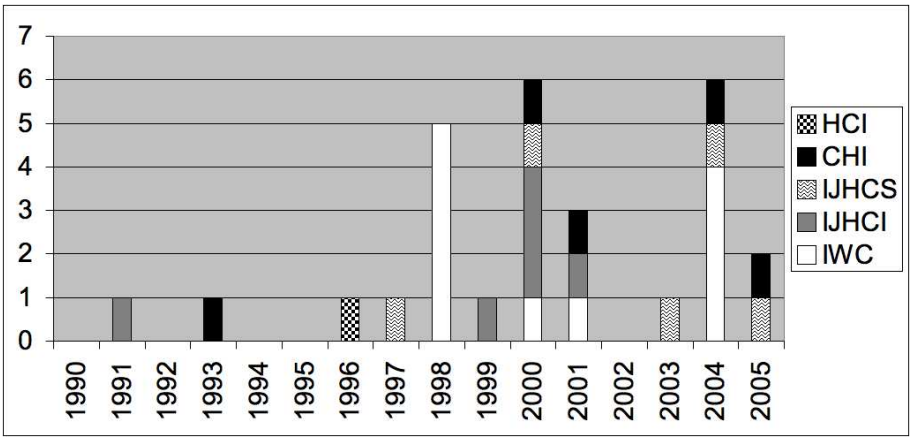

Figure 1. Culture-related articles per year and publication.

entailed collecting the data in a rigorous way, using a coding scheme with categories formed prior to analysis and paying attention to the objectivity of the results.

Data

As our main objective was to take a systematic look at the culture as a research topic of HCI during a long time scale, we collected the data from the established sources that would represent the most prominent part of HCI research. For that reason, we chose four well-known scientific journals: Human-Computer Interaction (JHCI), International Journal of Human-Computer Interaction (IJHCI), International Journal of Human-Computer Studies (IJHCS) and Interacting with Computers (IwC). In addition, we included the proceedings of ACM CHI conference into the study. This was justified by the arguably high quality of the conference (judged by its low acceptance rates), the wide availability of its proceedings via digital library and the fact that in the United States ACM conferences are generally regarded as premier publication arenas as journals are in Europe [5].

Beside the prominence, we considered comparability as an important factor while selecting the sample for the review. We thus restricted the review to the full-length scientific articles, leaving out such material as short papers of the CHI conference and introductions and book reviews published in the journals. The data was further limited to the years of 1990-2005, which we believed would offer long enough time scale to see possible trends.

We obtained the original sample by searching for the articles containing the term ”culture” or ”cultural” in the title, keywords or abstract. After that, we removed from the sample the articles that used the term culture in a meaning that was different from ours [1] or in which culture was only in a marginal role. The number of articles in the final sample was 28. (For the full list of the articles, see [10].)

[1] Although the concept of culture has many meanings, in this paper we refer to culture as national and ethnic culture. Thus we do not consider, e.g., the studies of organisational culture, which have been widely discussed elsewhere.

Although the final sample was not large, we believe it to represent the acknowledged cultural studies in the field of HCI. The number of articles we searched from was considerable, as there were a total of 3286 full-length articles in the source publications between the years 1990 and 2005. That is, of all the articles included in the original population about 0.9% were dedicated to the studies of cultural aspects.

Analysis and Coding Scheme

A unit of the analysis was article. During the analysis, the first author of this paper went through the articles and collected and classified the information from them with the aid of a code sheet that had been designed beforehand. Prior to that, the coding scheme had been tested and updated by two reviewers.

At the end of this process, the coding sheet included the following parts:

- General information (name, author(s), publication, year, volume, pages)
- Technology (web, groupware, embedded systems, etc.)
- Research methodology and approach (type of study, methods)
- Sources of cultural theory (definitions, references)

RESULTS

Cultural studies by source and year

As shown in Figure 1, HCI articles considering national / ethnic culture were rare in the first half of the 1990’s. Despite the fact that culture is still rather a marginal research topic in HCI, there is a noticeable difference between the first and second half of the 16-year-period (4 articles between 1990 and 1997 vs. 24 articles between 1998 and 2005). Even though the total number of HCI articles has also grown during the later half, it is only about 1.2 times greater compared to the earlier half, whereas the number of culture-related articles is six times greater.

IwC seems to be a pioneering journal in cultural HCI research. With its two special issues on culture (in 1998 and 2004), the journal has published eleven culture-related articles, which is 39% of all the articles in the sample. IwC also has the highest percentage of culture (2.4%) when the total number of published studies in each journal or proceedings is considered. For IJHCI the corresponding percentage is 1.6% whereas for the rest of the publications it is 0.5% or below.

Technological areas of the studies

We grouped the articles on the basis of their technological areas (Table 1). Internet and groupware were the most common technological contexts in the studies. However, nearly 40% of the articles were discussing design issues in general without specifying a certain technology. In these articles the topics varied from user interface design to usability engineering and technology development.

Research approaches found

On the basis of the review, the most commonly used research methods were questionnaires (n=13), formal experiments (n=8) and interviews (n=8). Geert Hofstede's [7] cultural model and contextual methods were each used in four studies.

In general, the reviewed studies approached culture in three different ways:

- Studying culture as a characteristic of a user
- Studying the (immediate) cultural context of a user
- Studying culture as a larger system

Most of the studies (57%) considered culture as a characteristic of a user which can affect the users' cognitive style, attitudes towards technology or the meanings they give to representations. These studies were usually based on cognitive psychology and favoured formal experiments and surveys as their methods.

Two other types of studies in cultural HCI were less common, each representing about 18% of the sample. The studies of the users in their cultural context were inspired by "second wave" HCI approaches such as activity theory and contextual design. As expected, observations and interviews were common methods in this group. The third group consisted of studies which were concerned not so much with individuals but with cultures as larger systems. Most of them were discussion papers addressing the relationship between technology and culture, including topics such as cultural factors in the adaptation of technology.

Coverage of countries

The studies in the sample covered five continents and a total of 24 countries. Although the need for cultural research is often justified by the Western bias in HCI, the traditional technology countries were well represented also in the cultural studies of HCI. This follows from the fact that in the reviewed studies the non-Western cultures were often compared to Western cultures. The most common national culture studied was thus American (n=10), followed by Chinese (n=5), Japanese (n=4) and German (n=4).

Design	39%
WWW	18%
Groupware	18%
Embedded systems	14%
Interface agents	7%
Other	4%
Σ	100%

Table 1. Distribution of technological areas.

Sources of cultural theory

Culture is a concept that is difficult to define, a fact that is generally acknowledged by many researchers also in cultural HCI. Thus, we were interested in finding out how many studies would actually define culture and whose definitions would be cited. As it turned out, in nearly 40% of the articles the concept of culture was left without any definition. In cases where culture was defined, the most common source was the work of Hofstede, whose definitions were cited in seven studies. Hofstede's [7] definition of culture as "the collective programming of the mind which distinguishes the members of one group from people from another" was especially popular.

We also analysed the main sources of cultural theory on the basis of the reference lists of the articles. As expected, the literature of cultural HCI and information systems was the most popular source of cultural information. Outside the domain of computer science, cross-cultural psychology and especially the research on cultural dimensions (e.g, Hall [6] and Hofstede [7]) was the most common source of cultural theory. Marketing and management literature was also cited, but there were surprisingly few references to anthropological literature. In addition, only one of the studies included references to the papers presented in the conferences relating to culture and technology (International Workshop on Interactive Products and Systems (IWIPS), Cultural Attitudes towards Technology and Communication (CATaC)).

DISCUSSION AND CONCLUSION

We have conducted a meta-review of full-length articles published in five major HCI forums that have discussed any aspect of national/ethnic culture. In total, we found 28 such studies [10].

In 2005, JHCI had the impact factor of 4.682, the highest of all HCI journals [8]. Considering the absence of culture related articles in what appears to be the leading journal of the field and the small total number of articles, it can be argued that culture is still a marginal topic in HCI. On the other hand, considering that 24 out of 28 studies were published in the later half of the studied period (1998-2005), it seems that culture has been getting more and more attention in the mainstream HCI during the past few years. This conclusion

is further supported by the fact that the first cultural theme issue in a HCI journal was published in 1998 and the first CATaC and IWIPS conferences were arranged in 1998 and 1999, respectively.

Although HCI is only one of the themes in aforementioned conferences (IWIPS deals also with other internationalisation issues, whereas CATaC is a multidisciplinary conference attracting researchers from several fields that are dealing with culture and technology), they have nevertheless provided new publication arenas for the researchers interested in HCI and culture. Unfortunately, it seems that these conference series have currently only minor impact on the cultural HCI. One probable reason for this is that neither the papers nor the abstracts of the papers are available in an electronic format, which restricts their availability.

According to our review it seems that most of the studies borrow their methodology from more traditional HCI research, that is, there is a prevalence of experimental and comparative and quasi-experimental work. This finding seems to be supported by the fact that cross-cultural psychology was one of the major sources for cultural theory.

Especially cultural dimensions have been popular in cultural HCI, even though the results of the studies have usually been mixed. In general, the criticism of cultural dimensions for their abstractness and emptiness as concepts [12] may well apply to their use in HCI, as cultural dimensions seem to have been more useful as a post-hoc framework than as a model that would inform design.

On the other hand, relatively few studies in the review were based on the second-wave theories of HCI or used contextual methods. This is somewhat surprising, considering that many of these theories were introduced to HCI over fifteen years ago. We believe that in the future they shall be more common also in cultural HCI, because they can offer more interesting and deeper views on culture.

Current cultural HCI research is dominated by experimental and comparative studies, in which some aspects of non-Western cultures are compared to Western, usually American, ones. We believe this leads to research that emphasises the cultural differences without attempting to understand different cultures from their own perspective. This view is in line with the one of [14], who criticise the current internationalisation practices in which design for other cultures usually means adapting existing (Western) versions of the interface.

In summary, in this meta-review we have found that the prevailing methodology in cultural HCI is comparative and based on traditional human factors studies. In addition, the underlying cultural theory is borrowed mostly from the studies of cultural dimensions that are often considered controversial. These approaches often lead to straight comparisons between two cultures. We believe that more efforts should be spent on trying to understand the interplay between culture and technology and studying the cultures from within. We therefore argue for employing more contextual, ethnographic studies that would provide new viewpoints to the research of cultural HCI and complement the traditional approaches.

Future work

This study is a part of the ongoing research into the studies of cultural HCI. The sample of our initial analysis represents cultural HCI as a part of mainstream HCI. We are currently making a similar analysis of relevant articles from other publications, including the proceedings of IWIPS and CATaC. We believe that extending the breadth of our analysis will allow us to make more detailed and accurate conclusions.

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