# Final report to FKK

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## Cultural usability: Innovating the quality of Information and Communication Technology through an understanding of culturally sensitive aspects of usability evaluation methods (UEMs)

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The cultural usability (CultUsab) project aimed to investigate the impact of culture on the results of established methods of usability testing of information and communication technology. The project was an in-depth investigation of the cultural specifics that go into usability test situations in three countries: Denmark, India and China. The project aimed at exploring possible developments of the testing methods in order to avoid cultural bias and produce comparable results across countries of the world. In the following, we present first implications and the impact of the project, then the major achievements of the CultUsab project, and we end by discussing methodological issues including the partners' collaboration across cultures that emerged during the project lifecycle.

## 1. Implications and impact of the project

Practical application of results. The project has been discussed at events held by the Usability Professionals' Association in Denmark [1] and India [2]; the Danish special interest group on computer human interaction [3], industry experience sharing meetings [4], and IT companies in China [5]. Danish Usability professionals have demonstrated improvements in their understanding of usability in other parts of the world and in their ability to configure usability evaluation methods cross culturally, which have been published in the project [6, 7]. The project results include findings that combine system development approaches, design methods and the psychology-oriented interaction design approach to usability, see e.g., [8, 9]. The concept of cultural usability developed in the project may support a wide range of interpretations of the use of technology on many levels within society, see e.g., [10].The project website www.culturalusability.com has since its beginning in April 2007 had nearly 6000 unique visitors, and in the year 2009 had an average per month of 260 unique visitors, who read about the project and downloaded papers.

Publication of results. The publications from the CultUsab project include one PhD thesis (submitted), three edited proceedings, a book chapter, nine journal publications, 23 conference papers, five conference abstracts/posters, and eight magazine publications and oral presentations and industry conferences. Further journal publications are underway, in preparation [11] or submitted [12, 13]. The project's publications have so far been cited in more than 30 scientific works. Results of the project have been published in international journals such as Interacting with Computers [14], International Journal of Design [15]. Publications included psychology outlets, such the International Ergonomics Conference [16]. An edited book was one of the target outcomes of the CultUsab conference held at the end of the project in the month of October 2009 in Pune, India [17]. The CultUsab project was presented and discussed with researchers and industry at appropriate conferences including the annual Danish HCI research symposium [18, 19], the INDIA HCI conferences [20-23] and HCI International 2007 in Beijing [24-32], the American CHI conference [33-35], and the International ICIS Information Systems conference [36]. A number of workshops [20, 37, 38] and presentations [19, 39-43] were also conducted by the project members travelling across continents.

International collaboration and methods development. In developing the methods of testing intercultural usability evaluation, the project developed and evaluated the methods for doing so, as described below, see also [9, 17, 44]. Moreover, the intense collaboration on all levels of this project, from field testing to analysis and publication, strengthened research networks between the countries involved and paved the way for future research in this and related areas to the benefit of all participating research institutions and researchers, as well as their students. The cooperation with the international research group behind the first Indian Human-Computer Interaction conference resulted in, among others, researchers such as Anirudha Joshi, Andy Smith (who headed the mentioned research group), and more associated researchers taking part in the CultUsab end conference [17].

Educational benefits. The PhD students Qingxin Shi (CBS), Jyoti Kumar IITG), Huiyang Li, Weina Qu, Chenfu Cui, Yun Jiang (CAS) co-authored project papers, and some visited Denmark for assisting in research and workshops. Furthermore, a number of Master's and Bachelor students co-authored research papers, wrote theses or student papers or helped with experiments; to mention a few of the many: Olaf Frandsen-Thorlacius (DIKU), Kemal Sahin (CBS), Kirti Meera Goel (IITG).

Future research agenda. The future research agenda that emerged from the project concerns an issue that was raised by multiple project members at project seminars, particularly in Copenhagen in 2008: internationally, there is a need for a theoretical framework for cultural usability of interactive consumer artefacts. Comparison was made to the cultural factors in engineering psychology in safety critical aviation that collects real scenarios and does error analysis in cultural issues.

## 2. Major achievements of the Cultural usability (CultUsab) project

The CultUsab project studied the issues of how to avoid cultural bias in requirements elicitation and usability data collection in the development of information and communication technology. This section presents the important publications, research problems, techniques, methods, solutions and network of international researchers that emerged out of the CultUsab project. This is done through answering first the overall research question, and then each of the sub research questions of the project.

The project's main research question was: *What is the impact of culture on the results of established methods of usability testing?*

The sub research questions were:

- *How are the different components of a usability test, e.g., planning, performing and reporting, influenced by a cultural diversity of users and contexts of use?*
- *How are cultural backgrounds taken into account when recruiting and describing usability test users?*
- *Which form of relations and communications between evaluators and test users are most effective in terms of finding relevant usability problems in culturally localized applications?*
- *What is the nature of common cross culturally related usability problems, and what is a good quality of cultural usability of information and communication technology?*

Overall, the project has conceptualised how the impact of culture on usability can be accounted for by focussing on shared, culturally specific models of the use of technology, and how the usability evaluation methods in practice are adapted and contextualised to ensure a high degree of alignment between the different models of use involved in a usability evaluation session. Compared to previous theory of cultural usability that tends to focus on national cultural dimensions, values and social traits, and how the designer should include these as diversity items in the design process to ensure a high degree of satisfaction to the user, the project's focus on cultural-cognitive models of technology use is a new insight in the field of culture and Human Computer Interaction [10, 17]. A paper from the project that presented this theoretical insight received in 2009 a best paper award at the world's largest Human Computer Interaction conference [45]. Another project paper [33] was nominated for best paper award at the world's premium Human computer conference, CHI2009. This paper established empirically that the concept of usability itself varies across cultural contexts, see also [46]. In the following, we present the project's contributions related to each of the sub research questions.

How are the different components of a usability test, e.g., planning, performing and reporting, influenced by a cultural diversity of users and contexts of use? The CultUsab project studied the impact of culture on the results of established methods of usability testing. A literature study found that culture impacts all the different components of a usability test [14]. The conclusion pointed to the importance of matching the task presentation to users' cultural backgrounds, the different effects

of thinking aloud on task performance between Easterners and Westerners, the differences in nonverbal behaviour that affect usability problem detection, and, finally, the complexity of the overall relationship between user and evaluator when they have different cultural backgrounds.

The findings from the literature study were supported by insights from field studies of Think Aloud usability tests in companies in Copenhagen, Beijing, and Mumbai [24, 34, 47, 48]. These studies shed light on culturally variant influences on initial socialization between moderator and test users, the test moderator's focus on client satisfaction, task performance and test users' comfort; formal vs. informal nature of evaluation interviews; evaluation after each sub-task vs. evaluation after the whole task; and culturally specific understandings and practices concerning what essentially is part of a usability test. The field studies found a number of country–specific and also a number of cross cultural context variables for usability testing. Further support for the findings from the literature study was gained by Nielsen [28] who in field studies of an online variant with remote usability testing of standard usability testing found that, compared to a task list presentation, a scenario based description of the computing task given to low power status participants made them more innovative in finding and suggesting solutions to usability problems. Plocher et al. [29, 49, 50] studied participants' familiarity with the evaluated software's information architecture, and found that this may vary systematically among cultural groups, as predicted by the literature study, because of cultural differences in structures of categories.

How are cultural backgrounds taken into account when recruiting and describing usability test users? The second finding from the project was that culture influences the ways of involving participants in usability evaluation. Joshi, in a review of typical real-life projects from a variety of companies in the Indian IT industry [22, 26], found that Usability professionals in India come in late in design, they are often replaced by software engineers, their user centered design focus is not easily accepted in large software engineering companies, and their human-oriented, holistic approach to interaction design does not go well with the preferred step-by-step, atomistic, approach of software engineering methods. Nielsen [7] studied the "persona" technique, a method to communicate data on target user groups and to aid the perception of users, and to determine how different designers and users with different backgrounds perceive the same textual description of a persona. She found that small cues are given in the text that are interpreted from the informant's cultural background, and that there seems to be a global stereotypical image of a businessperson as the primary user of technology.

Which form of relations and communications between evaluators and test users are most effective in terms of finding relevant usability problems in culturally localized applications? The third finding from the project was that the cultural background of moderator and test users determines what is effective communication in terms of finding relevant usability problems [30] [51] [35]. Moderators with a background similar to that of the test users gave better descriptions, and more frequently found the most severe, important problem with the software tested. In the interview-style parts of the tests, local moderators facilitated more explanations and descriptions from users, but there were no differences in the process when the moderators acted as passive observers in line with classic think aloud testing. Research in the relationship and communication patterns in usability tests is on its way in a PhD study [52], already indicating that an important factor in cross cultural usability testing is the relationship management. Sun and Shi [31] studied the effect of language in usability testing in China and found that speaking Chinese made the moderator to be more assisting in detail, and encourage users more frequently, while when speaking English, the moderator had to pay more attention to the screen to understand what was going on. Yammiyavar et al. [15, 23, 32] observed that the use of non-verbal Cues in Usability Evaluation seemed to be an important corollary to the users' verbal statements in detecting usability problems. They reported, first, that the Indian users found the think aloud test to be exhausting and interfering with their tasks; second,

gestures were interpreted in the same way by users and moderators when they were familiar with them, but not when the moderator was a stranger. Surprisingly, there were very small overall differences in the use of non-verbal gestures among the users from different countries. In India, Kumar et al. [27, 53] tested a method for retrospective usability evaluation that previously had helped Danish users overcome their difficulties with thinking aloud, and found it to be sensitive to information on users' motives and intentions in different cultural contexts, which may be helpful when comparing usability problem lists in cross cultural usability evaluations.

What is the nature of common cross culturally related usability problems, and what is a good quality of cultural usability of information and communication technology? The fourth finding from the CultUsab project was that the nature of common cross culturally related usability problems, and determining what was good quality of cultural usability of information and communication technology would vary across country and stakeholder groups. Hertzum et al. [13, 25, 54] carried out repertory-grid interviews in three countries (China, Denmark, India). They investigated how stakeholders (developers, users, usability professionals) personally construct the use of their own software systems as affected by their cultural background. They found that for the user group, frustrating and useful systems were experienced similarly, whereas for the developers, frustrating systems were experienced similar to easy-to-use systems. Looking at the most characteristic construct for each participant, they found that Chinese participants use constructs related to security, task types, training, and system issues, whereas Danish and, to some extent, Indian participants make more use of constructs traditionally associated with usability (e.g., easy-to-use, intuitive, and liked). In a questionnaire study in Denmark and China, Frandsen-Thorlacius et al. [33] confirmed that the notion of usability, its aspects, and their interrelations are not always constant across cultures.

## 3. Methodological issues and challenges met during the project

The project was planned to have an exploration phase and a test phase. We assumed that in the exploration phase we could first create a common basis among partners for doing ethnographic studies of usability testing in China, India and Denmark to provide answers to the explorative parts of the research question, and then in the test phase formulate precise hypotheses and do field experiments with UEMs in all three countries to test the hypotheses. However, it turned out that the field studies and experiments had to run in parallel, thus creating a shared understanding of cultural usability was an outcome, rather than a precondition of the whole project, and what constituted an UEM had to be a topic of study itself. Below we describe these challenges.

Development during the project of the central object (the UEM) studied. A focus in the CultUsab project was Usability Evaluation Methods (UEMs), as defined by [55]. However, during the project it became clear that there was a need to discuss the grand context of UEMs in order to understand what the research experiments and field studies could tell us about interaction design and usability, particularly in India. This was done by interviewing prominent researchers and practitioners in the Indian software industry and the university, and ask them to speak about the big questions in the field. The first set of questions was related to issues concerning the relation between usability and design and development of software in India. The second question dealt with the relation between culture and usability, including questions related to the significance of the users' cultural background, and the relation between culture and usability for different kinds of interactive technologies. Among the findings were that: definitions of usability should include regional parameters and explain the culturally sensitive design philosophy; it is important to return to rural users in India, and for designers to learn from user studies; usability professionals in India are currently a scarce resource; using a distributed mixed model for user testing can help decide when it is possible to profile users and use them from the local Indian market, and when it is necessary to

recruit users from the foreign market; and usability engineering can be the much needed and wanted research companion to the design discipline in technology education in India [56]. Context factors for UEM practice thus proved to be even more important than expected at the time when the research questions were formulated.

Development during the project in the shared concept of culture. The CultUsab project intended to apply a social-cognitive model of culture [57] that conceptualized culture as a loose network of domain-specific cognitive structures (including theories, beliefs), and, furthermore, argued that an individual can hold more than one cultural meaning system, even if the systems contained conflicting cultural theories. However, the project team from the beginning of the project refrained from agreeing on a common definition of 'culture,' as the Indian partner suggested that it would be more appropriate to work on the basis of 'commonalities' in usability rather than on 'differences.' A broad definition of culture would suffice for the team which was more interested in making inroads into HCI and Usability across cultures. Some team partners at first attempted to apply known culture theories, such as Hofstede's cultural dimensions, to explain the results of the tests or provide a convincing framework that could be used to build heuristics for Usability testing. There were, however, academic arguments within the team that recommended the examination of other theories such as Nisbett's culture theory as framework, which actually proved to be partly successful as a common theory of cultural influence on usability evaluation [14]. It seems that neither Hofstede nor Nisbett, even after both being utilized on the same data, were able to help in predicting user responses and behaviour between Chinese and European usability tests [6], and not at all in a multi cultural societies such as India. This calls for a real need of a more contemporary theory of culture that can be specifically useful to cross cultural usability researchers. Several delegates in the conferences of the CultUsab project and the HWID events echoed the same lack of robust cultural theories and frame works for the use of HCI and usability researchers.

Development during the project in the project's research approach. While the Cultusab project itself originated around the idea of understanding cross cultural issues in usability testing, the deliberations and exchanges between the involved researchers themselves were intensive. The project was a great cross cultural experience personally, as well as academically, for all its participating members. The need to have local team members present during data collection and experimentation by a team not belonging to that place was reinforced during the course of this project. There were the usual time zone differences, administrative procedural differences, time consuming official regulations of individual institutions, and confusion regarding fluctuations in international exchange value of the sponsors currency, etc., but what was more interesting to the researchers in HCI and related fields was the difference in mental models that each team member brought to the discussions to understand and contribute to the project.

Organizational constrains are expected in such international collaborating teams. The team discovered early in the process that it is not really easy to use one of the new technologies such as video and voice over IP conferencing, instant messaging, etc., due to human factors such as time shift, non availability, band width failure, etc. It seemed that the more reliable format of email technology, indigenously operated by each of the team members, served the purpose better. A project website helped communication with members who followed the project on the sideline.

One of the difficult situations was regarding the status of research scholars working in such projects. Adherence to maintaining the difference in Teacher – Student status in India and China was necessary due to traditions and prevalent practices in these countries. It did take some time to adjust to such cultural practices. Nonetheless, research students who went on exchange visits and attended conferences as part of the CultUsab project learned a great deal. The CultUsab project's investments in these research scholars by planting the 'seeds of interest' in Cultural usability research can easily turn out to be the most valuable return of investment in terms of the future.

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